



Edited by:

Vijay Pal Singh

Janice Siegford

Sophie Jenkins-Siegford

PROCEEDINGS OF THE 59TH CONGRESS OF THE ISAE



GREATER NOIDA | 10TH - 14TH AUGUST 2026

Shared worlds: ethology-driven animal welfare & coexistence

ISAE
2026

Shared worlds: ethology-driven animal welfare & coexistence

59TH CONGRESS OF THE INTERNATIONAL SOCIETY FOR APPLIED ETHOLOGY

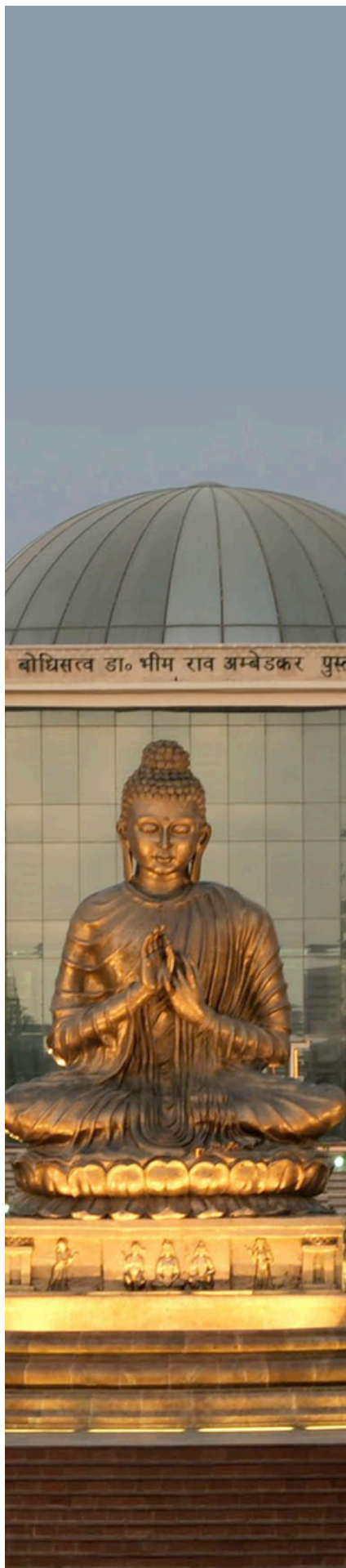
PROCEEDINGS

**10-14 August 2026
Greater Noida**

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Janice Siegford
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Welcome to ISAE 2026

It is my great pleasure and honour to welcome you to the 59th International Conference on Applied Ethology, held under the inspiring theme **“Shared Worlds: Ethology-Driven Animal Welfare and Coexistence.”** This theme resonates deeply with both the scientific vision of applied ethology and the cultural philosophy of India.

India is one of the world's oldest living civilizations, rooted in the timeless principle of **वसुधैव कुटुम्बकम्**—the world is one family. plays a vital role in deepening our understanding of how scientific insight can improve animal welfare while responsibly meeting human needs. The work of this community is central to creating more ethical, evidence-based, and compassionate systems across agriculture, biomedical research, wildlife management, and companion animal care.

The mission of the International Society for Applied Ethology (ISAE)—to advance science, education, and animal welfare through applied animal behaviour research—aligns seamlessly with this ethos. By fostering dialogue through its international congresses, regional meetings, and its official journal *Applied Animal Behaviour Science*, ISAE plays a vital role in deepening our understanding of how scientific insight can improve animal welfare while responsibly meeting human needs. The work of this community is central to creating more ethical, evidence-based, and compassionate systems across agriculture, biomedical research, wildlife management, and companion animal care. Applied Animal Behaviour Science, ISAE plays a vital role in deepening our understanding of how scientific insight can improve animal welfare while responsibly meeting human needs. The work of this community is central to creating more ethical, evidence-based, and compassionate systems across agriculture, biomedical research, wildlife management, and companion animal care.

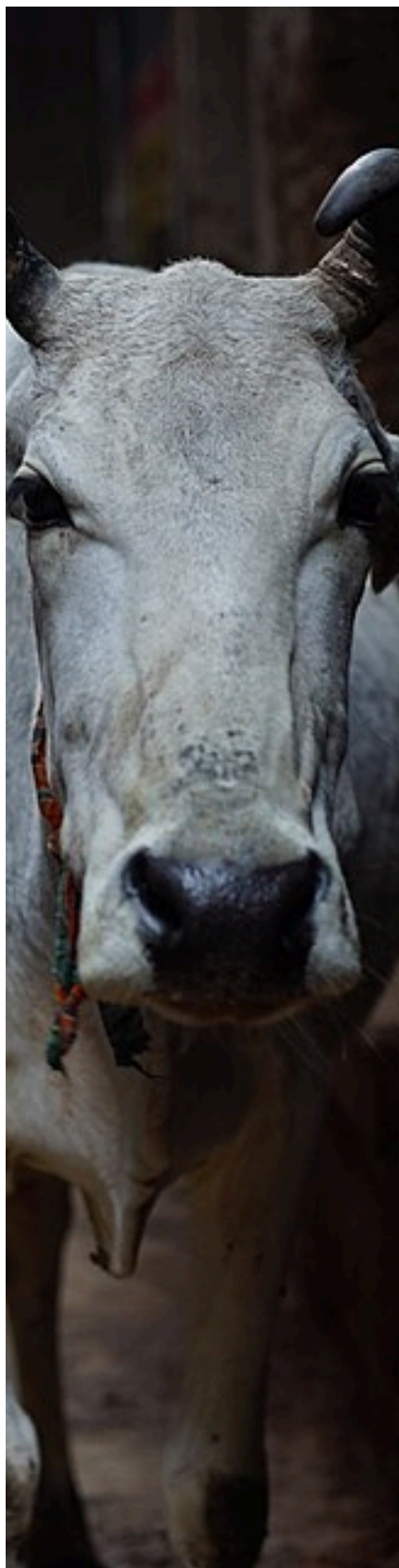
This year, we are delighted to host ISAE at Gautam Buddha University, Noida, Uttar Pradesh, India—a globally acclaimed integrated academic and research institution. Guided by the values of Character, Creativity, Competence, and Commitment, the university provides an intellectually vibrant environment that nurtures innovation, interdisciplinary dialogue, and socially meaningful research. It is a fitting venue for a conference that seeks not only scientific excellence, but also transformative impact on society.

As we gather here, we bring together diverse cultures, disciplines, and perspectives, united by a shared commitment to improving the lives of animals and strengthening human–animal coexistence. I warmly invite the international ISAE community to engage fully in the scientific sessions, discussions, and collaborations, and also to experience India's rich cultural heritage and hospitality.

I look forward to welcoming you to ISAE in India,



Dr. Vijay Pal Singh,
Chair of the Organising Committee



Acknowledgements

Patron

Prof Rana Pratap Singh, Vice Chancellor Of Gautam Buddha University

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ISAE 2026 programme



Monday, 10 August

09:00	ISAE Council Meeting Board Room, GBU Convention Center	DCCAF Workshop International Guest House, 1 st Floor Conference Room	World of Good Initiative Leadership Program for Animal Welfare Conference Room, GBU Convention Center
18:00	Registration Registration Desk, Radisson Blu Hotel		
19:00	Welcome Reception Radisson Blu Chaired by: Vijay Pal Singh and Maria Jose Hötzel		

Tuesday, 11 August

08:00	Registration Opens Registration Desk, GBU Convention Center		
09:00	Welcome and Opening Auditorium 3, GBU Convention Center Chaired by: Vijay Pal Singh and Maria Jose Hötzel		
10:00	Keynote Auditorium 3, GBU Convention Center Chaired by: Vijay Pal Singh		
	Between replacement and relevance: Artificial intelligence, automation, and image-based phenotypes in silkworm infection models for drug discovery Atsushi Miyashita		
11:00	Tea and Coffee Break		
	Oral 1: Insect Ethology & Digital Tools for Measuring Behavior and Enhancing Animal Welfare Auditorium 3, GBU Convention Center Chaired by: Dhanalakshmi Sivanandhan and Atsushi Miyashita	Oral 2: Pigs--Ethology and Welfare of Managed Animals Auditorium 2, GBU Convention Center Chaired by: Gudrun Illmann and Thi Thu Hoai Nguyen	
11:30	Can we know if a black soldier fly is stressed? First steps in assessing larval stress and habituation with tonic immobility testing Elijah Persson-Gordon, Narmeen Hashim, Samuel O Durosaro, Joseph Brumfield, Meghan Barrett*	Exploring the bi-directional relationship between affective state and contest behaviour Simon Turner*, Victoria Lee, Lucy Oldham, Gareth Arnott, Agnieszka Futro, Mark Brims, Andrew Crump, Rick D'Eath	
11:45	When can we know if a black soldier fly is stressed? First steps in assessing larval stress with passive acoustic monitoring Craig Perl*, Oliver Escott, Gesa Reiss, Andrew Crump, Meghan Barrett	Reliability of Qualitative Behavior Assessment (QBA) observers across different countries assessing sow welfare Sarah Ibach*, Jen-Yun Chou, Monica Battini, Maria Camila Ceballos, Lauren Powell, Adenrele Olalekan Adebayo, Charlotte Burn, Louise Connelly, Katy Proudfoot, Siobhan Mullan, Thomas D. Parsons	
12:00	Increased space allowance improves productivity and welfare in growing pigs: Insights from continuous artificial intelligence-based monitoring of agonistic behavior Md Kamrul Hasan*, Hong-Seok Mun, Eddiemar B. Laguna, Md Sharifuzzaman, Ahsan Mehtab, Jin-Gu Kang, Young-Hwa Kim, Hae-Rang Park, Chul-Ju Yang	The role of behavioural flexibility in the navigation of social chaos Katja Zumer*, Lucy Oldham, Victoria Lee, David Fisher, Agnieszka Futro, Mark Brims, Andrea Doeschl-Wilson, arie Haskell, Craig Lewis, Simon Turner	
12:15	Revealing individuality and plasticity in indoor space allocation of dairy cattle using real-time location data Niclas Högberg*, Liselle Simonsson, Hector Marina	Visual representation of environmental enrichment in pig farming: A systematic review of Google Images Leticia Nogueira*, Vitória Alves, Maria José Hötzel	

12:30	Artificial intelligence in animal welfare and behaviour monitoring: A review of ethical, technological and policy perspectives <i>Opeyemi Yusuf*</i>	Prepartum nest-building intensity is associated with distinct gut microbial profiles in loose-housed sows <i>Sarvani Biswas*, Jinhyeon Yun</i>
12:45	Multiclass acoustic monitoring in pigs: Linking coughing dynamics with environmental stressors using machine learning <i>Md Sharifuzzaman*, Hong-Seok Mun, Keiven Mark B. Ampode, Eddiemar B. Laguna, Md Kamrul Hasan, Ahsan Mehtab, Jin-Gu Kang, Young-Hwa Kim, Hae-Rang Park, Chul-Ju Yang</i>	Developing contest skill in young pigs – is it worth the fight? <i>Lucy Oldham*, Gareth Arnott, Mark Briffa, Agnieszka Futro, Jo Donbavand, Mhairi Jack, Alena Kadlecova, Ali Alameer, Manzar Malik, Zeeshan Afzal, Iona Smith, Mark Brims, Claire Anderson, Simon Turner</i>
13:00	Lunch GBU Convention Center	
14:30	Plenary: Ethology and Welfare of Managed Animals Auditorium 3, GBU Convention Center <i>Chaired by: Donald Broom and Nagendra Singh</i>	
	Pain experienced by progenitors modulate nociceptive threshold in their offspring <i>Adroaldo Zanella*, Marisol Parada Sarmiento, Bruna Stanigher, Marco Aurélio Pereira de Almeida</i>	
15:15	Poster 1 Pitches Auditorium 3, GBU Convention Center <i>Chaired by: Beth Ventura and Rekha Puria</i>	
	Green synthesized nano-silver formulations along with its amelioration with herbal essential oils to cure demodicosis in dogs <i>AK Samanta, Moneesh Thakur*</i>	
	Can the presence of diarrhea interfere with personality tests in piglets? <i>Gabriela Jimenes Stofella*, Rafaela Dos Santos, Isabela Bez, Mariana Blanc Taques, Leandro Batista Costa, Ruan Daros</i>	
	Assessment of infrastructure, sanitary practices, and animal welfare compliance in slaughtering points of Mymensingh District, Bangladesh <i>M. Ariful Islam, Md. Siam Ahmed*, Solama Akter Shanta, Mst. Tahomina Akter</i>	
	Effects of different types of environmental enrichment on physiological stress and welfare indicators in CARI Red layer chickens <i>Tanya Chaudhary*, Shrey Aditya Saxena, Manoj Kumar Singh, Ahmad Fahim</i>	
	Lameness-associated changes in milk yield, composition, and inflammatory quality indicators in dairy cows under tropical conditions in Bangladesh <i>Solama Akter Shanta*, Mst. Tahomina Akter, Md. Siam Ahmed, M. Ariful Islam</i>	
	Does a environmental enrichment lead to improved health and more social Jamunapari goats? <i>Mohammad Danish, Chandan Kumar*, Rajneesh Sirohi, Yajuvendra Singh, Mukul Anand, Ajay Kumar, Mamta, Aakansha Mathur, Srasti Dixit, Anmol Pareek, Arundhati Sharma</i>	
	Weaning performance: Benchmarking calf growth on dairy farms in Canada <i>Elizabeth Russell*, Marina von Keyserlingk, Daniel Weary</i>	
	Estimation of prevalence and risk factors of mastitis in dairy cows under smallholder dairy systems in Bangladesh <i>Md. Morsalin*, Tazin Khandoker, Ashikur Rahman, Tasnim Binte Hassan, M. Ariful Islam</i>	
	Effect of floor type on lameness and welfare indicators in lactating cows under smallholder tie-stall systems in Bangladesh <i>Ashikur Rahman*, Shahed Ahamed, Solama Akter Shanta, Md. Morsalin, M. Ariful Islam</i>	
	Evaluation of oxidative stress and emotional/behavioural responses of Red Sokoto goats to the effects of rain in Northern Guinea Savannah zone of Nigeria <i>Minka Ndazo Salka, Shittu Salisu, Tavershima Dzenda, Kuta Makeri*, Priscilla Komolafe</i>	
	Descriptive analysis of tail-directed stereotypic behavior in female breeding rats <i>Carly O'Malley*, Hannah Klossner, Amber Alston, Amber Bradley, Elizabeth Nunamaker</i>	
	Animal welfare and occurrence of subclinical mastitis in smallholder dairy cows: A cross-sectional study in Njoro Sub-County, Kenya <i>Wyckliff Ngetich, Collins Kevin*, Joshua Onono</i>	
	The effect of sleep quality on the navigational ability of sheep <i>Srijana Bhandari*, Jasmine Lamnea, Kieren Powell, Nicole Pacheco Danielski, Ellie Roobottom, Sebastian McBride</i>	
	Paddock access with artificial shade improves egg quality in cage-free laying hens <i>Nadalin Yandra Botton, Caroline Citta Mazocco, Rosangela Poletto*</i>	

Laboratory rats ingest kaolin clay in an attempt to alleviate nausea induced by voluntary wheel running: A transfer test

*Sadahiko Nakajima**

Administration of carbetocin - a long-acting oxytocin analogue - reduces the aggressiveness immediately after mixing adult rams

Lorena Lacuesta, María Pía Tonna, Mercedes Ponce, Ana Egüez, Rodolfo Ungerfeld*

Welfare assessment of pigs reared in an organized farm and backyard production system

Kalyan De, Nitin M. Attupuram, Priyajoy Kar, Salam Jayachitra Devi, Loksha E., Vivek Kumar Gupta*

Influence of coloured enrichment on behavioural response and growth performance in Ross 308 broiler chickens

Ayoola Oluoyemi, Temitope Bankole, Abdulafeez Olawale, Kamaldeen Yusuf, Olufemi Adebiji*

Assessment of knowledge, attitudes, and practices of cattle farmers in Northern Nigeria towards livestock vaccination

Farhan Akorede, Latifah Abdulkarim, Abdulrauf Usman, Abdulhakeem Azeem, Abdulhakeem Binhambali, Shuaib Mahmoud, Adebimpe Adefila, Abdulsalam Magaji, Abdurrahman Jibril*

Applying behavioural science to the study of wild animal welfare

*Janire Castellano Bueno**

Effect of increasing photoperiod on growth performance, welfare and stress in broiler chickens

Temitope Bankole, Ayoola Oluoyemi, Olufemi Adebiji, Ngozi Anurudu, Surajudeen Mustapha*

Mitigating the impact of tail biting through a botanical supplementation

Claire Maltret, Amélie Roques, Alexis Nalovic, Mohammed el Amine Benarbia*

Investigating socially driven robot preference in an AMS-managed dairy herd

*Joanna Tubbs, Day Teixeira**

15:45 **Tea and Coffee Break**

16:15 **Group Photo**
Entrance Stairs, GBU Convention Center

16:30 **Poster 1 Viewing**
Poster Area, GBU Convention Center

Green synthesized nano-silver formulations along with its amelioration with herbal essential oils to cure demodicosis in dogs

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The effect of sleep quality on the navigational ability of sheep*Srijana Bhandari*, Jasmine Lamnea, Kieren Powell, Nicole Pacheco Danielski, Ellie Roobottom, Sebastian McBride***Paddock access with artificial shade improves egg quality in cage-free laying hens***Nadalin Yandra Botton, Caroline Citta Mazocco, Rosangela Poletto****Laboratory rats ingest kaolin clay in an attempt to alleviate nausea induced by voluntary wheel running: a transfer test***Sadahiko Nakajima****Administration of carbetocin - a long-acting oxytocin analogue - reduces the aggressiveness immediately after mixing adult rams***Lorena Lacuesta*, María Pía Tonna, Mercedes Ponce, Ana Egüez, Rodolfo Ungerfeld***Welfare assessment of pigs reared in an organized farm and backyard production system***Kalyan De*, Nitin M. Attupuram, Priyajoy Kar, Salam Jayachitra Devi, Loksha E., Vivek Kumar Gupta***Influence of coloured enrichment on behavioural response and growth performance in Ross 308 broiler chickens***Ayoola Oluymemi*, Temitope Bankole, Abdulafeez Olawale, Kamaldeen Yusuf, Olufemi Adebisi***Assessment of knowledge, attitudes, and practices of cattle farmers in Northern Nigeria towards livestock vaccination***Farhan Akorede*, Latifah Abdulkarim, Abdulrauf Usman, Abdulhakeem Azeez, Abdulhakeem Binhabali, Shuaib Mahmoud, Adebimpe Adefila, Abdulsalam Magaji, Abdurrahman Jibril***Applying behavioural science to the study of wild animal welfare***Janire Castellano Bueno****Effect of increasing photoperiod on growth performance, welfare and stress in broiler chickens***Temitope Bankole*, Ayoola Oluymemi, Olufemi Adebisi, Ngozi Anurudu, Surajudeen Mustapha***Mitigating the impact of tail biting through a botanical supplementation***Claire Maltret*, Amélie Roques, Alexis Nalovic, Mohammed el Amine Benarbia***Investigating socially driven robot preference in an AMS-managed dairy herd***Joanna Tubbs, Day Teixeira**17:30 **Indian Culture****Auditorium 3, GBU Convention Center****Wednesday, 12 August**09:00 **Plenary: Sustainable Welfare of Cattle and Buffalo****Auditorium 3, GBU Convention Center***Chaired by: Maria Camila Ceballos and Imteyaz Qamar***Natural behaviors of water buffaloes and their utilization for sustainable welfare and improved performance***Madan Lal Kamboj****Oral 3: Sustainable Welfare of Cattle and Buffalo****Auditorium 3, GBU Convention Center***Chaired by: Maria Camila Ceballos and Imteyaz Qamar***Oral 4: Dogs & Horses--Ethology and Welfare of Managed Animals****Auditorium 2, GBU Convention Center***Chaired by: Suzanne Millman and Shakti Sahi*09:45 **Interrelationships between behavioural, physiological, emotional responses and milk production in dairy cows***Mst. Ishrat Zerin Moni*, Asif Uzzaman, Jashim Uddin***Consolation responses to human fear and sadness in pet dogs***Laura Rial*, Magdalena Jousset, Juan Pablo Damian, Mariana Bentosela*10:00 **Suckling mitigates cognitive and behavioural rigidity in socially isolated Murrah buffalo (*Bubalus bubalis*) calves***Rajashree Rath*, Pawan Singh Dabas, Madan Lal Kamboj, Shwetambri Jamwal***Human-dog relationships shape attitudes toward livestock production practices***Elisa Cesário Pereira Stadnick*, Bianca Vandresen, Maria José Hötzel*10:15 **Grazing behaviour of cattle and environmental services in silvopastoral and monoculture systems in the tropics of Mexico***Francisco Galindo*, Gustavo Flores, Roberto Marquez***Does electroencephalogram (EEG) monitoring influence lying behavior in horses?***Angela Perrone Barbosa*, Tiago Marcelo Oliveira, Elie Atallah, Yuri Ferreira Vicentini, Hayza Hamazaki, Raquel Yvonne Arantes Baccarin, Emanuela Dalla Costa*10:30 **Tea and Coffee Break**11:00 **Poster 2 Pitches****Auditorium 3, GBU Convention Center***Chaired by: Rosangela Poletto and Anubha Singh*

Integrated veterinary interventions improve stray animal welfare and public health: Evidence from a one health program in urban Bangladesh

Obak Obak, Riyad Hasan, Md. Touhidul Islam Shiblu, Mahmudul Hasan, Abid Ahmed Niloy, Rakibul Hasan, Mst. Ishrat Zerin Moni, Jashim Uddin*

Public perception of animal welfare in Ghana: A cross-sectional survey

*Ebenezer Effah**

Cattle transportation in Bangladesh impacts on welfare, physiology, health, and productivity: A comprehensive review

Mehedy Hasan Pranto, Mst. Ishrat Zerin Moni, Md. Mahabubur Rashid, Md Niamot Ali, Jashim Uddin*

Balancing welfare and productivity: Determinants of cow-calf contact adoption in smallholder and commercial dairy systems of Bangladesh

M. Ariful Islam, Tazin Khandoker, Solama Akter Shanta, Tasnim Binte Hassan*

Bonds beyond borders: Trust over territory in free-ranging dogs

Sivasubramaniam S, Sriyaya Nandi, Anindita Bhadra*

Redrawing boundaries: Investigating the influence of resource dispersion on territoriality in free-ranging dogs

Richik Guha Neogi, Sourabh Biswas, Anindita Bhadra*

Effect of staggered single-entry of freshly calved water buffaloes into resident lactating buffaloes on their welfare and lactation performance

Sunil Dutt, Madan Lal Kamboj, Nishant Kumar, Sabyasachi Mukherjee, Sunita Didel*

Placental development as a prenatal predictor of early-life behaviour and growth trajectory in indigenous Gir calves managed at a gaushala

Anusmita Baishya, TKS Rao, Brijal Barot, Sriranga K.R*

Early rearing practices and its influence on handling behavior of Sahiwal calves during growth monitoring

Shwetambri Jamwal, Pawan Singh Dabas, Madan Lal Kamboj, Rajashree Rath*

Assessment of the welfare status of cattle during transport, at markets, and in slaughterhouses in Bangladesh

Md. Jalal Uddin Sarder, Md. Hemayatul Islam, Abdulla Al-Mamun Bhuyan, Jahingir Alam Shah, Mst. Ishrat Zerin Moni, Akhtarul Islam, Nabin Kumar Das, Sabrina Anam, Jashim Uddin*

Monitoring the behavioural and physiological responses in cats during the perioperative period to evaluate their health status

Shafika Sultana Eti, Mst. Ishrat Zerin Moni, Abdulla Al-Mamun Bhuyan, Md Niamot Ali, Robiul Alam, Md. Jalal Uddin Sarder, Aurangazeb Kabir, Mohammad Mahbubur Rahman, M. Ariful Islam, Md. Rafiqul Alam, Jashim Uddin*

Bridging the welfare gap: Internet of Things (IoT) applications for behaviour monitoring and animal welfare in Nigerian livestock systems

Funmilayo Bamigboye, Emmanuel Ademola*

Does habituation modulate vocal parameters of dairy cows during negative challenges?

Dinu Gavojdian, Madalina Mincu-Iorga*

Behavioural drivers of animal welfare adoption among cattle farmers in Northern Nigeria: A Theory of Planned Behaviour approach

Farhan Akorede, Latifah Abdulkarim, Abdurrahman Jibril*

Assessment of emotional changes in horses using infrared thermal measurement of the eye

Oceane Liehrmann, Veera Riihonen, Léa Lansade*

The bridge from human to animal well-being

Asmi Aggarwal, Daniel Weary*

Amplifying applied ethology research impact: A practical science communication approach for researchers in developing countries

*Oluwaseun Iyasere**

Supporting broiler resilience under reduced medication management using Ocimum gratissimum leaves extract

Tomilola Makanju, Bamidele A. Bako, Hammed O. Amusa*

Welfare Practice Index predicts milk yield variation in Himalayan smallholder dairy cows

Ankaj Thakur, Meesam Raza, Rohit Kumar, Brij Vanita, Rakesh Thakur, Shivani Katoch*

Serotonin, temperament, and lactating dairy cow performance: Linking the autonomic nervous system and productivity

*Guadalupe Ceja, Courtney Daigle**

Assessing animal welfare in Nigerian industrial farms: A case study of Ogun and Niger States

*Oluwaseyi Olawuyi**

Assessment of knowledge, attitudes, and practices among pet owners regarding neutering and spaying of pet animals in Dhaka, Bangladesh

Md Rashedul Islam, Md. Arifur Rahman, Nurjahan Akter Juli, Md Mozahidul Islam Tuser*

	Effects of Astragalus membranaceus by-product on pellet quality, mold growth and resistance of Crucian carp (<i>Carassius auratus</i>) against <i>Aeromonas hydrophila</i> <i>Gangfu Chen*</i>
11:30	Poster 2 Viewing Poster Area, GBU Convention Center
	Integrated veterinary interventions improve stray animal welfare and public health: Evidence from a one health program in urban Bangladesh <i>Obak Obak*, Riyad Hasan, Md. Touhidul Islam Shiblu, Mahmudul Hasan, Abid Ahmed Niloy, Rakibul Hasan, Mst. Ishrat Zerin Moni, Jashim Uddin</i>
	Public perception of animal welfare in Ghana: A cross-sectional survey <i>Ebenezer Effah*</i>
	Cattle transportation in Bangladesh impacts on welfare, physiology, health, and productivity: A comprehensive review <i>Mehedy Hasan Pranto*, Mst. Ishrat Zerin Moni, Md. Mahabubur Rashid, Md Niamot Ali, Jashim Uddin</i>
	Balancing welfare and productivity: Determinants of cow-calf contact adoption in smallholder and commercial dairy systems of Bangladesh <i>M. Ariful Islam, Tazin Khandoker*, Solama Akter Shanta, Tasnim Binte Hassan</i>
	Bonds beyond borders: Trust over territory in free-ranging dogs <i>Sivasubramaniam S*, Srijaya Nandi, Anindita Bhadra</i>
	Redrawing boundaries: Investigating the influence of resource dispersion on territoriality in free-ranging dogs <i>Richik Guha Neogi*, Sourabh Biswas, Anindita Bhadra</i>
	Effect of staggered single-entry of freshly calved water buffaloes into resident lactating buffaloes on their welfare and lactation performance <i>Sunil Dutt*, Madan Lal Kamboj, Nishant Kumar, Sabyasachi Mukherjee, Sunita Didel</i>
	Placental development as a prenatal predictor of early-life behaviour and growth trajectory in indigenous Gir calves managed at a gaushala <i>Anusmita Baishya*, TKS Rao, Brijal Barot, Sriranga K.R</i>
	Early rearing practices and its Influence on handling behavior of Sahiwal calves during growth monitoring <i>Shwetambri Jamwal*, Pawan Singh Dabas, Madan Lal Kamboj, Rajashree Rath</i>
	Assessment of the welfare status of cattle during transport, at markets, and in slaughterhouses in Bangladesh <i>Md. Jalal Uddin Sarder*, Md. Hemayatul Islam, Abdulla Al-Mamun Bhuyan, Jahingir Alam Shah, Mst. Ishrat Zerin Moni, Akhtarul Islam, Nabin Kumar Das, Sabrina Anam, Jashim Uddin</i>
	Monitoring the behavioural and physiological responses in cats during the perioperative period to evaluate their health status <i>Shafika Sultana Eti, Mst. Ishrat Zerin Moni, Abdulla Al-Mamun Bhuyan, Md Niamot Ali, Robiul Alam, Md. Jalal Uddin Sarder, Aurangazeb Kabir, Mohammad Mahbubur Rahman, M. Ariful Islam, Md. Rafiqul Alam*, Jashim Uddin</i>
	Bridging the welfare gap: Internet of Things (IoT) applications for behaviour monitoring and animal welfare in Nigerian livestock systems <i>Funmilayo Bamigboye*, Emmanuel Ademola</i>
	Does habituation modulate vocal parameters of dairy cows during negative challenges? <i>Dinu Gavojdian*, Madalina Mincu-Iorga</i>
	Behavioural drivers of animal welfare adoption among cattle farmers in Northern Nigeria: A Theory of Planned Behaviour approach <i>Farhan Akorede, Latifah Abdulkarim*, Abdurrahman Jibril</i>
	Assessment of emotional changes in horses using infrared thermal measurement of the eye <i>Oceane Liehrmann*, Veera Riihonen, Léa Lansade</i>
	The bridge from human to animal well-being <i>Asmi Aggarwal*, Daniel Weary</i>
	Amplifying applied ethology research impact: A practical science communication approach for researchers in developing countries <i>Oluwaseun Iyasere*</i>
	Supporting broiler resilience under reduced medication management using <i>Ocimum gratissimum</i> leaves extract <i>Tomilola Makanju*, Bamidele A. Bako, Hammed O. Amusa</i>
	Welfare Practice Index predicts milk yield variation in Himalayan smallholder dairy cows <i>Ankaj Thakur*, Meesam Raza, Rohit Kumar, Brij Vanita, Rakesh Thakur, Shivani Katoch</i>
	Serotonin, temperament, and lactating dairy cow performance: Linking the autonomic nervous system and productivity <i>Guadalupe Ceja, Courtney Daigle*</i>
	Assessing animal welfare in Nigerian industrial farms: A case study of Ogun and Niger States <i>Oluwaseyi Olawuyi*</i>

	Assessment of knowledge, attitudes, and practices among pet owners regarding neutering and spaying of pet animals in Dhaka, Bangladesh <i>Md Rashedul Islam*, Md. Arifur Rahman, Nurjahan Akter Juli, Md Mozahidul Islam Tuser</i>	
	Effects of Astragalus membranaceus by-product on pellet quality, mold growth and resistance of Crucian carp (<i>Carassius auratus</i>) against <i>Aeromonas hydrophila</i> <i>Gangfu Chen*</i>	
12:30	Lunch GBU Convention Center	
	Mini-Plenaries: Science for Animal Welfare & Humane World Auditorium 3, GBU Convention Center <i>Chaired by: Maria Jose Hötzel and Nisha Gaur</i>	
14:00	The role of applied ethology in science for animal welfare <i>Birte Nielsen*, Huw Golledge</i>	
14:20	From evidence to impact: Applying animal welfare science to advance cage- and crate-free transitions globally <i>Vineeta Poojary*, Anna Souza, Sara Shields</i>	
	Oral 5: Evidence-Based Practices for Integrating Animal Welfare into Human Cultural Contexts Auditorium 3, GBU Convention Center <i>Chaired by: Maria Jose Hötzel and Nisha Gaur</i>	Oral 6: Sustainable Welfare of Cattle and Buffalo Auditorium 2, GBU Convention Center <i>Chaired by: Trevor DeVries and Eti Sharma</i>
14:45	A five-realms framework for animal welfare <i>Katarína Bučková*, Hsiao-Mei Chang, Kendy Tzu-yun Teng</i>	Farmers' awareness, perceptions, and on-farm management practices related to dairy cow lameness in smallholder dairy systems of Bangladesh <i>Solama Akter Shanta, Tasnim Binte Hassan*, Md. Siam Ahmed, M. Ariful Islam</i>
15:00	Behaviour and welfare: Studies towards a sustainable future <i>Donald Broom*</i>	Effect of staggered single-entry of freshly calved water buffaloes into resident lactating buffaloes on their circadian ingestive and resting behaviours <i>Madan Lal Kamboj*, Sunil Dutt, Pawan Singh Dabas, Nishant Kumar, Sabyasachi Mukherjee</i>
15:15	Tea and Coffee Break	
15:45	Workshops GBU Convention Center	
	Anticipating futures in applied ethology and animal welfare science: Exploring key uncertainties across contexts <i>Débora Racciatti, Laura Rial, Maria Jose Hötzel*</i>	
	Behaviour, body language, buckets and bananas: How to and how not to assess animals' affective states <i>Lucy Oldham*, Cathy Dwyer</i>	
	Exploring opportunities for behavior to support the convalescent veterinary patient <i>Suzanne Millman*</i>	
	Implementation of the 3Rs: National and international perspectives <i>Carly O'Malley, Arvind Ingle, Vijay Pal Singh*, Ramachandra Gudde</i>	
18:00	Yoga and Meditation Auditorium 3, GBU Convention Center	

Thursday, 13 August

09:00	Plenary: Digital Tools for Measuring Behavior and Enhancing Animal Welfare Auditorium 3, GBU Convention Center <i>Chaired by: Courtney Daigle and Jyoti Upadhyay</i>	
	Non-invasive infrared thermography as a tool for assessing emotion and productivity in dairy cows <i>Jashim Uddin*, Clive Phillips, David McNeill</i>	
	Oral 7: Digital Tools for Measuring Behavior and Enhancing Animal Welfare Auditorium 3, GBU Convention Center <i>Chaired by: Courtney Daigle and Jyoti Upadhyay</i>	Oral 8: Ethological Approaches to Managing Conflict of Free-Living Animals in Human Environments Auditorium 2, GBU Convention Center <i>Chaired by: Rielle Perttu and Kushagra Krishnan</i>

09:45	Individual piglets identification based on dorsal keypoint detection during behavioral tests <i>Luis Fernando Costa Garrido*, Fernando Jean Dijkstra, Leandro Batista Costa, Ruan Daros</i>	Human perceptions of coexistence with Sri Lankan leopards (<i>Panthera pardus kotiya</i>) across multiple landscapes <i>Enoka Kudavidanage*, Gihani Hettiarachchi, Lasanthi Kanthika Wijayathunge Arachchige, Uditha Egodaayana, Thilina Dilsara, Sinnathamby Ranjith, Rathnam Yuthahari, Nilma Heshani, et al.</i>
10:00	What can sound analysis of broiler chickens vocalizations tell us? <i>Patricia Soster*, Tomasz Grzywalski, Pieter Thomas, Camila Lopes Carvalho, Imad Khan, Luc Duchateau, Maarten De Gussem, Frank Tuytens, Gunther Antonissem</i>	Understanding reward preferences in Indian free-ranging dogs <i>Srijaya Nandi*, Aesha Lahiri, Dipayanti Aditya, Tuhin Subhra Pal, Anamitra Roy, Rittika Bairagya, Tithi Chakraborty, Rachel Sara Paul, Anindita Bhadra</i>
10:15	A deep learning system for automating head direction annotation in ungulates <i>Akin Kaki*, Jana Deutsch, Steve Lebing, Sandra Dupjan, Christian Nawroth</i>	Predictable resource pulses alter space use and behavioural budgets of free-ranging dogs at public fairs <i>Sourabh Biswas*, Kalyan Ghosh, Hindolii Gope, Anindita Bhadra</i>
10:30	Tea and Coffee Break	
	Oral 9: Ethology and Sustainable Welfare of Cattle and Buffalo Auditorium 3, GBU Convention Center <i>Chaired by: Marina von Keyserlingk and Tejveer Singh</i>	Oral 10: Poultry--Ethology and Welfare Auditorium 2, GBU Convention Center <i>Chaired by: Oluwaseun Iyasere and Chandan Kumar</i>
11:00	Breed and feedlot phase shape feeding behaviours in steers: Insights from beef-on-dairy and Holstein cattle <i>Michail Moroz*, Zheqi Tao, Titouan Chapelain, Melinda Kovacs, Joao Costa, Ruan Daros, Michael Steele</i>	Behavioural consequences of keel bone damage on night-time perching in laying hens: An exploratory RFID pilot study <i>Serge Alindekon*, Helen Louton</i>
11:15	Staggered paired integration modulates social synchrony, agonistic interactions and milking-time behaviour in freshly calved water buffaloes <i>Sunita Didel*, Madan Lal Kamboj, Sunil Dutt, Sanjay Choudhary</i>	Individual characteristics of piling behaviour <i>Alex Johny*, Peta Taylor, Alexander Kashev, Maxine Fogarty, Michael Toscano</i>
11:30	Beyond locomotion: Chronic pain, affective states, and the potential of electroencephalography in lame dairy cows <i>Beatriz Souza*, Thiago Bernardino, Fabio Pogliani</i>	To cluster or not: Estimation of distance thresholds in laying hens <i>Susnato Das*, Lorenz Gyga, Edna Hillmann, Antonia Patt</i>
11:45	Behavioral and postural assessment of affective state in buffalo calves housed on slatted-bedded flooring <i>Dhawal Kant Yadav*, Seema Yadav, Madan Lal Kamboj, Deeksha Patel</i>	Piling behavior is associated with farm technological level in cage-free egg production <i>Caroline Citta Mazocco*, Robson Mateus Freitas Silveira, Rosangela Poletto, Iran José Oliveira da Silva</i>
12:00	Inter-observer reliability of adapted Qualitative Behaviour Assessment in beef cattle welfare protocols: Effects of methodological variations <i>Débora Racciatti*, Cecilia Ferrufino, Leandro Langman</i>	Does manipulation of nest enclosure or uniformity of light affect hens' spatial navigation? <i>Valentina Bongiorno*, Kathryn Baugh, Janice Siegford</i>
12:15	Behavioural time budget and welfare responses of buffalo calves to slatted floor plus paddy straw bedding during winter season <i>Madison Bacon*, Courtney Daigle</i>	Chicken play – individual variation and connection to affective state <i>Rebecca Oscarsson*, Per Jensen</i>
12:30	Lunch GBU Convention Center	
14:00	Plenary: Ethology and Welfare of Managed Animals Auditorium 3, GBU Convention Center <i>Chaired by: Cathy Dwyer and Dinesh Kanwar Yadav</i>	
	From smell to emotion – can we measure how odours affect farm animal behaviour and welfare? <i>Maria Vilain Rørvang*, Birte Nielsen, Vincent Bombail</i>	
	Oral 11: Free Papers Auditorium 3, GBU Convention Center <i>Chaired by: Cathy Dwyer and Dinesh Kanwar Yadav</i>	Oral 12: Lab--Ethology and Welfare Auditorium 2, GBU Convention Center <i>Chaired by: Carly O'Malley and Shantanu Kalambi</i>
14:45	What does current neurophysiological evidence tell us about the cause and function of environmentally induced stereotypic behaviour in animals? <i>Sebastian McBride*</i>	Replacement of laboratory animals in cancer research using 3D spheroid model <i>Tejveer Singh, Deepika Sharma*, Aadipoojya Jain, Areena Turk, Ram Avtar Singh, Ankita Mohapatra, Rajat Gupta, Monica Bohot, Vijay Pal Singh</i>

15:00		Advancing animal welfare in Asia-Pacific by AAALAC International accreditation – 30 years of achievement <i>K B Patel*, Montip Gettayacamin</i>
15:15	Tea and Coffee Break	
	Oral 13: Fish & Zoo--Ethology and Welfare of Managed Animals Auditorium 3, GBU Convention Center <i>Chaired by: Yifei Yang and Pawan Singh Dabas</i>	Oral 14: Free Papers Auditorium 2, GBU Convention Center <i>Chaired by: Emma Fàbrega and Ramachandra Gudde</i>
15:45	Behavioural and physiological stress responses as integrated welfare indicators in farmed African catfish (<i>Clarias gariepinus</i>) <i>Felix Nwose*</i>	How applied ethologists experience and cope with internal conflicts resulting from using animals in their research <i>Beth Ventura*, Bianca Vandresen, Caroline Ritter, Katy Proudfoot</i>
16:00	Long-term husbandry records reveal individual and life-history drivers of daily fish consumption in zoo-managed penguins <i>Courtney Archer*, Cara Templeton, Katie Hall, Rielle Perttu</i>	Role of human posture in free-ranging dogs' approachability towards unfamiliar humans <i>Aesha Lahiri*, Srijaya Nandi, Anamitra Roy, Tuhin Subhra Pal, Anindita Bhadra</i>
16:15	Balancing foraging engagement and caretaker usability: Evaluating automated feeding strategies for zoo-managed Japanese macaques <i>Rielle Perttu*, Mary Pederson, Rachel Peters, Katie Hall, Courtney Archer</i>	
16:45	Annual General Meeting (AGM) Auditorium 3, GBU Convention Center <i>Chaired by: Maria Jose Hötzel</i>	
20:00	Gala Dinner (Banquet)	

Friday, 14 August

09:00	Plenary: Ethology and Welfare of Managed Animals Auditorium 3, GBU Convention Center <i>Chaired by: Arvind Ingle and Rajashree Rath</i>	
	How do mothers influence their offspring? An exploration of the role of suckling and maternal care in the development of young animals <i>Cathy Dwyer*</i>	
	Oral 15: Lab--Ethology and Welfare of Managed Animals Auditorium 3, GBU Convention Center <i>Chaired by: Arvind Ingle and Rajashree Rath</i>	Oral 16: Cattle & Small Ruminant--Ethology and Welfare of Managed Animals Auditorium 2, GBU Convention Center <i>Chaired by: Madison Bacon and Madan Lal Kamboj</i>
09:45	Investigating the welfare challenges and benefits for rehomed ex-research rats: Mid-term results from a longitudinal survey <i>Carole Fureix*, Nick Cherbanich, Louise Evans, Molly Davidson, Caitlin Walburn, Jack Olive, Augustina Resasco, Chris Handley, Vikki Neville, Michael Mendl</i>	Maternal protective behaviour and handling reactivity in Angus cows are independent behavioural traits <i>Aiden Dawn McBean, Ed Pajor, Maria Camila Ceballos*</i>
10:00	Scars of the past or signs of the present? Investigating persistent stereotypic behaviours in laboratory mice <i>Shay Forget*, Lindsey Kitchenham, Georgia Mason</i>	Descriptive analysis of calving site selection, postpartum behaviours, and misothering across different calving environments in beef cattle. <i>Emma Roux*, Maria Camila Ceballos, M. Claire Windeyer, Jennifer Pearson, Ed Pajor</i>
10:15	Behaviour of non-human primates in captivity <i>Ramachandra Gudde*, Ramesh Venkatarayappa</i>	Two-year-old rams born to shorn ewes display more homogeneous physical activity than those born to non-sheared ewes <i>Rodolfo Ungerfeld*, Andrea Jaqueline Pérez Nieva, Aline Freitas de Melo, Hernán Cardoso, Rocío Cabral, Julián Oreggioni</i>
10:30	Tea and Coffee Break	

11:00

Poster 3 Pitches**Auditorium 3, GBU Convention Center***Chaired by: Simon Turner***Working donkey welfare in West Africa: A case study in Zuarungu, upper east region of Ghana***Abdul-Rahman Safian****Effects of emersion in water on behaviour, morphometric development, reproductive endocrinology and body surface thermoregulation in water buffalo heifers***Pradeep Singh*, Arun Kumar Mishra, Madan Lal Kamboj, Sunil Dutt***What does the meow say? Investigation of the bioacoustics and frequency of vocalisations during behavioural tests and their association with the veterinary consultation***Paula Gieslinski*, Luis Fernando Costa Garrido, Ruan Daros***Impact of slaughter techniques on animal welfare and ethical meat production: A comprehensive review focusing on the context of Bangladesh***Md. Mahabubur Rashid*, Mst. Ishrat Zerin Moni, Mehedy Hasan Pranto, Md Niamot Ali, Jashim Uddin***Animals at work, welfare in context: Linking human practices to animal well-being***Dennis Kipkorir*, Wyckliffe Ngetich***Using tri-axial accelerometers to evaluate the lying time of working donkeys in Mwea Sub-County, Kenya***Wilson Kuria*, Eddy Mogoa, James Nguhiu-Mwangi, Willy Mwangi, Peter Kimeli***Efficacy of electrical stunning and halal slaughter on broiler stress physiology and meat quality: A meta-analysis***Utibe Okon*, Muhammad Nizam Hayat, Emmanuel Nuamah, Mohd Amran Radzi, Azalea Hani Othman, Awis Qurni Sazili***One Welfare at home: Caregiver challenges and cat welfare during home-based treatment of feline sporotrichosis in Brazil***Sabrina Sato*, Ruan Daros***Water quality as a determinant of welfare indicators in semi-intensive Nile tilapia farms in Egypt***Wasseem Emam*, Mohamed Bakr, Nada Habashi, Radi Mohamed, Ahmad Hamza, Mahmoud Eltholth, Sara Barrento, Murilo Quintiliano***Incorporating animal welfare assessment as a criteria to promote improvements in small scale pig farms in the South of Brazil***Marcia Inês Grapéggia Zanella*, Alexandre Copatti Loregian, Adroaldo Zanella***Towards a dialogue between multispecies ethnography and animal welfare science: Insights from pasture-based systems in Southern Brazil***Maria Cristina Yunes*, Jean Segata***Understanding tick prevention gaps through one health lens: Evidence from companion animal owners in Kerala, India***Mohammad Faizan T K*, Vinod V K, Jess Vergis***Impact of confinement on behavior and cortisol chronobiology in gilts***Marisol Parada Sarmiento*, Leandro Sabei, Sarah Ibach, Sophia T. Barone, Thomas D. Parsons***Epidemiological trends of bovine viral diseases: Welfare implications for cattle in smallholder systems of Bangladesh***Aurangazeb Kabir*, Jashim Uddin, Mohammad Mahbubur Rahman, Shohana Sharmin***Lessons learnt from developing a machine learnable ethogram***Adrien Kroese*, Moudud Alam, Lena-Mari Tamminen, David Berthet, Nils Fall, Niclas Högberg***Prevalence and risk factors of lameness and it's underlying causes in lactating dairy cows in Bangladesh***M. Mahadi Hasan, Solama Akter Shanta, Tazin Khandoker, M. Ariful Islam****Pre-lamb shearing: Effects on ewe-lamb behavioral responses to early post-partum handling***Aline Freitas de Melo*, Messy Pantoja, Rodolfo Ungerfeld***Effect of a calming supplementation on tail biting: An ethological approach***Amélie Roques, Alexis Nalovic*, Claire Maltret, Mohammed el Amine Benarbia***Saving the next generation: Understanding the struggles of newborn buffalo calves in the Bathan (coastal pasture) areas of Bangladesh***A.K.M. Mostafa Anower****Wallowing improves thermoregulatory and reproductive response of geese during high temperature-humidity index***Emmanuel Ewuola*, Elizabeth Akinbola, Julius Oyewale, Aminat Ogundele, Femi Oyeniyi***From science to policy: Applied ethology and global south collaboration to end the donkey skin trade***Patricia Tatemoto****Comparative physiological responses of Nigerian indigenous goat breeds to varying durations of heat stress exposure***Mathew Ayoola*, Deborah Fatoki, Deborah Ayoola*

The effect of straw bale packaging on slower growing broiler behaviour

Charlotte James*, Dawn Scholey, Ashraf Alkhtib, Nick Davies, Izzy Candy, Kate Parkes, Anna Lampitt, Andrew Gibson, Lauren Spencer, Paul Phillips, Kelly Grellier, Emily Burton

Mapping pig welfare best practices across the five domains model along the production chain, with emphasis on behaviour

Emma Fábrega*, Marko Ocepek, Lene-Juul Pedersen, Alessia Zoroaster, Antonio Marco Maisano, Heng-Lun Ko

11:30

Poster 3 Viewing**Poster Area, GBU Convention Center****Working donkey welfare in West Africa: A case study in Zuarungu, upper east region of Ghana**

Abdul-Rahman Safian*

Effects of emersion in water on behaviour, morphometric development, reproductive endocrinology and body surface thermoregulation in water buffalo heifers

Pradeep Singh*, Arun Kumar Mishra, Madan Lal Kamboj, Sunil Dutt

What does the meow say? Investigation of the bioacoustics and frequency of vocalisations during behavioural tests and their association with the veterinary consultation

Paula Cieslinski*, Luis Fernando Costa Garrido, Ruan Daros

Impact of slaughter techniques on animal welfare and ethical meat production: A comprehensive review focusing on the context of Bangladesh

Md. Mahabubur Rashid*, Mst. Ishrat Zerin Moni, Mehedy Hasan Pranto, Md Niamot Ali, Jashim Uddin

Animals at work, welfare in context: Linking human practices to animal well-being

Dennis Kipkorir*, Wyckliffe Ngetich

Using tri-axial accelerometers to evaluate the lying time of working donkeys in Mwea Sub-County, Kenya

Wilson Kuria*, Eddy Mogoa, James Nguhiu-Mwangi, Willy Mwangi, Peter Kimeli

Efficacy of electrical stunning and halal slaughter on broiler stress physiology and meat quality: A meta-analysis

Utibe Okon*, Muhammad Nizam Hayat, Emmanuel Nuamah, Mohd Amran Radzi, Azalea Hani Othman, Awis Qurni Sazili

One Welfare at home: Caregiver challenges and cat welfare during home-based treatment of feline sporotrichosis in Brazil

Sabrina Sato*, Ruan Daros

Water quality as a determinant of welfare indicators in semi-intensive Nile tilapia farms in Egypt

Wasseem Emam*, Mohamed Bakr, Nada Habashi, Radi Mohamed, Ahmad Hamza, Mahmoud Eltholth, Sara Barrento, Murilo Quintiliano

Incorporating animal welfare assessment as a criteria to promote improvements in small scale pig farms in the South of Brazil

Marcia Inês Grapéggia Zanella*, Alexandre Copatti Loregian, Adroaldo Zanella

Towards a dialogue between multispecies ethnography and animal welfare science: Insights from pasture-based systems in Southern Brazil

Maria Cristina Yunes*, Jean Segata

Understanding tick prevention gaps through one health lens: Evidence from companion animal owners in Kerala, India

Mohammad Faizan T K*, Vinod V K, Jess Vergis

Impact of confinement on behavior and cortisol chronobiology in gilts

Marisol Parada Sarmiento*, Leandro Sabei, Sarah Ibach, Sophia T. Barone, Thomas D. Parsons

Epidemiological trends of bovine viral diseases: Welfare implications for cattle in smallholder systems of Bangladesh

Aurangzeb Kabir*, Jashim Uddin, Mohammad Mahbubur Rahman, Shohana Sharmin

Lessons learnt from developing a machine learnable ethogram

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Prevalence and risk factors of lameness and it's underlying causes in lactating dairy cows in Bangladesh

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Pre-lamb shearing: Effects on ewe-lamb behavioral responses to early post-partum handling

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Effect of a calming supplementation on tail biting: An ethological approach

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Saving the next generation: Understanding the struggles of newborn buffalo calves in the Bathan (coastal pasture) areas of Bangladesh

A.K.M. Mostafa Anower*

Wallowing improves thermoregulatory and reproductive response of geese during high temperature-humidity index

Emmanuel Ewuola*, Elizabeth Akinbola, Julius Oyewale, Aminat Ogundele, Femi Oyeniji

From science to policy: Applied ethology and global south collaboration to end the donkey skin trade

Patricia Tatemoto*

	Comparative physiological responses of Nigerian indigenous goat breeds to varying durations of heat stress exposure <i>Mathew Ayoola*, Deborah Fatoki, Deborah Ayoola</i>	
	The effect of straw bale packaging on slower growing broiler behaviour <i>Charlotte James*, Dawn Scholey, Ashraf Alkhtib, Nick Davies, Izzy Candy, Kate Parkes, Anna Lampitt, Andrew Gibson, Lauren Spencer, Paul Phillips, Kelly Grellier, Emily Burton</i>	
	Mapping pig welfare best practices across the five domains model along the production chain, with emphasis on behaviour <i>Emma Fàbrega*, Marko Ocepek, Lene-Juul Pedersen, Alessia Zoroaster, Antonio Marco Maisano, Heng-Lun Ko</i>	
12:30	Lunch GBU Convention Center	
14:00	Plenary: Applying Animal Behaviour Science to Wildlife Welfare and Conservation Auditorium 3, GBU Convention Center <i>Chaired by: Maria Vilain Rørvang and Enoke Kudavidanage</i>	
	Wildlife welfare: Centering the conversation around behavioral biology <i>Janice Siegford*, Maria Diez Leon, Valentina Bongiorno, Vittoria Elliott</i>	
	Oral 17: Applying Animal Behaviour Science to Wildlife Welfare and Conservation Auditorium 3, GBU Convention Center <i>Chaired by: Maria Vilain Rørvang and Enoke Kudavidanage</i>	Oral 18: Pigs--Ethology and Welfare of Managed Animals Auditorium 2, GBU Convention Center <i>Chaired by: Rodolfo Ungerfeld</i>
14:45	Associations between judgement bias and other indicators of affective state: A way to advance wild animal welfare science? <i>Janire Castellano Bueno, Michael Beaulieu*</i>	Housing alters piglet vocalization during handling <i>Leandro Sabei*, Marisol Parada Sarmiento, Thomas D. Parsons</i>
15:00	Using mice as models to improve conservation captive breeding: Females prefer males from higher-welfare, well-resourced housing <i>Prathipa Anandarajan*, Jiayi Cai, Georgia Mason</i>	Effects of crate opening from day 4 postpartum until weaning on postural changes and piglet trapping in lactating sows <i>Gudrun Illmann*, Helena Chaloupková, Veronika Sekyrová</i>
15:15	Closing and Awards Auditorium 3, GBU Convention Center <i>Chaired by: Vijay Pal Singh and Maria Jose Hötzel</i>	
16:00	Tea and Coffee Break	
16:30	Yoga, Meditation or 5K Fun Run/Walk	

Tuesday, 11 August

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Between replacement and relevance: Artificial intelligence, automation, and image-based phenotypes in silkworm infection models for drug discovery

Dr. Atsushi Miyashita*¹

1. Teikyo University

Since the beginning of the twenty-first century, efforts to abolish animal experimentation have expanded worldwide. In the food and cosmetics sectors, many countries and regions have eliminated the use of animals for safety and efficacy studies. In contrast, animal experimentation remains routine in medicine and pharmaceutical science because complex biological phenomena relevant to human disease cannot yet be fully reproduced by in vitro systems or computational simulation alone. This raises two questions: are animal experiments truly unnecessary in the food and cosmetics fields, and are they truly indispensable in medicine and pharmaceutical science? In this lecture, I reconsider these questions not as a binary choice between conducting and not conducting animal experiments, but as a problem of selecting the most appropriate living system for a given scientific purpose. What is required is not necessarily a mammalian organism itself, but a living system in which infection, immunity, pharmacological efficacy, toxicity, and pharmacokinetics interact in an integrated manner. If part of this role can be fulfilled by smaller, more tractable organisms with a lower ethical burden, the future of animal experimentation may be transformed. As one such system, I introduce the silkworm infection model. Silkworms are large enough for quantitative injection, infection, drug administration, and hemolymph collection, and are well suited for in vivo evaluation of therapeutic efficacy in relatively large numbers of individuals. Silkworm infection models have contributed to the discovery of the antibacterial agent lysocin E and the novel antifungal agent ASP2397 against *Aspergillus fumigatus* infection, demonstrating their value as in vivo screening systems with translational relevance. We are currently extending this concept to invasive fungal infections, particularly mucormycosis. Because in vitro antifungal activity alone is insufficient to predict in vivo efficacy, safety, and disease-context dependence, we are pursuing an in vivo-first strategy to determine whether candidate compounds are truly effective in a living organism. Furthermore, by combining silkworm infection models with artificial intelligence, it is becoming possible to quantify survival, activity, postural change, and recovery as image-based phenotypes. This is not simply automation, but a new observational methodology that also engages a central question in applied ethology: how the condition of an individual animal can be observed and interpreted. Silkworms also carry broader significance as biocultural resources rooted in the history of sericulture across Asia. Through the past, present, and future of silkworm-based drug discovery, this lecture explores a new kind of animal model positioned between replacement and relevance.

Can we know if a black soldier fly is stressed? First steps in assessing larval stress and habituation with tonic immobility testing

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Black soldier fly larvae are reared by the trillions for food, feed, and waste management applications. However, very little is known about indicators of stress in black soldier fly larvae (BSFL), leaving most performance and welfare checks focused on population-level mortality or escape behaviour. BSFL are known to be photophobic (showing light-avoidance behaviors) and handling, a predator-associated cue, is also known to be stressful in most insects. In two experiments, we looked for behavioural measures of stress and habituation to stress by assessing tonic immobility (TI; a rigid, motionless state where the insect 'freezes' after being picked up while mobile with soft forceps and then gently placed back down on the petri dish surface). In the first study, animals were exposed to an acute stressor – light – or darkness for lower-stress controls and a TI assay was conducted; the number of attempts required to induce TI and latency to unfreeze were assessed. Preliminary analyses showed that individual BSFL exposed to light were more likely to freeze in fewer attempts compared to those in the dark (Mann-Whitney U; $U = 3565$, $p < 0.0007$). Latency to recover was also longer in the light than in the dark ($U = 2491$, $p = 0.0031$). In the second study, larvae were exposed to chronic, mild unpredictable stress (CMUS) for two weeks leading up to the TI assay, including multiple exposures to light and disturbance. CMUS larvae did not differ from control, low-stress larvae in the number of attempts required to freeze (as the majority of both groups froze in a single attempt; $U = 11455$, $p = 0.0688$). However, CMUS larvae recovered from TI nearly 1.7x more quickly than low-stress larvae ($U = 9005$, $p = 0.0021$), suggesting some habituation to the stressor. These data suggest that tonic immobility tests should receive further research attention as a tool for assaying stress in farmed BSFL.

When can we know if a black soldier fly is stressed? First steps in assessing larval stress with passive acoustic monitoring

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Black soldier fly larvae are reared by the trillions for food, feed, and waste management applications. However, very little is known about indicators of stress in black soldier fly larvae (BSFL), leaving most performance and welfare checks focused on population-level mortality or escape behaviour. Passive acoustic monitoring has been successfully employed in traditional agriculture as a low-intervention welfare indicator. We looked for changes in the acoustic profile of larvae exposed to stressful conditions, with the aim of assessing the efficacy of passive acoustic monitoring for insect rearing under industrial conditions. We selected two treatments that are known to be stressful to BSFL; light and physical disturbance. BSFL are photophobic (showing light-avoidance behaviors) and handling, a predator-associated cue, is also known to be stressful in most insects. We recorded the sound intensity of 2,000 BSFL in a bin for six hours using full spectrum audio loggers (AudioMoths), with three bins per replicate per day for two days (36 total test bins, 12 bins per treatment). Sound intensity decreased significantly in both stressed conditions compared to low-stress control bins (LMM; $F_{3,400} = 29.82$, $p < 0.001$). The acoustic complexity index also decreased significantly in the light-stress condition compared to the low-stress control ($t = 7.50$, $p < 0.0001$); the low-stress and disturbance conditions did not differ ($t = 1.92$, $p = 0.22$). Further validation of our results (such as directly testing for larval stress and surveying other stressors) are advised but these data indicate that passive acoustic monitoring may be a viable low-intervention method for assaying stress in farmed BSFL.

Increased space allowance improves productivity and welfare in growing pigs: Insights from continuous artificial intelligence–based monitoring of agonistic behavior

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Stocking density is a key management factor affecting productivity and animal welfare in intensive pig production systems; however, its effects on behavior and physiological stress under fixed-pen housing conditions remain insufficiently characterized. This study investigated the effects of increasing space allowance from 0.57 to 0.97 m²/pig, implemented by reducing pig number within identical pens, on growth performance, agonistic behavior, and stress-related indicators in growing pigs, while assessing a previously developed artificial intelligence (AI)-based behavioral monitoring system. Seventy-six 12-week-old pigs were allocated to either high stocking density (HSD; 12 pigs/pen, n = 4 pens; 0.57 m²/pig) or low stocking density (LSD; 7 pigs/pen, n = 4 pens; 0.97 m²/pig) for 28 days. Growth performance was recorded weekly. Agonistic behaviors (aggression, ear biting, and tail biting) were continuously monitored using red, green, blue (RGB) cameras and detected with a previously validated You Only Look Once version 8 (YOLOv8)-based model, which showed high detection accuracy (mAP50 = 0.953; aggression = 0.960, ear biting = 0.927, tail biting = 0.972) and strong agreement with manual observations (intraclass correlation coefficient = 0.83–0.85; Pearson's correlation coefficient = 0.80–0.88; all p < 0.001). Behavioral outputs were quantified at the pen level and normalized as daily count and duration per pig. Physiological stress was assessed using ear base temperature measured at baseline and twice weekly, whereas ear and tail biting lesion scores and blood biochemical indicators were evaluated at the end of the study. Compared with HSD pigs, LSD pigs showed higher final body weight and average daily gain (both p < 0.001), higher feed intake (p = 0.001), and lower feed conversion ratio (p = 0.003). Increased space allowance also reduced aggression, ear biting, and tail biting frequency and duration per pig (all p < 0.001), together with lower ear and tail biting lesion scores (both p < 0.001). These behavioral improvements were accompanied by lower ear base temperature over time (group effect, p < 0.001), and reduced plasma glucose (p = 0.036), free fatty acids (p = 0.046), and cortisol (p < 0.001), suggesting mitigation of both thermal and metabolic stress. Under these fixed-pen housing conditions, increasing space allowance was associated with improved growth performance and welfare in growing pigs, and the AI-derived behavioral measures were consistent with lesion scores, ear base temperature, and blood stress indicators, supporting AI-based monitoring as an objective tool for continuous welfare assessment.

Revealing individuality and plasticity in indoor space allocation of dairy cattle using real-time location data

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Understanding how animals distribute behaviour across space and time is central to interpreting behaviour in managed systems, where housing design and daily routines strongly influence activity. In group-housed dairy cattle, indoor environments are typically highly standardised, yet individuals may differ consistently in how they use indoor space. This study aimed to describe the multivariate structure of daily indoor space-use allocation in group-housed dairy cattle and to quantify between- and within-individual variation under routine, undisturbed conditions. The study was conducted at the Swedish Livestock Research Centre in a free-stall dairy barn housing lactating Swedish Red and Holstein cows, managed in multiple groups across different lactation stages and milked using a voluntary milking system.. Data were collected between February 2024 and August 2025 using an ultra-wideband real-time locating system. Daily time budgets were derived for four functional zones: cubicles, feeding areas, walking alleys, and the milking area. Data were filtered to exclude days affected by health events, treatments, management interventions, or excessive missing positions, with predefined washout periods applied, resulting in a final dataset of 56,320 cow-days from 355 individuals. For each retained cow-day, descriptors including month, parity, days since calving, days in group, daily milk yield, group identity, and group stability were derived. Daily time budgets were analysed as compositional data using centred log-ratio transformation followed by principal component analysis, and linear mixed-effects models were applied to principal component scores to partition variance and assess individual-specific responses to temporal covariates. Daily space-use allocations formed continuous and overlapping distributions in principal component space, with no evidence for discrete behavioural categories. The first three principal components explained 51.9%, 34.0%, and 14.1% of the total variance, respectively. Between-individual differences accounted for 9.2%, 19.5%, and 28.9% of the variance in PC1, PC2, and PC3, indicating increasing individual differentiation along finer-scale behavioural axes. Models including individual-specific slopes revealed heterogeneity in within-individual responses, with random-slope variance for days since calving approximately 2.3 times larger along PC2 than PC3, consistent with stronger individual differences in reallocation between feeding and resting versus walking alley use and milking. These results show that behavioural individuality, expressed as persistent differences in daily space-use allocation, co-occurs with heterogeneous within-individual trajectories over time even in a stable social and physical environment, and illustrate how longitudinal measures of space allocation can be used to quantify behavioural organisation in group-housed animals.

Artificial intelligence in animal welfare and behaviour monitoring: A review of ethical, technological and policy perspectives

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Artificial Intelligence (AI) is rapidly transforming livestock production and animal management systems globally, providing innovative tools for precision monitoring, early disease detection, and welfare assessment. In Nigeria and other developing livestock economies, the integration of AI into animal welfare and behavioural management is emerging but remains uneven and poorly studied. Despite the growing adoption of sensor technologies, computer vision, machine learning algorithms, and automated decision-support systems, critical concerns persist regarding ethical use, data governance, infrastructural limitations, and policy readiness guiding the application of AI in animal production systems. Animal welfare is increasingly recognized as central to sustainable livestock productivity, public health, and ethical farming. AI-driven systems now enable real-time monitoring of behavioural indicators such as feeding patterns, locomotion, vocalization, heat stress responses, social interactions, and disease-associated behavioural deviations. These technologies improve early intervention, reduce mortality, and optimize farm management. However, the rapid automation of animal agriculture raises ethical questions relating to surveillance intensity, techno-centric farming, reduction in human-animal relationships, and algorithmic bias in welfare assessment models trained predominantly on data from intensive systems in the Global North. This review examines AI applications in animal welfare and behaviour from three interrelated perspectives: ethical considerations, technological implications, and policy frameworks. It synthesizes current literature on wearable sensors, computer vision, bioacoustic monitoring, and predictive analytics in welfare assessment, while evaluating their suitability within Nigeria's livestock systems. The review further analyzes existing animal welfare regulations, digital agriculture policies, and data protection laws to identify governance gaps affecting responsible AI adoption in animal welfare. Key challenges identified include limited digital infrastructure, high technology costs, data ownership concerns, low farmer literacy in AI systems, and the absence of AI-specific welfare guidelines. To address these issues, the study proposes context-adapted AI governance frameworks, inclusive policy development, farmer capacity-building initiatives, and ethical standards for automated welfare monitoring. In conclusion, a multi-stakeholder approach involving researchers, technologists, policymakers, and livestock producers is necessary for the responsible integration of AI into animal welfare and behavioral management. Establishing ethical safeguards, regulatory clarity, and locally relevant innovation pathways will be essential for ensuring that AI advances both animal well-being and sustainable livestock development.

Multiclass acoustic monitoring in pigs: Linking coughing dynamics with environmental stressors using machine learning

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Respiratory disease and environmental stress remain major challenges in pig production, causing economic losses and compromising animal welfare. Early, objective, and continuous detection of respiratory problems under farm conditions is therefore essential. This study aimed to develop and evaluate an artificial intelligence (AI)-based multiclass acoustic monitoring system for pigs and to investigate the temporal dynamics of coughing in relation to environmental stressors. Fifty-two growing pigs were allocated to a control group (standard ventilation) or a treatment group (restricted ventilation) and monitored continuously for 28 days. Environmental variables (ammonia, CO₂, temperature, relative humidity, and dust) and respiration rate were recorded using sensor-based systems. An Audio Spectrogram Transformer (AST) model was trained to classify five sound categories (coughing, sneezing, aggressive vocalizations, normal vocalizations, and silence) using labeled audio data. Longitudinal acoustic outcomes were analyzed using generalized linear mixed models, and associations between coughing and environmental variables were assessed using Spearman correlation analysis. The AST model achieved 95% overall classification accuracy, and model predictions showed very strong agreement with manual annotations (Pearson $r = 0.976\text{--}0.998$ across sound categories). Treatment pigs exhibited significantly higher sound event counts, longer sound durations, and greater time occupancy for coughing, aggressive, and normal vocalizations, alongside significantly reduced silence (all $p < 0.001$). Growth performance was impaired under treatment conditions, with significantly lower average daily gain ($F = 87.1$, $p < 0.001$) and feed intake ($F = 1517.0$, $p < 0.001$). Coughing displayed a clear circadian structure, with a dominant evening peak (19:00–22:00) and a secondary late-morning peak (~10:00). Strong positive correlations were observed between coughing frequency and ammonia ($r = 0.66\text{--}0.86$), temperature ($r = 0.72\text{--}0.81$), and CO₂ ($r = 0.76\text{--}0.77$), with consistently stronger associations in the treatment group. These findings demonstrate that AI-based acoustic monitoring can reliably capture biologically meaningful respiratory and behavioral patterns in pigs. Importantly, the identification of reproducible high-risk time windows provides a practical basis for optimizing precision livestock farming systems, allowing respiratory surveillance algorithms to prioritize monitoring during periods of highest diagnostic yield. Such time-aware monitoring strategies can improve early disease detection while reducing computational load and false alarms, supporting the development of efficient real-time, non-invasive health surveillance tools for commercial pig production.

Exploring the bi-directional relationship between affective state and contest behaviour

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Aggressive contests reduce captive animal welfare but individuals pay different contest costs (e.g. injuries). The role of affective state in shaping contest decisions is largely unexplored. Specifically, how does affective state before a contest influence the likelihood of winning and the costs animals will pay, and how do contests influence subsequent affective state? We tested two hypotheses using pigs: (1) Animals with a more positive affective state pre-contest, reflected by optimistic assessment of ambiguous stimuli, will have a higher perception of their fighting ability, leading to longer and costlier fights, and an increased likelihood of winning; (2) Affective state will be more negative following a fight and will reduce more for losers and those that paid a high contest cost. Ninety sex-matched dyadic contests (n=180 pigs) were staged at 11-12 weeks old with ethical end-points. Judgement bias tests (JBT, n=135 pigs) and startle tests (ST, n=179) assessed affective state pre- and post-contest. Contest costs were measured by change (before/after contest) in skin lesion count, blood glucose and lactate. Linear or generalised linear mixed models were used. Fight win (yes/no), contest duration or contest cost (lesion, lactate, glucose change) were response variables for Hypothesis 1. Latency to open ambiguous reward boxes in the JBT or to return to the location of the startle were responses for Hypothesis 2. Depending on the specific response variable, batch/dyad were random effects, and relative weight, latency to open the positive box and latency to open ambiguous boxes in the JBT or latency to return to the location of the startle in the ST were fixed effects. Pigs which had a short mean latency to open three ambiguous JBT reward boxes had greater likelihood of winning ($F=4.84$, $p=0.03$), suggesting positive affective state pre-contest was associated with fight success. However, there was no relationship between startle response and fight success. Contrary to Hypothesis 1, pessimistic pigs experienced greater lactate change, and affective state did not influence lesion or glucose change or contest duration. Pigs took longer to open negative and ambiguous boxes in the post-contest JBT, suggesting contests made pigs more pessimistic. Affective state was not affected by winning/losing nor the contest costs. Optimism before a contest measured by JBT is associated with higher fight success, but this is not achieved by paying greater costs to secure victory. Contests suppress optimism in both winners and losers, irrespective of the costs paid.

Reliability of Qualitative Behavior Assessment (QBA) observers across different countries assessing sow welfare

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Although validated tools exist to assess physical and physiological aspects of pig welfare, methods to reliably evaluate their affective states are still lacking. Qualitative Behavior Assessment (QBA) is a holistic approach that integrates details of how animals behave to gain insight into their emotional state. However, questions arise about the role of subjectivity in these assessments, given their reliance on human perception. As the first step in an ongoing international study, we investigated agreement amongst observers assessing sow welfare using QBA across multiple locations. Fifty-four veterinary students enrolled in American Veterinary Medical Association-accredited DVM or BVSc programs were recruited from six veterinary institutions located in the United States (PENN, N=15), Canada (CALG, N=8; UPEI, N=5), Ireland (UCD, N=11), and the United Kingdom (EDIN, N=3; RVC, N=12). Participation was limited to citizens of the country where their institution was located. All observers received standardized training through a self-administered online program covering sow behavior, husbandry, and QBA-assessed welfare. Trained observers then assessed a video library of 31, one-minute clips of post-wean sows (54.9 ± 2.7 weeks old) isolated within a novel arena test using fixed-list QBA with predefined descriptors. Intra-observer reliability was assessed using Kendall's correlation coefficient W on the scoring of three videos triplicated and randomly presented for a total of three separate reliability checks. Four assessors (PENN, N=2; UCD, N=2) were removed from analysis due to insufficient internal consistency across the three checks (mean W < 0.60). The remaining assessors' scores for 20 defined descriptors were pooled across 25 videos and analyzed using principal component analysis (PCA). Three principal components (PCs) were retained for analysis, accounting for 69% of total variance, and interpreted as emotional valence, arousal, and withdrawal. Observer agreement within each institution was calculated at the PC level using Kendall's Coefficient W, and linear mixed models were used to investigate location-based effects on component scores. Individual descriptor scores varied from 0 to 125, spanning the full range of possible responses. Within each institution, agreement was substantial for PC1 (W=0.61–0.69) and PC2 (W=0.61–0.64), while agreement for PC3 was very low (W=0.09–0.18). Linear mixed models revealed no significant effect of country on QBA outcomes. Data collection is ongoing, and future analyses will integrate demographic and perception results into linear mixed models to further elucidate the role individual background plays in QBA, however, preliminary results indicate assessors show consistency in their observations across geographic locations.

The role of behavioural flexibility in the navigation of social chaos

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Commercial farming systems change the social groups of animals several times throughout their life, requiring new dominance-subordinance relationships to be formed through interactions that may or may not escalate into fights. The ability to flexibly adapt behaviour based on recent fight success ought to reduce animals' costs of losing fights, which should improve animal welfare. Here we tested the hypothesis that flexibility in cognitive tasks (reversal learning) predicts flexibility in contests. Flexibility in contests was defined by (a) avoiding initiating new fights against an opponent that had defeated the subject within the preceding 60s; and (b) shortening of fight duration over a period of group aggression post-mixing. Reversal learning performance was tested on n=92 female and n=83 male pigs (10-11 weeks old). Pigs passed the reversal learning test when choosing a rewarded over unrewarded location on 6/6 or 10/12 consecutive occasions. Pigs were mixed into new social groups of 8-16 animals at 14 weeks old. All aggressive interactions were recorded for 2 hours post-mixing (peak aggression). Linear or generalised linear mixed models tested the effect of cognitive ability (pass/fail reversal learning test) on behavioural flexibility, with fixed effects of sex and weight and random effects of pen nested in farrowing batch. Pigs initiated 1-16 fights within the first 2 hours post-mixing and initiated 0-13 attacks against opponents that had defeated them within the previous 60s. The two measures of contest flexibility were not strongly correlated (Spearman $\rho \approx -0.06$, $p = 0.996$) and neither was significantly affected by sex or weight. Passing or failing the reversal learning test did not significantly affect either measure of flexibility, conflicting with our hypothesis ($p=0.15-0.39$). Pigs that passed and failed the reversal learning task did not reduce their fight duration as they gained experience at a significantly different rate ($p=0.386$). Interestingly, animals that never completed the reversal learning task (e.g. because they did not habituate) showed a greater decline in fight duration over time than those that did participate ($p=0.0419$). Speculatively, this could indicate that animals that are more fearful of handling/novelty and therefore refused to participate in the test are also more fearful in contests and concede defeat faster. Improving flexibility in contest decisions based on recent win-loss experience could reduce the welfare costs of aggression. Although cognitive ability, as measured here, did not predict flexibility, other aspects of cognition and non-cognitive factors could affect contest flexibility and influence animal welfare.

Visual representation of environmental enrichment in pig farming: A systematic review of Google Images

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Adequate environmental enrichment (EE) is central to intensive pig farming, as it enables species-specific exploratory and foraging behaviours and mitigates redirected behaviours resulting from environmental restrictions, such as tail biting. Despite scientific evidence and regulatory recommendations supporting effective enrichment strategies, a gap remains between technical guidelines and their practical implementation on farms. This study investigated how EE in pig production is visually represented in digital media, considering that online imagery functions as an interface between ethological scientific knowledge, industry practices, and public perception. We conducted a systematic review of images retrieved through anonymous searches on Google Images using the terms “environmental enrichment” and “pig” in English and Spanish on January 30th, 2026. Of the 766 images obtained, we retained those depicting pigs from commercial farms, with or without EE, as well as items marketed as EE, excluding montages and cartoons. The 347 included images (174 in English; 173 in Spanish) were assessed by two researchers, with a third evaluator consulted in cases of disagreement. The images originated mainly from corporate blogs or commercial websites (34%), specialized magazines (17%), and NGO pages (12%). The most represented EE types were objects (38%; 53% suspended) and substrates (30%; 48% deep bedding). In 25% of the images associated with the search terms, no EE strategy could be visually identified. Pigs were predominantly shown housed in group pens (80%) or outdoor paddocks (12%). Most were in the finishing (52%) and growing (17%) phases, followed by piglets in farrowing units (10.2%), gestating sows (8%), and one image of a breeding boar. Considering all analyzed images depicting pigs, 15% showed animals with visible body lesions. Among the images in which pigs’ tails were visible, 70% showed tail-docked animals. The marked online presence of EE-related content suggests an effort to promote welfare-oriented practices. However, the predominance of suspended object-type enrichment indicates the dissemination of strategies limited in enabling rooting behaviour or sustained manipulation. Besides, the meaningful proportion of tail-docked and injured animals may reflect insufficient opportunities for pigs to express their behavioural needs, with the persistence of fights and cannibalism. The underrepresentation of breeding animals is noteworthy given ongoing efforts to transition away from cage systems. This study suggests a visual normalization of minimally functional enrichment and preventive mutilations, which may compromise welfare standards ethologically grounded and influence both farmer practices and societal expectations regarding pig farming.

Prepartum nest-building intensity is associated with distinct gut microbial profiles in loose-housed sows

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Prepartum nest-building behaviour is an instinctive maternal behaviour expressed prior to parturition, driven by endocrine changes even under spatial and material constraints in modern production systems. Given the bidirectional interactions within the gut–brain axis, variation in this behaviour may be associated with differences in gut microbial composition. Therefore, this study investigated whether prepartum nest-building intensity is linked to gut microbiota profiles in loose-housed sows. A total of 39 crossbred sows housed in loose pens were classified into shorter nest-building (SN, $n = 19$, 144.04 ± 64.21 min) and longer nest-building (LN, $n = 20$, 310.99 ± 54.88 min) groups based on the total duration of nest-building behaviour during the 24 h preceding parturition. Faecal samples were collected on day 1 after farrowing. No significant differences were observed in alpha diversity indices. However, microbial community structure differed consistently between SN and LN groups across Bray–Curtis and Jaccard ($P = 0.008$ for both), Jensen–Shannon ($P = 0.009$), unweighted UniFrac ($P = 0.045$), and weighted UniFrac ($P = 0.036$) distances. At the phylum level, the LN group exhibited higher abundances of Proteobacteria and Actinobacteria. At the genus level, *Lactobacillus* was more abundant in the LN groups, while *Romboutsia* and *Terrisporobacter* were reduced. At the species level, the LN group exhibited higher abundances of *L. amylovorus* and *L. ruminis* and lower abundances of *Clostridium butyricum*. LEfSe analysis further identified enrichment of Bacteroidota and Spirochaetota in the LN group ($P < 0.01$), while Firmicutes were more abundant in the SN group ($P = 0.014$). Several genera, such as *Peptococcus*, *Treponema*, *Oribacterium*, *Megasphaera*, *Catenisphaera*, and *Lactobacillus*, were enriched in the LN group ($P < 0.05$), while *Romboutsia* and *Turicibacter* were more abundant in the SN group ($P < 0.01$). Functional prediction analysis indicated enrichment of pathways related to core metabolism and biosynthesis processes in LN, whereas SN showed enrichment of pathways related to transport and signal transduction ($P < 0.05$). In conclusion, compared with SN sows, LN sows exhibited a distinct gut microbiota composition and were enriched in predicted pathways related to core metabolism and biosynthesis, whereas SN sows were enriched in transport and signal transduction pathways. These findings suggest that behavioural variation before parturition is accompanied by early postpartum structural and functional divergence in the gut microbiome between SN and LN sows.

Developing contest skill in young pigs – is it worth the fight?

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The ability of animals to deploy complex behaviours skilfully and the consequences for welfare are unknown. Skill has several components, including accuracy, effectiveness, appropriateness and efficiency, and can improve with experience. We hypothesised that early life exposure to contests (pre-weaning socialisation, post-weaning mixing) would increase contest skill. We predicted that pigs' skilful behaviour in dyadic contests would decrease the welfare cost of contests, estimated using Qualitative Behaviour Assessment (QBA). Early life treatments were applied in a 2x2 design (socialised / control x mixed / control). "Socialisation" involved access to an adjacent litter for 2 weeks. "Mixing" of 3 familiar + 3 unfamiliar pigs lasted 1 hour. Each pig experienced two dyadic contests (C1, C2) at 12 weeks & 13 weeks of age. Pigs met two different, same-sex, unfamiliar opponents in a novel arena. Contests ended when one pig clearly retreated + 60s, or up to 15min, unless welfare endpoints were reached. Skill included accuracy (composed of 'aim': attacks targeted to the face/ears, and 'effectiveness': attempted attacks landing on the face/ears), appropriateness (attacks from T position, appropriate blocking, post-retreat avoidance) and efficiency (attacks per distance moved). Post-contest affective state (C1: 128 pigs; C2: 147 pigs) was scored using QBA with a fixed list of descriptors by a highly experienced observer. Lmm responses were QBA principal components 1&2. Predictors were, sex, weight relative to opponent, early life treatments, and individual skill metrics (fixed), dyad ID and litter (random). In C1, females showed higher accuracy ($z=5.637$, $p<0.001$) than males and in both contests, females attacked more appropriately (from T position) (C1: $z=-3.406$, $p=0.001$, C2: $z=-6.325$, $p<0.001$). In C2, males demonstrated more appropriate blocking ($z=6.684$, $p<0.001$). Post-retreat attacking by the winner was only affected by the submitting pig's behaviour. Relative body weight and early life treatments did not predict skill, suggesting early contest experience does not shape skill. QBA dimensions characterising post-contest behavioural expression were similar for C1&C2. PC1 represented valence (uncomfortable/agitated to relaxed/calm) and PC2, arousal (tired/lethargic to energetic/boisterous). In C1, effective attacking was related to relaxed/ calm behaviour post-contest ($t=2.19$, $p=0.031$), while pigs that attacked from the T position were more tired/lethargic ($t=-4.03$, $p=0.0001$). After C2, winners that avoided attacking a retreating opponent were more relaxed/ calm ($t=2.67$, $p=0.0095$), whereas effective attacking increased tiredness/lethargy (PC2, $t=-2.14$, $p=0.034$). Key associations between skill and the affective costs of aggression were that more skilful attacking was more tiring while avoiding bullying benefitted winners and losers.

Pain experienced by progenitors modulate nociceptive threshold in their offspring

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Individuals with altered nociceptive and pain responses exhibit higher morbidity and shorter lifespans compared with those showing normal nociception. Understanding the developmental origins of pain sensitivity is therefore essential. We investigated the consequences of prenatal programming associated with lameness, a behavioral indicator of a painful, often chronic condition, in the offspring of sows, broiler breeders, and dairy cows, aiming to identify cross-species patterns in pain modulation. In pigs, we observed that the offspring of lame sows presented more skin lesions after weaning, suggesting increased involvement in aggressive interactions. In a subsequent study, offspring from lame sows exhibited higher nociceptive thresholds, measured using an algometer, compared with offspring from non-lame sows. These findings indicated that piglets born to sows that were lame during the last third of gestation were less sensitive to pain, suggesting prenatal influences on nociceptive processing. To evaluate whether this effect extended to other species, we conducted a study in broiler breeders under commercial conditions in Brazil. Parent birds were gait-scored as lame (L) or sound (S) and allocated into four mating groups: SS, SL, LS, and LL. Nociceptive thresholds were evaluated in adult broilers. We detected differences between the LL and LS groups (progeny of lame females and lame males or lame females and sound males) and the SS group (progeny of sound females and sound males) which exhibited the lowest nociceptive thresholds, indicating higher sensitivity to noxious stimuli than all other treatment groups. These findings reinforced the hypothesis that parental lameness, particularly maternal lameness, influences offspring pain sensitivity. Finally, we investigated this phenomenon in dairy cattle. Holstein–Friesian cows in the final third of gestation were classified according to locomotion score: $G1=LS \leq 2$, or $G2= \geq 3$. After calving, calves were assigned to maternal groups: GC1 born to cows with $LS \leq 2$, and GC2 born to cows with $LS \geq 3$. At 30 days of age, female calves were dehorned using a hot iron, and nociceptive responses were evaluated in a blinded manner. Calves born to cows with $LS \geq 3$ exhibited lower nociceptive thresholds, demonstrating that maternal lameness during gestation influences postnatal pain sensitivity in calves. Taken together, these cross-species findings suggest that maternal lameness during gestation consistently alters nociceptive processing in offspring. However, adaptive explanations for this modulation remain speculative. Further research is required to test mechanistic hypotheses and to evaluate alternative interpretations grounded in evolutionary principles of the pain system.

Green synthesized nano-silver formulations along with its amelioration with herbal essential oils to cure demodicosis in dogs

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Demodex canis has significant physical welfare implications such as pain and discomfort, chronic disease burden, systemic complications, physiological and behavioural welfare, human-animal bond implications, breeding and genetic welfare concerns, shelter and stray dog welfare, treatment-related welfare considerations, ethical and legal considerations, quality of life impact. Present investigation was conducted for incidence of demodicosis in dogs and its therapeutic management with special reference to herbal nano formulation. The incidence and risk factors of canine demodicosis are central to animal well-being which includes identify vulnerable populations, reveal management deficiencies, highlight genetic welfare concerns, enable early interventions, prevent chronic suffering. A total of 1200 dogs were screened for demodicosis and 35 cases were confirmed for demodicosis by skin scraping & PCR examination. Overall incidence of demodicosis was 2.91%. Month wise incidence study revealed highest incidence in summers (April-July) and lowest in the winter (October-March). Dogs of 0-6 months and >3 years age group was found more susceptible to demodicosis during the study period. Sex wise incidence showed males were more susceptible to demodicosis. Breed wise incidence revealed crossbred dogs (34.28%) were more affected. The typical characteristics of Demodex spp. were confirmed in (20/35) 57.14% cases by skin scraping examination while PCR examination demonstrated (35/35) 100% by the amplification of an approximately 483bp. Sequencing of PCR products were analyzed by BLAST & the results indicated 99.7% identical to available sequences of D. canis MG372354 (1:99.7) and 98.8 identical with D. canis KU253790 (33:98.8) & MG372359 (1:96.8). The sequence of the PCR product of positive samples was submitted to NCBI GenBank for accession number and MK177513 accession number was obtained for GenBank. Study of oxidant-antioxidant status of demodicosis, revealed a significant ($p < 0.01$) reduction in the mean values TA, GSH, SOD, LPO in Demodex infected dogs. From an animal well-being perspective modern isoxazolines (Amitraz) currently provide predictable, rapid relief and are the benchmark therapy. A validated herbal nano-formulation could enhance welfare by reducing suffering, improving clinical comfort, promoting faster skin recovery, minimizing systemic adverse effects. The therapeutic evaluation of herbal formulation against demodicosis revealed all the parameters viz, haemato-biochemical changes and oxidant-antioxidant status was improved on day 21 post therapy onwards which was similar with standard therapy i.e. Amitraz. From the present study it seems that Herbo-Nano medicine can be an effective alternative of Amitraz in case of demodicosis.

Can the presence of diarrhea interfere with personality tests in piglets?

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Behavioral tests are used to assess personality traits in animals. However, the potential influence of health status on behavioral responses during these tests remains underexplored. This study aimed to evaluate whether the presence of diarrhea affects behavioral parameters measured in two tests used to assess personality traits in piglets. Forty-five piglets (Landrace × Large White), housed in trios, underwent a five-minute open-field test at 49 ± 6 days of age, during which exploration time and vocalizations were assessed. After five days, the same piglets were subjected to the laser test which was conducted in their home pen. A red laser was projected in front of the piglet's snout and, as the animal approached, the laser was moved 10 cm away. The laser remained on for 10 seconds, during which time spent attending to the laser was recorded. Subsequently, the piglet was observed for an additional 20 seconds with the laser turned off, during which exploratory (head lowered, sniffing/licking, walking or stationary) and locomotor behaviors (head raised, walking without exploratory interest) were evaluated. Diarrhea was individually assessed daily in the afternoon by inserting a cotton swab 25–30 mm into the piglet's rectum, and fecal consistency was scored on a scale from 1 to 4, where 1 indicated the absence of diarrhea and 4 indicated watery diarrhea. Statistical analyses were performed using the R software, applying linear models and linear mixed-effects models. No significant difference in exploration time during the open-field test was observed between piglets with and without diarrhea (222.68 seconds without diarrhea; 167.00 seconds with diarrhea; $P = 0.07$). The presence of diarrhea did not influence the number of vocalizations (62.30 vocalizations without diarrhea; 76.29 vocalizations with diarrhea; $P = 0.5$). Vocalizations were not significantly associated with piglet age (-4.27 vocalizations per additional day of age; $P = 0.1$). In the laser test, locomotion time differed between groups, with piglets with diarrhea showing 2.29 seconds less locomotion (4.87 seconds without diarrhea; 2.58 seconds with diarrhea; $P = 0.04$), whereas no differences were observed for time spent attending to the laser (8.72 seconds without diarrhea; 9.33 seconds with diarrhea; $P = 0.38$) or exploration time (8.34 seconds without diarrhea; 8.33 seconds with diarrhea; $P = 0.99$). These results suggest that diarrhea does not influence piglets' behavioral responses during personality tests; thus, it is likely that diarrhea does not affect personality trait measurement.

Assessment of infrastructure, sanitary practices, and animal welfare compliance in slaughtering points of Mymensingh District, Bangladesh

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Ensuring humane slaughter practices and hygienic meat production is essential for safeguarding animal welfare, public health, and occupational safety. In Bangladesh, most slaughtering points operate as small-scale public or open facilities with limited regulatory oversight and inadequate documentation. Deficiencies in infrastructure, sanitary management, and veterinary supervision may compromise animal welfare during pre-slaughter handling and slaughter procedures, while also increasing risks of meat contamination and occupational hazards. This study aimed to assess slaughterhouse infrastructure, hygienic management practices, worker safety behaviors, and animal welfare-related conditions at slaughter points in Mymensingh district, Bangladesh. A cross-sectional study was conducted between July and October 2017 and between April and June 2018 across 78 slaughter points in 13 sub-districts of Mymensingh district. Data were collected from 212 adult workers using structured questionnaires and non-participant on-site observation checklists. Infrastructure conditions, availability of basic facilities, animal-handling practices, waste management systems, and the use of personal protective equipment (PPE) were evaluated using descriptive statistics. Among the surveyed slaughter points, 91% handled mixed ruminants (cattle, sheep, goats, and buffalo). Basic structural elements such as cemented floors (92.5%) and water supply (95%) were commonly available. However, facilities essential for hygienic operations were limited: only 32.5% had functional disposal pits, and about 30% lacked adequate drainage systems. Dedicated lairage areas, proper bleeding and evisceration sections, chilling facilities, ante-mortem veterinary inspection, and carcass classification systems were largely absent. Animal welfare-related shortcomings were evident during slaughter operations. Slaughtering was predominantly performed directly on concrete floors (97.5%) without the use of humane stunning methods, increasing the likelihood of animal stress and improper bleeding. The absence of structured animal-handling areas and veterinary oversight further indicates limited compliance with recommended humane slaughter standards. In addition, stray animals were observed around several slaughter points, posing potential contamination risks. Worker hygiene and safety practices were also inadequate. None of the workers used gloves or masks, only 2.5% wore gumboots, and protective clothing was rarely observed. Furthermore, 94.8% of workers had not received formal training in hygienic slaughter procedures or zoonotic disease prevention. Overall, the findings reveal substantial gaps in humane slaughter practices, hygienic management, and occupational safety in slaughter points of Mymensingh district. Strengthening veterinary oversight, improving facility organization, enforcing regulatory standards, and implementing structured training programs for workers are essential to enhance animal welfare, meat safety, and occupational health within Bangladesh's slaughter sector.

Effects of different types of environmental enrichment on physiological stress and welfare indicators in CARI Red layer chickens

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Environmental enrichment is an important management strategy that facilitates the expression of natural behaviors and improves overall welfare outcomes in commercial layer systems. To evaluate its impact, the present study examined how different types of environmental enrichment influence physiological stress responses and welfare indicators in CARI Red layer chicken, an improved dual-purpose strain widely reared under semi-intensive systems in rural India, where simple environmental enrichment can be cost-effective for farmers while also improving bird welfare, under deep litter conditions. A total of 160 CARI Red pullets were included in a 24-week experimental trial (20–42 weeks of age) and randomly allocated to five treatment groups under a completely randomized design with four replicates per treatment and eight birds per replicate ($n = 32$ per treatment). The treatments were: T1 – no environmental enrichment (control); T2 – provision of a dust bath; T3 – provision of perches; T4 – provision of a novel object; and T5 – combined provision of dust bath, perches, and novel object. Physiological stress status was assessed at the end of the trial by measuring plasma cortisol concentration, heterophil-to-lymphocyte (H/L) ratio, alkaline phosphatase (ALP) activity, and total immunoglobulin (TIG) levels. Welfare evaluation was conducted using physical integrity indicators, including feather condition score, body condition score and claw length measurement. Clear differences were observed in physiological stress indicators. Plasma cortisol concentration was highest in the control group and significantly reduced in the combined enrichment group. The H/L ratio and ALP activity exhibited similar trends, further supporting reduced physiological stress in enriched birds. In contrast, TIG levels were significantly higher in T5 (50.78 mg/dL) compared with T1 (44.67 mg/dL; $P = 0.031$), suggesting enhanced immune competence with combined enrichment. Regarding welfare outcomes, claw length was significantly reduced in the perch group (T3: 13.51 cm) compared to other treatments (~ 15.5 cm; $P = 0.0487$), reflecting improved natural claw wear. Footpad lesion scores were significantly lower in enriched groups, particularly in T5, compared to the control ($P = 0.0497$), indicating improved litter interaction and reduced contact-related lesions, while feather condition scores showed no significant variation. In conclusion, combined environmental enrichment effectively reduced physiological stress and enhanced immune response. Structural enrichment, particularly perch provision, improved specific physical welfare outcomes. These findings support the incorporation of multimodal enrichment strategies to promote welfare-oriented and sustainable layer production systems.

Lameness-associated changes in milk yield, composition, and inflammatory quality indicators in dairy cows under tropical conditions in Bangladesh

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Lameness is a major welfare and economic challenge in dairy cattle, yet evidence describing its effects on milk production and milk-quality parameters in tropical dairy systems such as Bangladesh remains limited. This longitudinal observational study evaluated the effects of clinical lameness on milk yield and selected milk-quality indicators in lactating dairy cows at a commercial dairy farm in Mymensingh, Bangladesh, between July 2024 and June 2025. Sixteen Holstein–Friesian cows were enrolled, including 12 clinically lame multiparous cows and 4 clinically healthy non-lame controls. Control cows were selected from the same herd and matched as closely as possible for parity and lactation stage to reduce confounding. Lameness was assessed using a standardized 1–5 locomotion scoring system; cows with scores ≥ 2 were classified as lame to allow early detection of gait abnormalities. At diagnosis, cows were evaluated through locomotion scoring and clinical inspection of the udder and teats, and milk was macroscopically examined for abnormalities. The relatively small and unbalanced sample size (12 lame vs. 4 controls) reflected the natural occurrence of lameness cases during the study period and represents a study limitation. Lame cows were monitored at three time points: 7 days before clinical diagnosis (pre-diagnostic), on the day of confirmed lameness (diagnostic), and 7 days after diagnosis (post-diagnostic). Daily milk yield data were obtained from farm records. Milk quality parameters including pH, electrical conductivity, somatic cell count (SCC), fat, protein, lactose, solid-not-fat (SNF), and total solids were analyzed using the Ekomilk Horizon Unlimited analyzer. Multivariable linear mixed-effects models (cow as a random intercept) indicated a significant stage effect on milk yield and inflammatory milk indicators. Milk yield declined during the diagnostic stage (15.00 ± 0.63 L/day) compared with the pre-diagnostic stage (19.00 ± 0.52 L/day; $p < 0.01$), representing an approximate 21% reduction. Compared with healthy controls (20.00 ± 0.55 L/day), clinically lame cows produced about 25% less milk. Yield partially recovered 7 days after diagnosis (18.00 ± 0.48 L/day) but remained lower than healthy cows ($p < 0.05$). Concurrently, inflammatory milk indicators increased during lameness: SCC more than doubled ($812.8 \pm 45.6 \times 10^3$ cells/mL vs. $335.4 \pm 22.1 \times 10^3$ cells/mL pre-diagnosis; $p < 0.001$), alongside increases in electrical conductivity and milk pH. Overall, clinical lameness was associated with inflammatory responses and reduced milk yield and quality. These findings emphasize the importance of early detection and improved lameness management to safeguard dairy cow welfare and productivity in tropical dairy systems.

Does a environmental enrichment lead to improved health and more social Jamunapari goats?

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The intensification of goat production systems often predisposes animals to stress, which can adversely affect their health, behavior, and overall welfare. The study evaluated the role of physical environmental enrichment as a practical strategy to alleviate stress and enhance welfare in Jamunapari goats. Goats were divided into control and enriched groups (n = 8 each). In enriched group six enrichment devices were introduced: Elevated platforms, PVC pipes (hanging leaves), tyres coiled with jute ropes (for scratching and facilitating bipedal feeding), wooden logs, pet bottles, and hollow pumpkins (containing feed as puzzle feeders) while in control barren environment was provided except feed manger and drinking trough. These enrichments were designed to stimulate natural behaviors such as climbing, browsing, scratching, exploratory and feeding behavior. Welfare was assessed using Body Condition Score (BCS), Hair Coat Condition (HCC), and Human-Animal Interaction (HAI) at 0, 30, 60, 90, and 120 days, and statistically analyzed using an independent t-test. Physical enrichment significantly improved BCS during the experimental period. The overall mean BCS was higher ($P = 0.002$) in the enriched group (3.06 ± 0.06) compared to the control group (2.75 ± 0.13). No significant differences were observed on Days 0, 30, and 60 days ($P > 0.05$). However, BCS was significantly higher but in ideal range in the enriched group on Days 90 (3.44 ± 0.11 vs. 2.94 ± 0.11 ; $P = 0.008$) and 120 (3.50 ± 0.09 vs. 3.06 ± 0.06 ; $P = 0.002$), indicating a progressive improvement in body condition. The enhanced coat condition reflects improved integumentary health and general appearance. Hair coat condition score also showed positive trends. Although differences were non-significant during the initial phase (Day 0–60; $P > 0.05$), however significant improvement was observed on Day 90 (4.09 ± 0.14 vs. 3.54 ± 0.18 ; $P = 0.028$) and Day 120 (4.29 ± 0.13 vs. 3.80 ± 0.15 ; $P = 0.044$). Furthermore, physical enrichment significantly reduced HAI distance ($P < 0.05$), indicating improved approachability and reduced fear toward humans. While no differences were noted on Days 0 and 30, the control group exhibited significantly greater avoidance distance on Days 60 (7.71 ± 0.57 vs. 5.46 ± 0.47 ft) and 90 (6.49 ± 0.42 vs. 4.64 ± 0.50 ft). Serum cortisol was significantly reduced in the enriched group at later stages. The findings demonstrate that physical environmental enrichment effectively reduces stress, enhances physiological condition, and improves behavioural responses in Jamunapari goats under intensive management systems.

Weaning performance: Benchmarking calf growth on dairy farms in Canada

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Weaning (i.e., the transition from milk to solid feed) is a critical time in a calf's life that can be stressful and affect their welfare. Calves that struggle at weaning can experience bouts of hunger and reduced rates of weight gain (i.e., a "growth check"). Despite having a general understanding of factors that can contribute to weaning success, little is known about how well calves cope with weaning on commercial dairy farms. The aim of our study was to use benchmarking for farmers to assess calf weight gains relative to other farms in their region. We recruited a cohort of 13 dairy farms from the largest dairy producing region in British Columbia, Canada and followed a total of 1,558 Holstein heifer calves. Farms were visited once a week for 12 months, collecting weight estimates before weaning and the three consecutive weeks after weaning using heart girth measurements. Average daily gain (ADG) per calf was calculated before and after weaning, along with the difference between pre- and post-weaning ADG, referred to as "growth check". Seven participants housed calves individually before weaning, while six housed calves in pairs or groups. The mean maximum milk allowance was 8.0 ± 1.3 L/d, with two farms offering unrestricted access to milk. Mean weight at week 1 was 41.5 ± 5.4 kg and mean weight at week 8 was 81.4 ± 10.5 kg. Weaning age averaged 80.1 ± 21.1 d but varied widely across farms (range 31-254 d). ADG was 0.8 ± 0.2 kg/d before weaning and 0.9 ± 0.6 kg/d after weaning. Growth check was noted in 42.8% of calves across all farms and the study period. Farmers received two benchmarking reports approximately five months apart, ranking farms by farm average "growth check". In the first reports, six farms experienced growth check at weaning. After receiving this report, three of these farms made changes to calf management and in all those cases the growth check at weaning was no longer apparent at the second report. We conclude that growth check around weaning is occurring on some commercial farms. Measuring changes in weight gains around weaning, and sharing these data with farmers, can promote management changes that improve calf outcomes on dairy farms.

Estimation of prevalence and risk factors of mastitis in dairy cows under smallholder dairy systems in Bangladesh

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Mastitis remains one of the most prevalent diseases affecting dairy cattle and poses major economic and animal welfare challenges, particularly in smallholder dairy systems where hygiene and housing infrastructure are often limited. This cross-sectional study estimated the prevalence of mastitis and identified cow- and farm-level risk factors associated with mastitis in dairy cows under smallholder dairy systems in Bangladesh. A total of 270 smallholder farms comprising 660 lactating cows were assessed through on-farm visits, with an average herd size of 2.44 ± 1.18 lactating cows per farm. Consequently, an average of 2.44 ± 1.18 cows were tested per farm. Management and welfare-related information were collected using a structured questionnaire and direct observation of housing conditions (floor type, drainage, and hygiene). Mastitis was screened using the California Mastitis Test (CMT), and somatic cell count (SCC) was measured using the Ekomilk Horizon Unlimited milk analyzer. Clinical mastitis was diagnosed based on abnormal milk and/or udder inflammation, while subclinical mastitis was defined by positive CMT ($\geq +$) and/or elevated SCC ($>200,000$ cells/mL). Associations between mastitis and selected factors were evaluated using Chi-square tests, and independent predictors were identified using multivariable logistic regression. The overall cow-level prevalence of mastitis was 34.8% (230/660), comprising 28.2% subclinical and 6.7% clinical cases. Quarter-level analysis indicated higher infection rates in the hindquarters (right hind 23.6%, left hind 22.6%) than in the forequarters (right fore 19.4%, left fore 18.5%), consistent with greater exposure to environmental contamination. In univariable analysis, mastitis prevalence was significantly higher among cows with parity ≥ 3 , low body condition score (BCS <2.5), poor drainage, absence of post-milking teat dipping, and those housed on concrete or earthen floors compared with those on brick floors. In the multivariable model, parity ≥ 3 (OR = 1.82; 95% CI: 1.28–2.59; $p = 0.001$), BCS <2.5 (OR = 1.54; 95% CI: 1.08–2.19; $p = 0.018$), poor drainage (OR = 1.91; 95% CI: 1.34–2.73; $p < 0.001$), and no teat dipping (OR = 2.48; 95% CI: 1.71–3.60; $p < 0.001$) were significant predictors; concrete flooring also increased risk relative to brick flooring (OR = 1.46; $p = 0.043$). These findings confirm mastitis, particularly subclinical mastitis, as a major udder-health and welfare concern in Bangladeshi smallholder dairying. Improving post-milking teat disinfection, drainage, housing hygiene, and nutritional management to maintain adequate body condition should be prioritized to reduce mastitis prevalence and improve dairy cow welfare and productivity.

Effect of floor type on lameness and welfare indicators in lactating cows under smallholder tie-stall systems in Bangladesh

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Flooring condition is an important housing factor influencing dairy cow welfare, particularly in smallholder tie-stall systems common in Bangladesh. This cross-sectional study evaluated the association between floor type and welfare indicators among lactating cows in Sirajganj district, a major milk-producing region. Sixty smallholder tie-stall farms were purposively selected, and 450 lactating cows (7–8 cows per farm) were assessed during both dry and wet seasons. Farms were categorized by predominant floor type: concrete (n = 180), brick (n = 150), and earthen (n = 120). Welfare was evaluated using standardized animal-based indicators, including locomotion score (LS), body condition score (BCS), hock lesions, cleanliness score, and comfort-related behaviors. Lameness was defined as LS ≥ 2 , and moderate-to-severe lameness as LS ≥ 3 . Mean BCS differed significantly among floor types ($p < 0.001$), with cows on concrete floors exhibiting lower scores (2.60 ± 0.41) compared with brick (2.78 ± 0.40) and earthen floors (2.70 ± 0.44). Lameness prevalence was highest on concrete floors (30.0%), followed by brick (18.0%) and earthen floors (15.0%) ($p = 0.003$). Hock lesions were also more frequent among cows housed on concrete surfaces (35.0%) compared with brick (20.0%) and earthen floors (22.5%) ($p = 0.005$). Poor cleanliness was most prevalent on earthen floors (45.0%) ($p < 0.001$), while comfort issues were more commonly observed on concrete floors (27.8%) ($p = 0.010$). Multivariable logistic regression analysis identified concrete flooring as an independent risk factor for lameness compared with brick flooring (adjusted OR = 1.95; 95% CI: 1.17–3.24; $p = 0.011$). Poor drainage was also significantly associated with increased lameness risk (adjusted OR = 1.68; 95% CI: 1.05–2.70; $p = 0.032$), whereas higher BCS was protective (adjusted OR = 0.80 per 0.5-unit increase; $p = 0.022$). In conclusion, hard concrete flooring and inadequate drainage significantly compromise locomotor health in smallholder dairy systems, while earthen floors present greater hygiene challenges. Improving floor design and drainage may substantially enhance dairy cow welfare and productivity in Bangladesh.

Evaluation of oxidative stress and emotional/behavioural responses of Red Sokoto goats to the effects of rain in Northern Guinea Savannah zone of Nigeria

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There is a notable lack of information regarding why goats are particularly sensitive to wet weather. Despite the availability of forage, goats frequently seek shelter during rain and often exhibit declines in health and productivity. This research investigated the oxidative stress and behavioural responses of goats to rainfall in the Northern Guinea Savannah zone of Nigeria. Twenty healthy, 2.5-year-old male Red Sokoto goats were housed in a standard college farm pen constructed with concrete flooring, cement block walls, and a corrugated metal roof with a plywood ceiling. To ensure adequate ventilation, the upper half of one side was left open and secured with wire mesh. The animals had ad libitum access to feed and water. Four weeks before the study, goats were dewormed, vaccinated against Peste des Petits Ruminants and preconditioned to experimental procedures of blood sampling and behavioural measurements. From June to October 2024, blood serum samples and continuous behavioural recordings were taken three times monthly, comparing rainy days to non-rainy days based on meteorological forecasts. Blood samples were collected from the jugular vein of each goat into anticoagulant-free tubes. Serum malondialdehyde (MDA) was measured via TBARS assay, while epinephrine and serotonin via ELISA kits. Behavioural parameters of standing, locomotion, urination, defecation, foot stamping, vocalisation, tail wagging, and ear/head movements were measured using continuous recording. Data were analyzed using RM-ANOVA, paired-sample t-tests, and Chi-square tests for behaviour, with significance set at $P < 0.05$. The results indicated that epinephrine (9.9 ± 0.5 pg/ml) and MDA (3.87 ± 0.3 mmol/l) concentrations were significantly higher ($p < 0.05$) during rain compared to non-rainy periods (8.05 ± 0.5 pg/ml and 2.87 ± 0.3 mmol/l, respectively), indicating acute oxidative stress. Serotonin levels dropped significantly during rain (2.5 ± 0.2 ng/ml vs. 2.9 ± 0.5 ng/ml), suggesting reduced well-being. Frequency and duration of standing, locomotion, urination, and vocalisation increased significantly on rainy days. Between 75% and 90% of the goats displayed negative valence (dysphoria) during rain, characterized by piloerection and asymmetrical ear positions. Conversely, positive behaviours like tail wagging and backward ear direction were dominant on non-rainy days. This study provides the first evidence that rainfall detrimentally affects goat physiology and psychology, likely due to noise, moisture, and wind. The findings suggest that serotonin levels could serve as a reliable biomarker for goat welfare. Ultimately, rainfall triggers acute stress and a shift toward negative emotional states in Red Sokoto goats.

Descriptive analysis of tail-directed stereotypic behavior in female breeding rats

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1. Charles River

A repetitive behavior was observed in female rats at a commercial breeding facility, where rats pick up their tail in their mouths and rotate in a circle. Tail-directed behavior had been described previously in rats in two studies, both related to social isolation, and neither focused on breeding female rats. The objective of this study was to characterize tail-directed behavior in breeding female rats. The aim was to gain an understanding of frequency and prevalence, and factors related to the behavior. Data was collected in summer 2025. There was one observer collecting data. Data was collected across 3 rooms. One room had Wistar Han (room 1), and the other 2 rooms had Sprague Dawley (SD, rooms 2 and 3). Three study groups were observed: PP: pregnant/pre-litter consolidation (no pups or pups < 3 days old); PN: post-litter consolidation natural litters (pups > 3 days old); PM: post-litter consolidation mixed litters (pups > 3 days old, litters mixed to achieve 14 same-sex pups per dam). Continuous-recording sampling was used to capture tail-directed behavior during 10-min observation periods. Order of observations were randomized based on study group, top or bottom of rack, and rack number. The observer recorded tail-directed behavior, cage location, number of animals in the cage, pup age, and behavior immediately after the tail-directed behavior. Observations were summarized as frequency (total number of observations per observation period divided by 10) and prevalence (number of unique cages performing behavior divided by total number of cages being observed). Other variables were summarized by total percentage of observations. Spearman rank correlations were used to assess the effect of environmental parameters (room temperature, pressure, humidity). There were more observations of the behavior in the Wistar Han compared with the SDs, with 52% of observations recording the tail-directed behavior in room 1, compared to 30% in room 2; and 21% in room 3. The behavior was most observed in the PP group (1: 63%; 2: 74%; 3: 65%). The most observed behaviors after tail-directed behavior were bedding manipulation (1: 27%; 2: 34%; 3: 37%) and social investigation (1: 40%; 2: 33%; 3: 31%). There were weak but significant correlations between frequency and prevalence of behavior and low room temperature (frequency: $r = -0.355$, $p = 0.0002$; prevalence: $r = -0.371$, $p = 0.0001$), high pressure (frequency: $r = 0.217$, $p = 0.026$; prevalence: $r = 0.219$, $p = 0.035$), and low humidity (frequency: $r = 0.312$, $p = 0.001$; prevalence: $r = 0.264$, $p = 0.007$).

Animal welfare and occurrence of subclinical mastitis in smallholder dairy cows: A cross-sectional study in Njoro Sub-County, Kenya

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Animal welfare remains a critical yet under-examined element of smallholder dairy production in Kenya, with implications for herd productivity and health. Diseases, like subclinical mastitis is a significant constraint affecting dairy cattle in smallholder systems. This study investigated knowledge, attitudes, and practices related to animal welfare through questionnaire survey among smallholder (1-10 cows) dairy farms and direct observation of lactating cows Njoro sub-County, Kenya. Prevalence and risk factors for subclinical mastitis was also determined. The second phase involved farmer training and forging sustainable practices on animal welfare. A total of 179 dairy cattle farmers were interviewed using structured questionnaires capturing information on demographics, farm practices, knowledge on animal welfare and animal characteristics. Similarly milk samples were collected from 248 lactating cows for California Mastitis Test. The data were analyzed using R software for descriptive statistics and logistic regression to determine risk factors associated with sub-clinical mastitis in herds. Variables such as parity, breed, hygiene status (teat, udder, hindlimbs, perineum) as well as management practices were analysed. Results indicated that dairy farmers' awareness of animal welfare was low, with only 30% having heard of the concept, and 62% rating their knowledge as poor. Lack of knowledge and training (83%), high cost of production (75%) and limited veterinary services (50%) were the main barriers to adopting welfare practices. Despite these gaps, farmers were willing to adopt improved dairy farming practices. The overall prevalence of subclinical mastitis in herds was 58 %, with higher rates in Kihingo ward (72 %) and in younger cows aged below six years (64 %). Multivariate analysis revealed that poor hind limb hygiene, prolonged lactation of more than 7 months, and co-rearing of sheep in farms were significant risk factors with increased likelihood of infection by 4, 1.8, and 2.3 times, respectively. A farmer-friendly animal welfare manual was also co-developed with the participating farmers. The manual outlines practical and affordable interventions that can be carried out in resource-limited setting to ensure good animal welfare. The participating farms will be reassess after introduction of the manual. This study highlights critical gaps in knowledge and management practices that contribute to high incidences of mastitis and suboptimal animal welfare. Strengthening farmer training, improving herd management, and enhancing access to veterinary and extension services are essential for improved dairy cattle productivity, animal welfare, and livelihood support for farming households in areas with similar production settings.

The effect of sleep quality on the navigational ability of sheep

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Spatial navigation is an important characteristic of extensively managed sheep, enabling both individuals and groups to traverse large areas in search of essential resources such as food, water, and shelter. This geographical knowledge is acquired over the course of an animal's lifetime and is often transmitted across generations. Understanding how sheep navigate their environment is important, as disease outbreaks that necessitate large-scale culling (e.g. the Foot and Mouth outbreak-UK, 2001) may lead to the loss of this navigational knowledge within a flock, potentially compromising the animals' ability to survive under extensive management conditions. The first aim of this study was to investigate the relative importance of proximate versus distal visual cues in sheep navigating a complex spatial environment (maze). Sleep in animals is critical for physiological maintenance, cognitive and emotional stability, and memory consolidation. Prolonged sleep disruption can therefore have significant negative effects on animal welfare, yet the influence of husbandry practices on sleep in domesticated species remains poorly understood. The second aim of this study was to assess the impact of sleep disturbance on navigational performance in the aforementioned maze task. Seventeen sheep, divided into two groups, were trained individually to use both proximate (coloured shapes) and distal (an elevated traffic cone) visual cues to navigate a four-choice maze in order to obtain a food reward (5g concentrate). Sheep were subsequently tested individually under two conditions: proximate cues only (control) or a combination of proximate and distal cues (treatment). In the treatment condition, the position of the distal cue was manipulated to increase the likelihood of errors when using proximate cue selection. Each sheep completed both conditions after either a normal sleep period or a sleep disturbance treatment (continuous overnight lighting and intermittent noise [dog barks and metal clanging] every 20 minutes). The order of treatments and the position of the distal cue were balanced across groups. The number of choice errors made during the task was recorded. There was a near-significant increase in errors ($p = 0.065$) when sheep were exposed to the distal cue. This effect was further amplified following sleep disturbance, but only in group 2 animals ($p = 0.006$). This group-specific effect may be related to the right-sided (rather than left-sided) positioning of the distal cue. Overall, the results confirm that sheep utilise both proximate and distal cues during spatial navigation, and demonstrate that sleep disturbance can negatively affect cognitive performance in this species.

Paddock access with artificial shade improves egg quality in cage-free laying hens

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This study evaluated how the spatial distribution of artificial shade affects range use behavior in free-range laying hens and its relationship with egg quality. A total of 80 H&N Brown Nick hens (17 weeks old) were allocated to free-range pens (20 birds/pen; 0.14 m²/hen), each connected to outdoor paddocks (2 × 8 m; 0.8 m²/hen) with perennial grass and artificial shade structures (4 m²; 80% light reduction). Shade was positioned at 2 m (S2), 4 m (S4), or 6 m (S6) from the shed exit. An additional group housed in conventional cages served as a reference. Hens had daily access to the paddocks from 07:45 to 18:30 between 20 and 26 weeks of age. Hen distribution in the outdoor area was assessed three times daily over 42 days to evaluate range and shade use. Egg quality was analyzed on days 0, 21, and 42, using 15 eggs per pen and 15 from the cage system. Yolk color was measured using a Minolta colorimeter (L*, a*, b*) and a YolkFan™ scale, while eggshell thickness was evaluated as an indicator of external quality. Data were tested for normality and analyzed using mixed models with Tukey's post hoc test and correlation analysis ($P < 0.05$). Results showed that yolk lightness (L*) was lower in eggs from caged hens compared to all cage-free treatments ($P < 0.001$) at the second collection. Yellowness (b*) was higher in eggs from the S6 treatment than in S2 and cage systems ($P < 0.01$), and in the third collection, S2 presented lower b* values than S4 and S6 ($P < 0.05$). Additionally, in the final evaluation, eggs from caged hens showed the lowest yolk color intensity on the YolkFan™ scale compared to all free-range treatments ($P < 0.001$). Eggshell thickness differed at the second evaluation ($P < 0.05$), with the lowest values observed in the cage system. Variations among shade distances suggest that increased movement and environmental exposure may influence yolk pigmentation. Overall, shade positioning affected hens' spatial distribution and use of the outdoor area, key indicators of welfare. Placing shade closer to the shed may improve range use and contribute to better welfare and production outcomes in free-range systems.

Laboratory rats ingest kaolin clay in an attempt to alleviate nausea induced by voluntary wheel running: A transfer test

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Activity wheels are often introduced into rodent cages as environmental enrichment and have well-documented health benefits. For example, wheel running enhances stress resilience, reduces obesity, and increases neurogenesis in laboratory rats. Additionally, it serves as a positive reinforcer for instrumental behaviors such as lever pressing and is considered pleasurable. The claim that running is pleasurable is supported by findings that access to an activity wheel induces 50-kHz ultrasonic vocalizations, which are associated with positive affective states. Despite these positive emotional effects, evidence suggests that wheel running also induces nausea in rats. For example, it evokes ingestion of kaolin clay, a known marker of nausea in rats, suggesting that wheel running provokes nausea. Kaolin consumption is not only a useful index of, but also an effective remedy for, emetic-induced nausea in rats, presumably by adsorbing emetic substances in the gastrointestinal tract. It is possible that the internal state induced by running is fortuitously similar to emetic-induced nausea and thus mistakenly provokes the instinctive behavior of kaolin consumption without benefit. In other words, running-induced kaolin ingestion may reflect a bodily fallacy (or misperception). The present study aimed to test this account using 15 naïve male Wistar rats (9 weeks old). Rats were housed individually with ad libitum access to food and water, and each cage contained 80 g of kaolin clay. They were given daily 45-minute access to activity wheels for 6 days. For the experimental rats ($n = 8$), emetic LiCl (0.15 M at 2% of body weight) was injected intraperitoneally 3 days before the wheel-running period, whereas saline was administered to control rats ($n = 7$). As expected, LiCl injection evoked kaolin intake for the experimental rats. Kaolin consumption increased across running days in both groups of rats but was greater in the experimental group, suggesting that the rats of this group had learned to ingest kaolin to alleviate LiCl-induced nausea and generalized this behavior to nausea induced by wheel running. A split-plot analysis of variance revealed significant main effects of group ($F [1, 13] = 5.17, p = .041$) and day ($F [5, 65] = 20.71, p < .001$). The interaction was not significant. This study was supported by a JSPS grant (25K06906) and approved by the Kwansei Gakuin University Committee for Animal Experimentation. No conflicts of interest are reported.

Administration of carbetocin - a long-acting oxytocin analogue - reduces the aggressiveness immediately after mixing adult rams

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After mixing, rams establish dominance relationships through aggressive behavior, with risks for their health and welfare. Oxytocin is a hormone that reduces aggressiveness, but has a very short half-life, so carbetocin, a long-acting oxytocin analogue, may be a simple alternative to reduce aggressiveness in rams immediately after mixing. The aim of the study was to compare the number and types of aggressive behaviors after joining rams in dyads that had been previously treated with or untreated with carbetocin. Thirty rams (18 Finnsheep and 12 Milchschaaf) were allocated to two groups (9 Finnsheep and 6 Milchschaaf rams in each group) over three months. Thereafter, one ram from each group was joined with a ram from the other group within the same breed. While both rams from 8 dyads received 0.2 mg/100 kg BW of carbetocin iv (CAR dyads), 20 min before joining them, rams from the other 7 dyads remained as untreated controls (CON dyads). The agonistic behaviors of all rams during the 3 following hours were analyzed from video recordings, including those without physical contact [sniffing the other ram, displaying flehmen, and physical approach], and with physical contact [push and bump]. Total interactions were calculated, and an aggressive index was calculated as [approach + (push x 3) + (bump x 3)]. The frequency of each behavior/dyad and the aggressive index/dyad were compared among treatments using the Mann-Whitney test. The proportion of dyads displaying each behavior was compared using Fisher's exact test. CON rams displayed more body pushes (4.1 ± 2.3 vs 2.2 ± 2.1 ; $P = 0.04$) and bumps (3.8 ± 1.4 vs 0.0 ± 0.0 ; $P = 0.01$) than CAR rams. The proportion of CON dyads that displayed body pushes and bumps was greater than in CAR dyads (body pushes: 5/7 vs 1/8, $P = 0.04$; bumps: 5/7 vs 0/8, $P = 0.007$; CON and CAR, respectively). Administering carbetocin also reduced the aggressive index (21.8 ± 7.9 vs 59.1 ± 15.3 , CAR and CON rams, respectively, $P = 0.04$). Carbetocin did not modify the frequency of sniffing, flehmen, or the total number of interactions. In conclusion, carbetocin administration before joining rams in dyads reduced aggressive behavior immediately after joining.

Welfare assessment of pigs reared in an organized farm and backyard production system

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Animal welfare refers to the overall state of well-being of animals, achieved by meeting their physical, environmental, nutritional, behavioural, and social needs while they are under the care, supervision, or influence of humans. The welfare quality is assessed mainly based on representative criteria of four main principles of animal welfare i.e. good feeding, good housing, good health and appropriate behavior. However, limited research is available on the welfare assessment of pigs in small-scale production systems, which account for the majority of pig production in India. Therefore, the present study was initiated to assess the welfare of grower pigs in organized farm and backyard production system. For this purpose, the observations were taken from six small-scale backyard system pig producers in farmers' fields and six pens from the institute's experimental animal sheds having grower pigs of 8-14 weeks of age. All the selected pens of the farmer's field have concrete flooring. The percentage of poor body condition was significantly ($P < 0.05$) higher among the grower piglets reared in the backyard small-scale farming as compared to the organised farm. The presence of bursitis was similar ($P > 0.05$) in the grower piglets of both organised and small-scale back yard production systems. The manure on the body also did not differ ($P > 0.05$) among the grower piglets of both the systems of rearing; however, it was higher in grower pigs reared in the small-scale production system. The panting was found in 5.56% animal of back-yard production system. Huddling was not observed in any of the groups. Lesions on the body were similar among both the grower piglets; however, they were higher in the small-scale production system. Lameness and coughing were not observed among the grower pigs of both production systems. In both the organised and backyard production systems, more than 60% piglets remained active; however, it was higher in the organised farm. The human-animal relationship was also similar between both organised and backyard production systems. Therefore, it may be concluded that animal-based welfare assessment protocol may be applied for both organized and backyard production systems and this process allows for a practical detection of farms that are more likely to present a welfare deficiency.

Influence of coloured enrichment on behavioural response and growth performance in Ross 308 broiler chickens

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Intensive rearing of broiler chickens has raised significant welfare concerns, particularly in terms of barren housing environments that limit expression of natural behaviours. Considering the well-developed visual sense of chickens, colour-based enrichment may provide appropriate stimuli that influence both behaviour and productivity. This experiment assessed the effects of blue- and yellow-coloured enrichment objects on behavioural responses and growth performance of Ross 308 broiler chickens reared under tropical conditions. A total of 90 unsexed day-old chicks were randomly allotted to three treatments (10 birds/3 replicates): Control (T1; no colour enrichment), Blue enrichment (T2; blue-painted feeders, drinkers, balls, and ribbons), and Yellow enrichment (T3; yellow equivalents). Behaviour was monitored using a 360° panoramic camera. Instantaneous scan sampling was conducted at 10-minute intervals (1-min observation per scan) for 2 h every two days to assess foraging, exploration, dust bathing, feather pecking, and aggression throughout the 42 days of study. Behavioural frequencies were expressed as percentages of total observations. Growth parameters measured included final body weight (FW), average weight gain (WG), and feed conversion ratio (FCR). Behavioural data were subjected to descriptive analysis while growth data were analysed using one-way ANOVA, and treatment means were separated using Duncan's Multiple Range Test at $\alpha = 0.05$. The result revealed enhanced expression of positive behaviours in enriched groups. Birds in T2 showed the highest frequencies of exploration (8.00%), foraging (30.33%), and dustbathing (9.00%). On the other hand, agonistic behaviours such as feather pecking and aggression were more observed in T1, with aggression lowest in T2 (2.85%) and T3 (3.84%). There were significant differences ($p < 0.05$) among treatments for final weight ($p = 0.0189$) and average weight gain ($p = 0.0085$), but FCR produced no significant difference ($p = 0.8791$). Birds in T3 achieved the highest FW (2164.33 g) and WG (1830.13 g), significantly higher than T2 (2095.14 g; 1756.98 g) and T1 (2130.95 g; 1772.50 g). FCR ranged from 1.58–1.60 across treatments. The results of this study demonstrate that visual enrichment using coloured objects significantly influenced both behavioural responses and growth performance in broilers. Yellow enrichment appeared to enhance growth, whereas blue enrichment promoted exploratory behaviour and reduced aggression. Incorporating simple colour-based enrichment strategies may therefore offer a practical approach to improving broiler welfare and productivity within intensive systems. However, it requires careful application and better management.

Assessment of knowledge, attitudes, and practices of cattle farmers in Northern Nigeria towards livestock vaccination

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Livestock diseases continue to pose a significant threat to cattle productivity and production in Nigeria. Although vaccination is one of the most effective tools for preventing infectious diseases, gaps in practices among cattle farmers continue to hinder effective disease control. The knowledge, attitudes, and practices (KAP) of farmers play a central role in determining whether herds receive timely and appropriate vaccination. This study is the first to assess the general KAP of cattle farmers toward vaccination in Nigeria. A cross-sectional survey of 750 farmers across seven states was conducted using a structured questionnaire, and the data were analysed to examine the associations between KAP scores and sociodemographic factors. Most farmers demonstrated a good knowledge of cattle diseases (59.6%) and a positive attitude toward standard vaccination (65.7%). However, 55.1% exhibited good vaccination practices. Location, level of education, herd size, gender, and farming purpose were key predictors of knowledge and practice. Attitudes were also significantly influenced by location and the type of farming system. The gap between knowledge and attitude with respect to actual practice highlights structural and logistical barriers that prevent farmers from translating awareness into effective vaccination. Significant disparities exist among the states in northern Nigeria, with some facing greater challenges in access, cost, and veterinary support. Improving vaccine availability, strengthening extension services, and implementing targeted community-based interventions are essential steps toward enhancing livestock vaccination uptake and reducing the burden of preventable cattle diseases in Nigeria.

Applying behavioural science to the study of wild animal welfare

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Ethological observation remains one of the most used, non-disruptive tools for assessing animal welfare states. However, those tools have traditionally been limited to managed or captive animals. As concern for the welfare of wild animal individuals grows, there is a clear need to adapt these methods for free-living populations. This workshop explores the practicalities of assessing wild animal welfare, focusing on how behavioural science can complement the study of wild animal welfare and benefit from it. The session provides participants with a framework for identifying and evaluating behavioural welfare indicators in the field. We will also discuss the differences between Wild Animal Welfare science, traditional welfare science and conservation alongside the specific challenges of wild settings, such as ecological complexity, long-term data collection, individual identification, and consistency. We will finally explore ways to translate captive welfare metrics into viable field methods. The workshop is organized into four interactive parts to ensure a hands-on experience: A brief overview of core wild animal welfare concepts and how they intersect with, and differ from, animal welfare science and conservation. Working in small groups, participants will work through scenarios involving the welfare assessment of free-ranging individuals. The goal is to identify suitable behavioral indicators of affective state and welfare metrics, either by adapting existing captive welfare methods or wild-specific ones drawing on participants' expertise in captive welfare and behavioural science. In the same groups, participants will apply the selection criteria outlined in Browning (2025, pre-print). This includes discussing the correctness, usefulness, and feasibility of each suggested indicator. Groups will also debate which other indicator types (e.g., physiological) may complement welfare assessments and ensure a comprehensive view of the target affective state. The final segment is dedicated to identifying how participants can integrate welfare assessments into their own future research and brainstorming solutions to common field-based barriers. Participants will then be able to understand the additional value of integrating welfare into behavioral studies, as it could help improve interpretation and quality of their results. By focusing on group discussion and practical exercises, this session provides a collaborative environment for researchers to move beyond theoretical welfare by considering practical field application and building bridges between welfare and behavioural science.

Effect of increasing photoperiod on growth performance, welfare and stress in broiler chickens

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Photoperiod management critically regulates growth, behaviour, and stress physiology in broiler chickens, and effective lighting strategies can enhance productivity without compromising welfare, particularly in tropical environments. This study evaluated the effect of increasing photoperiod on growth performance, welfare indicators, and stress response of broiler chickens over a 7-week experimental period to determine whether extending daily light duration would improve productivity without adversely affecting welfare and physiological status. A total of 96 day-old broiler chickens were randomly assigned to three photoperiod treatments: T1 (12 h light: 7:00 am–7:00 pm), T2 (14 h light: 7:00 am–9:00 pm), and T3 (16 h light: 7:00 am–11:00 pm), with four replicates per treatment and eight birds per replicate. Growth performance parameters (average weight gain, feed intake, and feed conversion ratio) were measured weekly. Welfare indicators including gait score, footpad lesions, and hock burn were assessed using standard procedures. Corticosterone concentration was determined at week 7 using blood samples collected from the brachial vein of three birds per replicate (twelve birds per treatment) and analyzed using Enzyme-Linked Immunosorbent Assay (ELISA); no baseline measurement was taken. Data were analyzed using one-way analysis of variance (ANOVA), and means were separated using Duncan's Multiple Range Test at a 5% level of significance. Results showed that birds under the normal photoperiod (T1) had significantly higher ($P<0.05$) final body weight (2079.17 g) and average weight gain (1213.17 g) than those in T2 (2029.17 g; 1154.83 g) and T3 (2000.00 g; 1100.00 g), respectively. Feed intake was significantly higher ($P<0.05$) in T2 (2378.60 g) compared to T1 (2308.70 g) and T3 (2157.83 g), while feed conversion ratio was significantly lower ($P<0.05$) in T1 (1.90) than in T2 (2.06) and T3 (1.96). Welfare assessment showed that gait score and footpad lesions worsened with increasing photoperiod: gait score was highest ($P<0.05$) in T3 (2.50), followed by T2 (1.75) and T1 (1.00), while footpad lesion scores were highest ($P<0.05$) in T3 (2.00), compared to T2 (1.00) and T1 (1.25). However, hock burn was significantly higher ($P<0.05$) in T1 (1.50) than in T2 (1.25) and T3 (1.25). Corticosterone concentration increased with increasing photoperiod length, with the highest value in T3 (23.5 ng/mL), followed by T2 (22.00 ng/mL) and T1 (19.00 ng/mL). It was concluded that extending photoperiod beyond normal lighting hours did not improve growth performance and adversely affected welfare and stress response in broiler chickens.

Mitigating the impact of tail biting through a botanical supplementation

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1. Nor Feed, 2. Epidalis

Tail biting is a multifactorial abnormal behaviour linked to stress and welfare impairment in farmed pigs. Calming botanical extracts have been studied as preventive solutions to tail biting outbreaks on farms. The objective of this study was to evaluate the preventive effect of a natural *Melissa officinalis*- and magnesium-based supplement on tail biting behaviour under commercial conditions. In a commercial farm, in a group of same-age pigs, animals were allocated, after weaning at 28 days, to either a supplemented (S, n=103) or a control (C, n=102) group in identical environments. Tails' condition was assessed weekly from week 7 to week 21 using 4 indicators: biting marks, blood, necrosis, and tail loss. When fresh blood was observed, the supplement (Care Zen®) was added to the drinking water (1 L/1000 L) for 5 days in the supplemented group. In both rooms, one pen was video-recorded during weeks 9, 12, and 16, for one to three consecutive days. A blinded observer quantified all tail-biting events. Data were analysed using Chi-square or Fisher's exact tests as appropriate. The study included two supplementation phases occurring at weeks 9 and 14. Video recordings showed significantly fewer tail-biting events in the supplemented group (Fisher's exact test, $p < 0.05$). The control group exhibited significantly more tail lesions with fresh blood than the supplemented group ($p < 0.05$). At week 21, pigs in the supplemented group exhibited a significantly lower number of severe tail losses than controls (Chi-square, $p < 0.05$). These results show that supplementation with a standardized botanical product may contribute to reducing tail biting and its severity on farms.

Investigating socially driven robot preference in an AMS-managed dairy herd

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The automatic milking system (AMS) permits cows to establish their own milking schedules, which in turn impacts their welfare. The functionality of the AMS is reliant upon cows choosing to self-milk; however, there is a growing belief that social competition around the AMS may be having a demotivating effect on lower ranking cows. In this study, the herd had access to two separate AMS-units (Robot 1 and Robot 2), and it aimed to evaluate whether, if given the choice, subordinate cows would choose to milk at a separate AMS unit to higher ranking cows. A total of 113 Holstein-Friesian lactating cows in a single study herd were separated into two corresponding pens with an interconnecting walking alley allowing free passage between them. Both robots were positioned in identical locations within each pen and were both available 24-hours a day. This gave the herd unmitigated access to either robot. To determine social rank, the agonistic behaviours of the herd were observed for a total of 168 hours over two months. Cows were allocated into three social rank levels (subordinate, intermediate, dominant) based on Index of displacements. This information was correlated with data on time of milking, robot choice, as well as other traits such as parity and milk yield. All statistical analyses were conducted in SPSS statistics. Results of the study showed a highly statistically significant association between social rank and robot choice ($p < .001$). Follow-up pairwise chi-squared comparisons showed significant differences between all rank groups: subordinate cows showed a preference for Robot 1, while intermediate and dominant cows favoured Robot 2 ($p < .001$). These findings suggest that subordinate cows may be choosing to self-segregate whilst milking, as proposed above, possibly to avoid social competition. This study builds upon existing studies in the field that are tackling one of the least understood areas to date around AMS-associated welfare; the social dynamics around the AMS and how this is affecting lower ranking cows.

Natural behaviors of water buffaloes and their utilization for sustainable welfare and improved performance

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India has a large population of water buffaloes (109.8 millions) that contribute almost half (106 million tons) of milk production in the country. However, individual buffalo productivity is low (average 6.92 kg/d) along with other problems of higher calf mortality (20-25%), slow growth (300-400 g/d), late maturity (30-36 months), poor expression of estrous, higher age at first calving and longer inter-calving intervals. This warrants use of more veterinary drugs during calf-hood stage and high use of reproductive hormones for estrus induction; which compromise buffalo welfare besides causing economic losses. Researches have been carried out in recent years on harnessing some important behaviors for improving welfare and performance. Studies on buffalo mother-calf contact systems have amply demonstrated superiority of natural suckling versus weaning at birth in terms of calf and mother behavior, physiology and performance. Within suckling systems, full time mother-calf contact during colostrum period and fenceline contact afterward proved to be better than no contact/restricted contact. Buffaloes suffer more from heat stress with consequent high incidence of anestrus, poor expression of estrus behavior and low conception rate. Various ethological interventions carried on exposure of intact bull (bio-stimulation) directly into buffalo pens or through fenceline contact in heifers resulted in early onset of puberty with greater expression of estrous symptoms with higher intensity. During post-partum period exposure to direct and fenceline contact with bull elicited greater expression of estrus behavior and higher conception rates. Further studies in this line revealed that provision of simultaneous buffalo mother-calf and mother-bull contact resulted in normal onset and expressing of estrus and this has the potential to overcome the calf induced anestrus during climatically comfortable period as well as during heat stress period with provision of cooling. Studies of natural thermoregulatory behavior of calf-bonded buffaloes with access to immersion in shallow water pool showed remarked improvement in behavioral, physiological and performance responses during summers. Studies on feeding, rumination and resting behavior of lactating buffaloes throughout the year demonstrated the need for greater protection from heat stress for the normal expression of these behaviors and highlighted the need for night feeding of buffaloes during heat stress. Studies on social behavior of buffaloes helped in developing protocol for estimation of social hierarchy and for introduction of freshly calved buffaloes into resident buffaloes. Overall, studies on cow-calf, cow-bull contact systems, maternal, thermoregulatory and social behaviors demonstrated substantial implications for sustainable welfare and improved performance of buffaloes.

Interrelationships between behavioural, physiological, emotional responses and milk production in dairy cows

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Dairy cattle are particularly susceptible to welfare challenges that can negatively impact their behaviour, physiological responses, milk yield, and overall health. These challenges include rough handling by humans, extreme climatic conditions, inconsistent feeding, regrouping, and transportation. This study investigated the interrelationships between behavioural, physiological, and emotional responses and milk production in smallholder dairy cows of the local crossbred (Friesian × indigenous) type reared in tethered housing in the Rajshahi district of Bangladesh. Twenty five cows were observed, with all cows assessed over the same five consecutive days. Video recordings were made using a smartphone during the morning milking routine, focusing on specific behaviours: ear position (upright, forward, backward, downward), sniffing, stepping, and tail movement. Observations were conducted during the first two minutes after the start of milking process manually. Physiological measures recorded included rectal temperature, vaginal temperature, heart rate, body condition score (BCS), and milk yield per milking. Environmental data were collected to calculate the Temperature-Humidity Index (THI), which averaged $84.8 (\pm 2.04 \text{ SD})$, exceeding the thermal comfort range for dairy cattle. Results showed that cows displaying a backward ear position during milking had positive relation with average daily milk yields ($r = 0.47, p < 0.05$). Milk yield was negatively correlated with THI ($r = -0.70, p < 0.05$) and positively correlated with BCS ($r = 0.71, p < 0.05$). Rectal and vaginal temperature positively associated with each other ($r = 0.76, p < 0.05$). Similarly, rectal temperature and heart rate positively associated with each other ($r = 0.49, p < 0.05$). Notably, sniffing behaviour was positively linked to rectal temperature ($r = 0.41, p < 0.05$). Ear position was used to assess emotional states, with upright ears associated with signs of stress. Healthy cows with higher BCS produced milk more frequently but also exhibited more stress indicators. This study highlights key behaviour and physiological indicators relevant to milk production and welfare. For greater generalisability, future research should incorporate larger sample sizes and repeated environmental assessments over extended periods.

Suckling mitigates cognitive and behavioural rigidity in socially isolated Murrah buffalo (*Bubalus bubalis*) calves

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Domestic water buffaloes (*Bubalus bubalis*) are characterized by exceptionally strong maternal instincts and mother-offspring bonds which makes weaning transition a significant stressor for the calves. This study examined whether the presence of maternal contact through suckling influence the learning ability and cognitive adaptability of Murrah buffalo calves maintained in socially isolated environments. For this study 12 calves were equally divided into two groups (suckled and weaned) and were housed in individual pens. The suckled calves had access to their mothers and had restricted suckling (for 2hours/day) during morning and evening milking period. The weaned calves were weaned immediately after birth and fed colostrum artificially through bottle for 5 days. At 5 weeks age the cognitive performance was assessed in a Y-maze visual discrimination task consisting of initial learning and reversal learning phases. Learning efficiency was measured by the number of sessions required to reach a 100% correct choice criterion. The rearing method significantly influenced cognitive adaptability in isolated environments. While both groups performed similarly during initial learning (suckled: 5 ± 0.00 ; weaned: 5.50 ± 0.22 sessions), a stark divergence occurred during reversal learning. The weaned calves were slow requiring 12 ± 0.70 sessions, whereas suckled calves were significantly more flexible, reaching the criterion in 9 ± 0.70 sessions ($P < 0.05$). The % of correct choices over sessions differed significantly ($P < 0.05$) with suckled calves achieving 100% accuracy by session 10 of reversal learning, whereas weaned calves struggled to reach 83% accuracy even by session 13. Maze behaviours further revealed a state of behavioural passivity in the weaned group; these calves spent significantly ($P < 0.01$) higher time standing idle (8.01 ± 0.94 sec) and showed a higher latency to make a choice (8.96 ± 0.22 sec) compared to suckled calves (6.92 ± 0.28 sec and 7.94 ± 0.12 sec, respectively). Suckled calves also exhibited higher levels of maze exploration, suggesting greater task motivation than their weaned counterparts. This study demonstrates that maternal contact, provided through suckling, serves as a vital cognitive buffer. Suckled calves maintained superior learning efficiency, higher task accuracy, and greater environmental engagement compared to their weaned counterparts in identical restricted housing. These results highlight that suckling management is a critical factor in preserving cognitive flexibility and mitigating the behavioural deficits typical of intensive housing systems. Our findings suggest that maternal-nutritional support can partially offset the psychological costs of social restriction in buffalo calves.

Grazing behaviour of cattle and environmental services in silvopastoral and monoculture systems in the tropics of Mexico

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Monoculture cattle grazing systems in the tropics have been associated with biodiversity loss, increased methane emissions, and animal welfare concerns, thereby threatening the provision of environmental services. Intensive silvopastoral systems, which integrate grasslands, shrubs, and trees, may represent a sustainable alternative capable of enhancing environmental services while improving animal welfare and productivity. In the present study, three dual-purpose monoculture (MS) and three intensive silvopastoral systems in the Yucatan peninsula were compared (ISPS). The variables assessed were: cattle grazing and social behaviour, cattle thermography, biodiversity (bats, rodents, birds) and methane emissions, during the dry and rainy seasons. Results show that ISPS provide better welfare of cattle, more biodiversity (birds and mammal species richness and abundance), and lower methane emissions than MS. Overall, cows were predominantly stationary, whereas movement was greater during the dry season ($P < 0.05$). Cattle in ISPS rest longer and in longer bouts ($P < 0.01$; respectively), distribute the grazing time throughout the day, and forage less at hours with maximum temperature and humidity ($P < 0.01$). Also, cows in ISPS express less aggressive interactions and more affiliative interactions ($P = 0.04$) than MS. On average cows had a greater skin temperature in the MS than in the ISPS (respectively, 40.72 ± 1.99 , 36.51 ± 2.09 , $p < 0.001$). In addition, ISPS had significantly higher rates of native and specialist species of birds, bats and rodents ($P < 0.05$), and a reduced abundance of West Nile virus-susceptible rodents by 60% ($p = 0.04$). In contrast, on the MS farms more generalist and invasive species were found ($P < 0.05$). On the other hand, although forage production and composition were relatively similar in both systems, compared to monoculture systems, we found that cattle in ISPS emitted 22% fewer methane emissions per kg of DM intake ($p < 0.001$). Our results demonstrate ISPS that silvopastoral systems are a viable practice to improve cattle welfare, increase biodiversity reducing the risk of zoonoses, and reducing methane emissions. These systems represent a sustainable production model and should therefore be considered a viable strategy for contributing to the achievement of the United Nations Sustainable Development Goals.

Consolation responses to human fear and sadness in pet dogs

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Consolation is the ability to recognize another's negative emotion and engage in behaviors to alleviate such state. Domestic dogs (*Canis lupus familiaris*) have been shown to console humans pretending to cry when compared to controls, yet their response to other emotions remains less explored. This study investigates whether domestic dogs provide consolation to their owners experiencing induced fear or sadness. Seventy-five dog-owner dyads were assigned to an intergroup design: Fear, Sadness, or Control (balanced by dog age, breed and sex). Procedural phases were: Induction (owners watched 7-min emotional or neutral film clips), Demonstration (owners expressed the emotion or read in a neutral tone for 20 s), and Post-demonstration (owners remained seated for 90 s). They were instructed to ignore the dogs throughout the task. Heart rate (HR) was monitored using non-invasive devices. Affiliative, stress behaviors and HR were analyzed via GLMM (fixed effects: Group, Phase, Interaction (Group*Phase), Sex, Age, and Subject as random effect). Regarding affiliative behaviors, results for proximity showed significant effects for Group ($F = 14.25$, $p < 0.0001$), with higher rates in the Fear group followed by Sadness and Control. Proximity also increased during the demonstration phase ($F = 7.95$, $p = 0.001$) and was higher in females than males ($F = 4.95$, $p = 0.029$). Gazing duration was significantly longer in the emotional groups compared to Control ($F = 4.66$, $p = 0.01$) and peaked during demonstration ($F = 39.12$, $p < 0.0001$). A significant Group*Phase interaction ($F = 2.47$, $p = 0.047$) revealed that Fear-group dogs gazed longer during demonstration, while the Sadness group maintained higher gazing than Control during both demonstration and post-demonstration. Physical contact was highest during demonstration ($F = 9.23$, $p < 0.0001$). Stress scores were higher in emotional groups ($F = 24.48$, $p < 0.0001$) and during later phases ($F = 19.56$, $p < 0.0001$). The interaction confirmed that stress in emotional groups exceeded the Control during demonstration and post-demonstration ($F = 3.09$, $p = 0.017$). Physiologically, Fear-group dogs showed higher HR during demonstration and post-demonstration ($F = 2.61$, $p = 0.023$). Females also exhibited higher HR than males ($F = 14.91$, $p = 0.001$). These preliminary findings suggest that dogs are capable to console their owners both experiencing fear and sadness, with some differences between emotions. This sensitivity reflects a sophisticated level of interspecific social competence, which may play a key role in canine well-being and the human-canine bond.

Human-dog relationships shape attitudes toward livestock production practices

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Public attitudes toward livestock production practices are shaped by moral values, sociodemographic characteristics, and by relationships with animals, particularly dogs in highly urbanized societies. This study aimed to examine how anthropomorphism toward dogs - used here as an indicator of human-dog attachment - and sociodemographic factors influence dog owners' attitudes toward five common livestock production practices: compost-barn housing for dairy cows, farrowing crates for sows, beak trimming in laying hens, forced moulting by feed withdrawal, and tail docking in piglets. A mixed-methods survey with texts and images explaining the practices was completed by 1,410 dog owners from all regions of Brazil with diverse ages, education levels, incomes, and degrees of involvement with animal production. Participants were recruited through social media platforms via an advertisement inviting individuals to take part in a survey about animals. Quantitative attitudes were analysed using multivariable linear regression models including production practice, gender, age, income, education, involvement with animal production, and the social role attributed to the dog ("child", "family member", "friend", "companion", or "animal"), followed by estimation of marginal means and Tukey-adjusted pairwise comparisons. Qualitative responses were analysed using thematic analysis. After controlling for sociodemographic factors, production practice significantly influenced attitudes: compost-barn housing was more accepted than all other practices, which did not differ significantly from one another ($p < 0.001$). Women expressed more negative attitudes towards livestock practices than men ($p < 0.001$). Attitudes became more positive with greater familiarity with animal production ($p < 0.001$). The social role attributed to the dog was a strong and independent predictor of attitudes ($p < 0.001$): participants who perceived their dogs as "children" expressed the most negative attitudes towards livestock practices, whereas those who perceived dogs as "animals" expressed the most positive attitudes, with intermediate values for those who considered their dogs "companions", "friends" or "family members". In the open-ended responses, concerns about animal welfare were frequently mentioned, particularly references to pain, suffering, restriction of movement, and ethical objections to profit-driven practices. These findings suggest that more anthropomorphic human-dog relationships may heighten moral concern to farm animals, potentially by positioning dogs as moral reference points in public evaluations of animal use. In conclusion, as dogs increasingly assume family-like roles within urban households, human-dog relationships play a meaningful role in shaping public attitudes toward livestock production, underscoring the relevance of companion animals in emerging ethical debates and public engagement around animal welfare and animal use.

Does electroencephalogram (EEG) monitoring influence lying behavior in horses?

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Sleep is a reversible state characterized by reduced responsiveness to external stimuli and is essential for physiological restoration and welfare maintenance. Horses are polyphasic animals exhibiting multiple short sleep bouts throughout the day, including two main phases: Non-rapid eye movement (NREM) and rapid eye movement (REM). To achieve REM sleep, horses must be in a recumbent position due to muscle atony. Electroencephalogram (EEG) is the gold standard for sleep evaluations, but little is known about whether continuous EEG recording may disturb lying behavior in horses. Hence, the aim of the study is to evaluate whether continuous EEG monitoring alters lying behavior patterns. For this reason, seven mares (age 4 to 8 years old) were recorded for 9 hours (15:00-00:00) using a fixed IP camera in a 4x4 meters stall. After that, the animals were fitted with an electroencephalogram (EEG) (BWMini PSG, Neurovirtual, USA) attached to the halter for the same time frame with 23 non-invasive electrodes positioned across the head, neck and thorax. The animals were free to move inside the stall that has wood shavings bedding. Horses were also recorded by video cameras during the EEG exam. Recumbency behavior during the EEG period was compared to a control period without EEG. All videos were analyzed using BORIS. The lying period was analyzed and divided into three categories: sternal recumbency, sternal recumbency sleep, and lateral recumbency. Sternal recumbency was defined as the sternum in contact with the ground. Sternal recumbency sleep was defined as sternum and nose in contact with the ground. Lastly, lateral recumbency was defined as the body positioned laterally on the ground. Frequency and duration of each behavior were recorded. The statistical analysis was done using SPSS (Version 29.0; IBM Corp., 2023), using the Wilcoxon signed-rank test. The project was approved by ethics committee CEUA-FMVZ under the protocol number 1513190225. No significant differences were found in the frequency of recumbency behaviors (all $p > 0.05$). However, the duration of sternal recumbency ($p = 0.031$), lateral recumbency ($p = 0.031$), and total recumbency time ($p = 0.031$) was significantly reduced during EEG monitoring. The duration of these behaviors was lower when using the EEG. This evidence suggests that EEG instrumentation may alter resting patterns and potentially reduce opportunities for specific sleep stages. Additional studies should be conducted over longer continuous nighttime periods to determine whether lying behavior continues decreasing or shifts to later periods.

Integrated veterinary interventions improve stray animal welfare and public health: Evidence from a one health program in urban Bangladesh

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Animal welfare reflects the physical and psychological state of an animal in relation to its environment and its ability to cope with prevailing conditions. In Bangladesh, stray animals are frequently exposed to injury, infectious diseases, malnutrition, and environmental stressors, contributing to compromised welfare and increased zoonotic risks, particularly rabies. This study aimed to evaluate the effectiveness of an integrated One Health intervention combining clinical veterinary care, vaccination, and community engagement to improve stray animal welfare and public health outcomes in an urban setting. A total of 229 stray animals, including 153 dogs (66.8%), 63 cats (27.5%), and 13 birds (5.7%; owl, pigeon, and parrot rescue cases), were managed using species-appropriate humane capture techniques, including nets, cage traps, and manual restraint by trained personnel to minimise stress and injury. Each animal underwent a standardised clinical and behavioural welfare assessment based on indicators such as body condition, wound status, feeding behaviour, and observable stress responses, followed by targeted therapeutic interventions for trauma, infections, parasitic infestations, and systemic conditions. Preventive care, including rabies vaccination, was also administered. Clinical recovery, defined by wound healing, improved body condition, normal feeding behaviour, and reduced stress indicators, was observed in 183 cases (approximately 80%), demonstrating substantial welfare improvement following intervention. In parallel, a targeted rabies vaccination campaign immunised approximately 150 stray animals. Community engagement and awareness activities resulted in increased public reporting of injured animals and improved acceptance of vaccination programs, indicating enhanced community participation in animal welfare initiatives. Additionally, a complementary livestock vaccination program covering over 300 cattle, sheep, and goats was conducted as part of a broader public health strategy to reduce cross-species disease transmission and strengthen community-level biosecurity; however, these animals were not included in the primary welfare assessment. Despite these positive outcomes, challenges included limited shelter capacity, inadequate resources for large-scale sterilisation and vaccination, reliance on clinical diagnosis due to restricted laboratory access, and constraints in manpower and transportation. These limitations highlight the need for sustained investment and institutional support. Overall, the findings suggest that an integrated One Health approach combining clinical care, preventive medicine, and community engagement can effectively improve stray animal welfare while contributing to public health protection in resource-limited urban environments, offering a scalable framework for similar settings.

Public perception of animal welfare in Ghana: A cross-sectional survey

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Animal welfare, a growing area of science and research has seen impacts and developments globally. However, in developing countries such as Ghana, the implementation of structured animal welfare frameworks remains challenging. Although Ghana has legislation that prohibits cruelty towards animals, several factors such as weak enforcement, inadequate resources, and low public awareness, often creates the impression that no framework exists. This study aimed to assess the knowledge, attitudes, and perceptions of Ghanaians to examine how demographic factors influence understanding and practice. A cross-sectional survey was conducted using a Google Forms questionnaire administered to 40 participants from different regions of Ghana. The questionnaire assessed demographics such as educational level, animal ownership, and occupational exposure to animals, and also assessed the knowledge about animal welfare in general. Data was analyzed using Pearson's Chi-square test to explore the associations between demographics and overall animal welfare awareness. The findings revealed that 80% of respondents considered animal welfare important due to its implications for public health, linking poor animal management and zoonotic disease risk. 42.5% cited ethical considerations as central to their views on animal welfare, while 30% recognized long-term economic benefits associated with improved animal husbandry. Over 70% of respondents identified public education and stronger enforcement of animal welfare policies as key strategies for improvement. The study highlights the growing awareness of animal welfare among Ghanaians especially its public health and economic significance. Although the gaps remain in structured understanding and implementation, strengthening public education and policy enforcement will enhance the current standards.

Cattle transportation in Bangladesh impacts on welfare, physiology, health, and productivity: A comprehensive review

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Cattle transportation is essential to the livestock value chain in Bangladesh, underpinning national meat and dairy production while sustaining rural livelihoods. Despite its economic significance, existing transportation practices often fall short of welfare standards, resulting in considerable stress, health disturbances, and productivity losses in cattle. This comprehensive review synthesises global and regional literature to critically examine transportation methods, welfare implications, physiological impacts, vehicle design challenges, and regulatory shortcomings relevant to Bangladesh. Evidence consistently demonstrates that transportation induces acute and chronic stress responses in cattle, including elevated cortisol, dehydration, heat stress, and immunosuppression. These physiological changes well documented internationally are mirrored in observational reports from Bangladesh, where overcrowding, rough handling, prolonged deprivation of feed and water, and the use of unsuitable vehicles remain widespread. Analysis reveals that high stocking densities, inadequate ventilation, and lack of proper loading ramps exacerbate animal discomfort, injury risk, and mortality. Handling practices such as tail twisting, beating, and improper restraint further intensify stress and pain. Bangladesh's Animal Welfare Act (2019) establishes broad welfare principles, yet it lacks transport specific guidelines and robust enforcement mechanisms. The review identifies major research gaps, including the absence of local studies on stress biomarkers, thermal imaging, and comprehensive data. Economic losses associated with transport induced stress remain under explored, as do the benefits of welfare friendly vehicle modifications. To address these challenges, the review advocates for the development of Bangladesh-specific transportation standards, the implementation of mandatory handler training, and the adaptation of vehicles with partitions, ramps, and adequate ventilation. Enforcing resting, watering, and stocking density regulations is also essential. Enhanced research focus is needed on physiological stress indicators and economic outcomes to inform policy and best practices. In conclusions, cattle transportation in Bangladesh is characterised by poor welfare conditions and significant stress related impacts on animal health and productivity. Adoption of evidence based, welfare oriented practices is critical to improving animal welfare outcomes, safeguarding public health, and enhancing economic efficiency. Addressing current gaps through targeted research and regulatory reforms will be pivotal in advancing sustainable livestock development in Bangladesh.

Balancing welfare and productivity: Determinants of cow–calf contact adoption in smallholder and commercial dairy systems of Bangladesh

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Cow–calf separation shortly after birth remains common in dairy production systems worldwide. However, increasing scientific and societal interest has highlighted the potential welfare benefits of prolonged or restricted cow–calf contact for both dams and calves, including improved behavioral expression, stress reduction, and enhanced calf vitality. In Bangladesh, dairy production is predominantly smallholder-based, with expanding cooperative and commercial sectors. Despite growing welfare awareness, empirical evidence on farmers' attitudes, experiences, and practical barriers related to cow–calf contact remains limited. This study assessed farmers' perceptions, current practices, and constraints to adoption across diverse dairy production systems in Bangladesh. A cross-sectional mixed-methods study was conducted among 270 dairy farms representing smallholder (67.4%), cooperative-based (21.5%), and commercial farms (11.1%) in major milk-producing regions. Data were collected through structured face-to-face interviews and semi-structured qualitative discussions during the period of 30/12/2024 to 30/06/2025. Quantitative variables included separation practices, perceived welfare and productivity impacts, housing adequacy, labor availability, disease concerns, and willingness to adopt restricted or full cow–calf contact systems. Multivariable logistic regression identified predictors of adoption willingness, while qualitative data were analyzed thematically to contextualize decision-making processes. Immediate separation (<6 h) was practiced by 43.7% of farms, whereas 35.6% applied restricted contact and 20.7% maintained prolonged contact (>3 months), with prolonged contact more common in smallholder systems. Most farmers perceived cow–calf contact as beneficial for calf vitality (78.5%), stress reduction (72.2%), maternal bonding (69.6%), and natural behavior expression (61.9%). Nevertheless, substantial barriers were reported, including concerns about reduced marketable milk (74.1%), increased labor demand (63.0%), mastitis risk (58.9%), calf diarrhea risk (54.8%), and inadequate housing infrastructure (48.9%). Overall, 41.5% of farmers expressed willingness to adopt restricted contact under appropriate technical guidance. Adoption willingness was independently associated with prior positive experience (AOR = 3.18; 95% CI: 1.74–5.82; $p < 0.001$), adequate housing facilities (AOR = 2.47; 95% CI: 1.36–4.51; $p = 0.003$), and regular veterinary or extension consultation (AOR = 1.89; 95% CI: 1.05–3.42; $p = 0.034$). These findings indicate that Bangladeshi dairy farmers demonstrate notable openness toward welfare-oriented cow–calf contact systems but face structural, economic, and knowledge-based constraints.

Bonds beyond borders: Trust over territory in free-ranging dogs

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Free-ranging dogs (FRDs) are free living synanthropic species - Species living closely with humans in their environment, utilizing human-created habitats, food, and waste, without being intentionally domesticated. FRDs are very territorial and protect their territories very actively. Getting into no man's land or into adjacent group territory is risky for them, it could lead to violent fights between groups for food resources and mates. This research examines how heterospecific trust influences behavioral plasticity - How the social bond between different species could influence decision and demeanor. Our aim, in bigger picture is to look if an influencing factor like presence of familiar human, will FRDs choose to follow them? And cross their territory irrespective of the risk awaiting? And what kind of behavioral and demeanor shift will happen?. To test this We constructed a four-phase longitudinal protocol. Ph- 1 (Day 0) establishes baseline sociability via an approachability test by experimenter 1 (E1). Ph-2 (Day 1-6) comprises 12hrs of observation on focal dog groups. Through AOS, intragroup dynamics and territorial boundaries of the focal group are mapped. Ph-3 (Day 7-9) familiarity enhancement through daily routines of gentle petting and food reward, during food giving phase the no of biscuits equals the dogs present, we won't feed them rather we threw them, preferably in midpoint. Consumption depends on intragroup dynamics/hierarchy, which E1 will not influence, followed by E1 walking to the focal groups boundary and staying near it for 30s without crossing it. Ph-4 (Day 10) Experiment day: Familiar E1 won't pet or feed the dogs, will just cross into adjacent territory and remain stationary for 30s record the dog's decision to follow or stay. Experiments for 12 groups completed and currently in decoding phase of videos, descriptively data shows 69% (N=41) of dogs have entered the adjacent territory. We are looking into more intricate details in their demeanors between phases and will proceed to analysis, which will be completed before the conference. This research provides a scientific basis for improving human-FRD coexistence. Practically, these insights can optimize public health interventions, such as vaccination or sterilization programs (ABC), by demonstrating how social bonds aid animal handling and urban population management. This work conforms to the ISAE Ethical Guidelines regarding the study of free-ranging populations.

Redrawing boundaries: Investigating the influence of resource dispersion on territoriality in free-ranging dogs

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Free-ranging dogs (FRDs) navigate complex social and territorial challenges in human-dominated landscapes. While intergroup aggression and feeding habits are documented, how neighbouring groups adjust their spatial boundaries when faced with new resources in the "no-man's land" remains poorly explored. This study aims to address this gap by experimentally examining the behavioural plasticity of FRDs in response to novel resource dispersion. In order to get a clear understanding on these behavioural patterns we designed and conducted experiments on groups of Free-ranging dogs in Nadia district of West Bengal, India. We designed a protocol and divided it into two parts. The first part being observational, where we collected scan and all-occurrence scan data for 12 hours for each groups of free-ranging dogs and by locating the locations of their territorial behaviours like marking, overmarking and other aggressive interactions towards their neighbouring group we were able to figure their territory size and locate the no-man's land between the groups. The second part is the experimental where we introduced a novel resource in the no-man's land consisting of cooked rice mixed with curry and by continuous recordings for 20 mins for each session we recorded any behaviour or interactions happening in that particular area. We did this experiment on 17 distinct groups of free-ranging dogs with group size from 3 to 8 individuals per group in Nadia district. Preliminary analysis of 5 completed groups (N=35) showed significant behavioural adaptations ($H=64.28$, $p < 0.001$). Statistical analysis using Dunn's Test confirmed distinct distributions of territorial and social behaviours across groups. Results indicate that dogs prioritized exploration of the new site over immediate boundary expansion. Furthermore, a clear trend emerged where one group tended to claim the new resource site as their own territory. The introduction of a novel resource triggers measurable behavioural adaptations in FRDs. The tendency for a single group to monopolize resources in previously neutral zones suggests that resource stability is a primary driver for redrawing territorial boundaries in urban environments. By experimentally showing how free-ranging dogs flexibly adjust their spatial and social behaviour, this study highlights the importance of ethological evidence in designing conflict-mitigation strategies for free-living animals. Understanding the behavioural mechanisms underlying resource use in human-dominated landscapes can inform more nuanced, welfare-oriented management approaches that promote coexistence rather than relying on assumptions of inevitable aggression.

Effect of staggered single-entry of freshly calved water buffaloes into resident lactating buffaloes on their welfare and lactation performance

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Freshly calved buffaloes face intense social stress when directly introduced from calving pens into large resident milking groups, triggering agonistic encounters that disrupt circadian behaviour, compromise welfare, and reduce lactation-long milk production. Targeted management strategies that temper the social shock of regrouping may therefore offer a practical route to improving both animal welfare and farm productivity. This study evaluated staggered single-entry effects on milking behaviour, physiological stress and lactation performance in freshly calved buffaloes integrating into established milking groups. Eighty-two Murrah buffaloes, stratified by parity (primiparous and multiparous), were randomly allocated to two regrouping strategies post 5-day colostrum period. Control (T0) buffaloes (22 primiparous, 22 multiparous) were introduced directly and full-time into the resident milking group on day 1. Treatment (T1) buffaloes (19 primiparous, 19 multiparous) underwent staggered single-entry: 2, 4, and 8 hours exposure to the resident group on days 1, 2, and 3, respectively, then withdrawn to separate loose housing with identical feeding and facilities; full integration occurred from day 4. Milking behavioural parameters were continuously recorded via closed-circuit television throughout lactation during hand-milking in milking parlour. Plasma cortisol was assayed on days 1, 3, 7, 15, and fortnightly to 90 days. Data underwent two-way ANOVA (parity $\times$ treatment) using SPSS 22.0. Milking temperament scores (on 1-5 scale; Tullow, 1961) improved significantly with staggered entry in both parities. Multiparous buffaloes scored 1.0 ± 0.0 (staggered) vs. 1.22 ± 0.09 (direct), and primiparous 2.35 ± 0.23 vs. 3.4 ± 0.22 , indicating markedly reduced stress reactivity during hand-milking. Overall plasma cortisol levels were lower in staggered entry buffaloes (5.07 ± 0.26 vs. 5.82 ± 0.24 ng/ml). Staggered-entry animals exhibited reduced milk let-down time (3.52 ± 0.19 vs. 3.93 ± 0.68 min), indicating efficient milk ejection and udder emptying in calmer animals. They showed faster milk flow rate (2.06 ± 0.05 vs. 0.96 ± 0.20 kg/min), shorter total milking time (9.30 ± 0.24 vs. 11.89 ± 0.32 min), and superior average daily milk yield (11.79 ± 0.30 vs. 10.63 ± 0.62 kg/day). Staggered entry accelerated lactation curve establishment and extended productive days in milk reaching peak yield earlier (23.1 ± 0.7 vs. 31.68 ± 0.53 days) and longer lactation length (313.21 ± 4.34 vs. 252.18 ± 3.27 days) than directly introduced animals. In conclusion, staggered single-entry of freshly calved buffaloes into resident milking groups after the colostrum period reduces regrouping stress, advances peak yield, lengthens lactation and increases milk output, while improved milk flow dynamics and milking temperament enhance welfare and milking parlour efficiency in primiparous and multiparous buffaloes.

Placental development as a prenatal predictor of early-life behaviour and growth trajectory in indigenous Gir calves managed at a gaushala

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Prenatal development is a critical determinant of postnatal growth, vitality, and behavioural competence in livestock. Placental development directly influences nutrient transfer, fetal growth, and neonatal physiological readiness, yet its role as a predictor of early-life welfare and behavioural expression in indigenous dairy calves remains underexplored. This study investigated placental weight as a prenatal predictor of neonatal vitality, behavioural expression, and growth trajectory in Gir calves reared under traditional gaushala management in Surat, India. Fourteen calves were monitored from birth to 90 days under uniform husbandry conditions. Placental weight was strongly correlated with birth weight ($r = +0.943$; $P < 0.01$) and significantly associated with body length ($r = +0.620$), heart girth ($r = +0.698$), paunch girth ($r = +0.764$), and height ($r = +0.756$). Male calves exhibited higher overall body weight (37.93 ± 1.311 vs. 31.74 ± 1.147 kg; $P < 0.05$) and significantly greater length (71.88 ± 0.48 vs. 63.31 ± 0.61 cm), heart girth (82.67 ± 0.867 vs. 72.26 ± 0.467 cm), paunch girth (84.36 ± 1.139 vs. 72.98 ± 0.912 cm), and height (90.00 ± 0.765 vs. 83.05 ± 0.649 cm) compared to females ($P < 0.01$). Vitality score at birth was slightly higher in males (2.1 ± 0.11 vs. 2.08 ± 0.18), with 42.9% of males and 57% of females classified as active on the day of calving. Maternal activity was 42.9% active for dams of males and 71% active for dams of females. Across 90 days, significant age-specific behavioural variations were observed, including tongue rolling (30th–45th day), head shaking (15th–30th day), pica (7th day), inter-suckling (60th–90th day), and hair licking (45th day), whereas coat mouthing and eye rolling were absent. Physiological parameters showed slightly higher heart rate (64.26 ± 0.94 vs. 59.79 ± 0.82 beats/min) and respiration rate (22.48 ± 0.61 vs. 21.75 ± 0.48 breaths/min) in males, while rectal temperature was marginally higher in females (101.895 ± 0.071 vs. $101.795 \pm 0.043^\circ\text{F}$). Placental weight emerges as a robust prenatal biomarker, linking fetal development to neonatal vitality and behaviour, with direct implications for welfare assessment and management of indigenous dairy calves.

Early rearing practices and its Influence on handling behavior of Sahiwal calves during growth monitoring

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The present study evaluated the reactivity of calves to a familiar human during weekly body weight recording under two different early life management systems. 32 healthy Sahiwal cow-calf pairs maintained at the Livestock Research Centre, ICAR-National Dairy Research Institute, were equally allotted into two groups (n=16 each): Fenceline Contact were allowed suckling during morning and evening milking with fenceline housing and separated calves were separated immediately after birth and were bottle fed. Behavioural responses during weekly weighing were monitored over a 12 week period through direct observation and CCTV recording and data were analyzed using SPSS 23.0. Fenceline calves showed significantly lower latency to approach the handler, decreasing from 35.00 ± 0.41 sec to 23.12 ± 0.90 sec compared to separated calves 40.88 ± 0.58 to 29.88 ± 0.98 sec. Retreat proportion declined from 0.75 ± 0.05 to 0.13 ± 0.04 in fenceline calves, whereas separated calves ranged from 1.00 ± 0.00 to 0.25 ± 0.05 . The number of retreats decreased markedly in fenceline calves (5.88 ± 0.46 to 1.12 ± 0.40), while separated calves exhibited consistently higher retreat frequency. Difficulty scores were lower in fenceline calves compared to separated calves. Fenceline calves required fewer gentle pushes and less time to mount the scale than separated calves. Urination incidence was also lower in fenceline calves compared to separated calves. These findings indicate that fenceline contact improves calf approachability, cooperation and reduces stress related responses during routine handling.

Assessment of the welfare status of cattle during transport, at markets, and in slaughterhouses in Bangladesh

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Cattle in Bangladesh are frequently exposed to challenging conditions during transportation, marketing, and slaughter, which may compromise their welfare and overall health. This observational study aimed to evaluate management practices and conditions affecting cattle welfare during transport, marketing, and slaughter in the Rajshahi district of Bangladesh. Data were collected from July to December 2025 using structured questionnaires and direct observations across 7 local markets and 6 slaughterhouses, involving 700 predominantly adult cattle (average body weight: 220 kg) transported via 40 local vehicles (Vutvuti) and 20 trucks. The assessment focused on space allowance, handling practices, and facility conditions. Results showed that adult cattle in markets were provided only 8.3 ± 2.01 sq.ft of space, below the recommended minimum of 15 sq.ft, while space during transportation decreased further to less than 6.0 ± 1.92 sq.ft for each cattle. Inadequate handling practices were commonly observed during loading, unloading, transport, and slaughter. Pregnant cattle and calves received minimal special care, and the absence of feed and water during 8-12 hour journeys further highlighted welfare concerns. Poor vehicle design, steep ramps, and lack of loading aids also contributed to injuries and accidents. Slaughter facilities were often poorly equipped, with some cattle slaughtered in open areas or restrained on hard surfaces, and inappropriate restraint and no stunning methods are used. Overall, the conditions observed during transportation, marketing, and slaughter indicate several factors that may compromise cattle welfare, including limited space, lack of feed and water, rough handling, and poor infrastructure and no stunning methods are used. These conditions are likely to expose cattle to discomfort, injury, pain, fear, and physiological stress, and do not fully comply with the principles of the animal's Five Freedoms. The findings suggest that cattle in Bangladesh are frequently subjected to management practices that pose potential welfare risks. Addressing these issues requires improved training, standardized procedures, better facilities, and stronger regulatory enforcement to enhance animal well-being and meat quality.

Monitoring the behavioural and physiological responses in cats during the perioperative period to evaluate their health status

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This pilot study examines the behavioural and physiological responses of pet cats during the perioperative period, including pre-, intra-, and post-operative phases, with a focus on non-invasive infrared temperature measurements as indicators of health and stress. Fifty-five cats of various ages, sexes, breeds, and health statuses undergoing surgical procedures at Birds and Pet Animal Clinic (BPAC), Bangladesh were investigated. Exclusion criteria comprised emergency surgery, pregnancy, and severe systemic illness. Written informed consent was obtained from all owners prior to include their pet in this study including explicit permission for the use of their cat's data for research purposes. Cats were investigated consecutively and classified as elective neutering (spay/castration for reproductive control) or therapeutic surgery for disease (fracture repair, abscess treatment). A standardised anaesthetic protocol was used for all cases, consisting of premedication with xylazine HCl (1.0 mg/kg, i/m), followed after five minutes by induction with ketamine HCl (8 to 10 mg/kg, i/m). Analgesic provision and perioperative monitoring adhered to BPAC guidelines. Behavioural assessment used a study-specific ethogram based on established feline behavioural indicators, including posture, self-grooming, vocalisation, activity, and temperament. Behaviours were recorded by the same trained observer at three perioperative timepoints: pre-, intra-, and post-operative phases. Each observation session lasted 10 minutes, with post-recovery behaviour assessed at 1 hour after surgery. Observer consistency was maintained throughout, eliminating the need for inter-rater reliability testing. Physiological parameters, including rectal temperature (RT), infrared temperature (IRT) of the ear pinna, heart rate (HR), and respiratory rate (RR), were measured at the same timepoints. Results indicated that RT, IRT, HR, and RR were highest pre-operatively, decreased intra-operatively, and returned close to baseline post-operatively. Male, non-vaccinated, and non-dewormed cats exhibited significantly higher RT, IRT, HR, and RR ($p < 0.05$), and pre-operative vomiting was independently associated with elevated physiological parameters ($p < 0.05$), suggesting increased surgical risk. IRT closely followed changes in rectal temperature and correlated with health and behavioural responses, supporting its valuable non-invasive monitoring tool. Key behavioural predictors, including vocalisation and reduced activity, were independently associated with higher RT and HR ($p < 0.05$). These findings demonstrate the utility of non-invasive infrared thermometry for perioperative monitoring, emphasise the importance of standardised pre-operative assessment and preventive healthcare (vaccination, deworming), and provide evidence for integrating behavioural and physiological monitoring to identify at-risk cats and improve surgical outcomes.

Bridging the welfare gap: Internet of Things (IoT) applications for behaviour monitoring and animal welfare in Nigerian livestock systems

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Animal welfare is increasingly recognized as a critical component of sustainable livestock production; however, effective behavioural monitoring remains a major challenge in many developing countries, including Nigeria. Conventional welfare assessment methods rely largely on visual observation, which is labour-intensive, subjective, and often incapable of detecting early indicators of stress, disease, or discomfort. These limitations hinder timely intervention and negatively affect animal health and productivity. The emergence of the Internet of Things (IoT) presents a transformative opportunity to enhance welfare monitoring through continuous, automated, and data-driven approaches. This review examines the potential of IoT-enabled technologies to measure animal behaviour and improve welfare within the Nigerian livestock context. A structured literature review methodology was adopted for this study. Relevant publications were sourced from major academic databases, including Scopus, Web of Science, PubMed, and Google Scholar, using keywords such as “IoT,” “animal behaviour monitoring,” “precision livestock farming,” and “animal welfare technologies.” Studies published between 2010 and 2025 were considered to capture recent advancements. Inclusion criteria focused on peer-reviewed articles, conference proceedings, and technical reports addressing IoT applications in livestock systems, while studies lacking empirical or technological relevance were excluded. Selected studies were critically analysed based on the types of technologies employed, behavioural and physiological parameters monitored, and their reported impacts on animal welfare and productivity. Findings from the review indicate that IoT-enabled technologies - such as wearable sensors, accelerometers, RFID systems, GPS tracking devices, and automated feeding and rumination monitoring tools - enable real-time and continuous monitoring of key welfare indicators, including body temperature, feeding behaviour, locomotion, and rumination patterns. Evidence suggests that these technologies improve early disease detection, enhance productivity, and support data-driven decision-making in livestock management. However, their adoption in Nigeria is constrained by high implementation costs, limited technical expertise, inadequate infrastructure, unreliable internet connectivity, and low awareness among farmers. In conclusion, IoT technologies offer significant potential for advancing animal welfare monitoring and productivity in Nigerian livestock systems. Nonetheless, effective integration requires context-specific adaptation, capacity building, improved infrastructure, and supportive policy frameworks. Future research should focus on developing affordable and scalable IoT solutions tailored to smallholder farmers to ensure widespread adoption and impact.

Does habituation modulate vocal parameters of dairy cows during negative challenges?

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Cattle vocalizations have been shown to have a significantly higher frequency during oestrus, separation from calf and conspecifics, and during anticipation of feed, and to encode information on sender identity and emotional state. To this aim, we set-up the current study to test the hypothesis that the vocal acoustic structure of high-frequency calls (HFCs) emitted by cows with the mouth open during an isolation challenge is being modulated by the duration of confinement. The study was carried out on 20 Holstein multiparous-lactating cows, that were individually isolated from their herd-mates for 240 minutes following the morning milking. Procedures were approved by RDIB Institutional Review Board (approval code PN-III-P1-1.1-TE-0027), with gentle handling methods being always implemented during animals handling and isolation. Vocalisations were recorded using directional microphones (Sennheiser MKH416-P48U3, 40-20.000 Hz), attached to digital solid-state recorders (Marantz PMD661). Calls (n=952) were analysed using Praat DSPv.6.0.31 package, for automatic extraction of 23 acoustic features. Analyses were performed in the R language v.4.2.2. First, a Principal Component Analysis (PCA) was performed in order to reduce the number of variables, then the PCs with eigenvalues larger than 1 were selected for further analyses, the first 6 PCs being retained. Linear mixed effect models (LMMs) were implemented using the lmer function from the R package lme4 v.1.1-33 in order to test the effect of time of isolation as a fixed effect on the scores of each of the selected PCs, with the cow ID as a random effect. F0 parameters loaded highly ($r \geq 0.30$) on PCvocal 1, 3, 4, 5 and 6, being validated previously as an indicator of emotional arousal for mammal species, given that an increase in the muscle tensions is expected during arousal, which in turn leads to an increase of the F0 vocal parameters. Furthermore, results on different non-human mammals suggested that F0 vocal parameters encode the emotional valence, in addition to arousal, in both positive and negative contexts. Quartiles, formants, AM and harmonicity means varied according to time interval, suggesting that these parameters can serve as additional indicators of animal emotions under negative challenges. The evidence from this study suggests that vocal parameters vary with the time interval of the negative challenge, and as a result have the potential to encode dynamic information regarding the emotional state and arousal of adult cattle.

Behavioural drivers of animal welfare adoption among cattle farmers in Northern Nigeria: A Theory of Planned Behaviour approach

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Improving animal welfare in livestock systems depends not only on technical solutions but also on farmers' behavioural decision-making. This study investigated the behavioural drivers of animal welfare adoption among cattle farmers in Northern Nigeria using the Theory of Planned Behaviour. The objective was to examine how attitudes, subjective norms, and perceived behavioural control shape farmers' intentions to improve animal welfare practices. A cross-sectional survey was conducted with 750 cattle farmers across five major cattle-producing states in Northern Nigeria. Data were collected using interviewer-administered questionnaires adapted to the local context and analysed using jamovi statistical software. Internal consistency of Theory of Planned Behaviour constructs was assessed using Cronbach's alpha. Composite scores were generated for each construct, and relationships between variables were examined using Pearson correlation analysis. Multiple linear regression models were estimated to identify predictors of intention to improve animal welfare, first using psychological constructs alone and subsequently incorporating socio-economic variables. All constructs demonstrated acceptable to excellent reliability, with Cronbach's alpha values ranging from 0.76 to 0.94. Farmers reported generally positive attitudes toward animal welfare and strong intentions to improve welfare-related practices. Intention was strongly correlated with perceived importance of welfare improvements ($r = 0.59$) and subjective norms ($r = 0.58$), and moderately correlated with general attitudes ($r = 0.49$) and perceived behavioural control ($r = 0.33$). In regression analysis, the Theory of Planned Behaviour constructs explained 55 percent of the variance in intention ($R^2 = 0.55$). Perceived importance of welfare improvements ($\beta = 0.62$, $p < 0.001$) and subjective norms ($\beta = 0.44$, $p < 0.001$) were the strongest predictors, while perceived behavioural control was not significant. Adding socio-economic variables increased the explained variance to 61 percent ($R^2 = 0.61$), with production system, age, and state of residence showing significant associations with intention. The findings demonstrate that Nigerian cattle farmers generally value animal welfare, but intention to adopt welfare improvements is driven primarily by social expectations and perceived importance rather than by feasibility alone. These results highlight the need for interventions that strengthen normative support and address structural constraints, rather than focusing solely on awareness or attitude change.

Assessment of emotional changes in horses using infrared thermal measurement of the eye

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Measuring immediate stress and emotional arousal in animals remains challenging. Behavioural observations can be difficult to interpret without extensive training, while physiological methods such as saliva or blood sampling require handling and prior habituation. Recent technological advances offer promising alternatives, including infrared thermal imaging, which enables non-invasive measurement of external body temperature changes. In humans and non-human primates, emotional stimuli often induce a decrease in nasal temperature, suggesting thermal responses may reflect autonomic arousal. However, in many mammals the nasal area is covered with fur, limiting its use. Instead, the medial canthus, a hairless region at the inner eye corner, provides an accessible thermal window. Previous work in cows reported a continuous drop in medial canthus temperature during stress, and similar patterns have been observed in reindeer. Most studies using infrared thermal imaging focus primarily on negative emotional states such as fear. Here, we address this gap by investigating medial canthus temperature variation in horses across situations differing in both emotional valence and arousal. Twenty-six mares were exposed to three behavioural tests: (1) a fearful stimulus involving an experimenter shaking a plastic bag (negative, high arousal), (2) an allo-grooming simulation through wither scratching (positive, low arousal), and (3) an appetitive food distribution stimulus involving pellet presentation (positive, high arousal). Each test included a 1-minute control phase, a 1-minute stimulus phase, and a 2-minute recovery phase. Stimuli were presented in randomized order on separate days. Continuous heart rate was recorded using an equine Polar monitor to assess RR intervals and RMSSD, while medial canthus temperature was video-recorded using an FLIR T540 infrared thermal camera. Behaviour was simultaneously captured with 4K video for later behavioural coding. Thermal frames were extracted every second, and a YOLO-based model was trained to automatically detect the medial canthus when the left side of the horses head was at about 90 degrees angle of the camera and then extract maximal temperature values. At the time of submission, behavioural coding and statistical analyses are still ongoing. However, the preliminary analyses using GLMER suggest a strong association between eye temperature and heart rate data, while also revealing significant variation in thermal patterns across the three emotional conditions. This poster will present the methodology and the results of a more extensive analysis, and will discuss whether medial canthus temperature can realistically be used as a non-invasive indicator of horses' emotional state across both positive and negative contexts.

The bridge from human to animal well-being

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Much research has addressed ‘human welfare’ from the perspective of economics, psychology, biology and behavioural sciences, but it is unclear how these conceptions apply to animal welfare. The study involved conducting a rapid scoping review of the scholarly literature with three aims: 1) describe key metrics used to assess human welfare, with a special focus on psychometric surveys and questionnaires used to operationalize human wellbeing, 2) critically assess if and how these constructs might be used to assess animal wellbeing, and 3) compare these approaches with the dominant approaches currently used in the scientific assessment of animal welfare. I have broadly divided the conceptions of human welfare into top-down and bottom-up variables with the former being highly under-represented in animal welfare sciences, including sub-constructs like life-satisfaction, happiness, autonomy, and psychological well-being. Discussing the items in these psychometric scales opens up interesting avenues for the field of applied ethology: an important implication is the creation of holistic surveys to assess animal welfare and study the effectiveness of various animal welfare interventions, identifying areas of improvement. In creating these surveys, the literature suggests two broad categories of questions: analysing items at a behavioural and physiological level, and proxy surveys where primary stakeholders in animal welfare can respond to surveys for the animals under their care. Understanding the nuances of such an endeavor is a necessary step in creating animal welfare frameworks and surveys that go beyond removal of negative environmental stimuli and focus on constructs that address an animal’s cognitive and affective state.

Amplifying applied ethology research impact: A practical science communication approach for researchers in developing countries

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Researchers in many developing countries produce valuable, context-specific knowledge that addresses pressing societal challenges. However, limited training in science communication often restricts the visibility, citation impact, and public engagement of their work. As a result, important findings may remain confined to academic journals, limiting their influence on policy, practice, and community adoption. Researchers need to be equipped with practical tools to effectively communicate their science beyond traditional academic platforms. A workshop approach to improve communication could begin by exploring the strategic importance of science communication in increasing research visibility, building professional identity, and fostering interdisciplinary and international collaboration. Participants would then examine common barriers to public engagement and reflect on how communication gaps may be limiting the reach of their own work. A core component of the workshop would focus on translating complex scientific concepts into clear, accessible language while maintaining scientific integrity. Through guided exercises, participants would practice rewriting a technical abstract into a 150-word plain-language summary suitable for a general audience. The workshop would also introduce practical strategies for repurposing research outputs into multiple digital formats. Participants would learn how to transform journal articles into short-form content such as LinkedIn posts, visual research summaries, infographic scripts, short video outlines, podcast talking points, and storytelling threads. In small breakout activities, attendees would have the opportunity to draft one social media post and one short video script based on their own research topic, receiving peer and facilitator feedback. Additionally, participants would explore how platform-specific communication strategies can increase traction and engagement. The workshop would conclude with the development of a simple visibility plan, enabling participants to consistently share their research in strategic and manageable ways. By the end of the session, participants would leave with concrete tools, draft communication materials, and a clear roadmap for amplifying their scientific voice. Ultimately, such a workshop seeks to empower researchers to ensure their findings reach the audiences who need them most, increasing both impact and adoption of their work.

Supporting broiler resilience under reduced medication management using *Ocimum gratissimum* leaves extract

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Routine prophylactic medication remains common in broiler production, yet increasing concerns regarding antimicrobial resistance and animal welfare highlight the need for management strategies that enhance resilience under reduced pharmaceutical intervention. From a welfare perspective, resilience reflects the animal's capacity to maintain physiological stability and functional performance when exposed to environmental or management challenges. Phytogenic additives may support gut integrity and adaptive capacity in antibiotic-reduced systems. This study investigated whether administration of *Ocimum gratissimum* leaf extract in drinking water could support broiler resilience under reduced medication management. Three hundred day-old chicks were brooded for seven days under standard management, including vaccination. From day 8, birds were randomly allocated to four treatments receiving 0 g (control), 50 g, 100 g, or 150 g of ground *O. gratissimum* paste per 2 Litres of drinking water (five replicates of 15 birds per treatment). Extract-treated groups received no further routine medication during the four-week trial. Welfare-relevant indicators included mortality, feed efficiency, and gut morphological parameters associated with physiological robustness. Broilers receiving 50–100 g extract demonstrated improved feed conversion ratio (1.32–1.34) compared with controls (1.56; $P < 0.05$). Mortality decreased from 2.88% in controls to 0.88% in treated groups. Villus width increased significantly (550 μm in controls vs. 838 μm at optimal dose; $P < 0.05$), indicating enhanced intestinal integrity. These findings suggest that phytogenic supplementation may strengthen physiological resilience while reducing reliance on routine pharmaceutical interventions. This is an indication that herbal water additives may contribute to more welfare-friendly and sustainable poultry production systems, although further research is warranted under commercial antibiotic-free conditions.

Welfare Practice Index predicts milk yield variation in Himalayan smallholder dairy cows

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Smallholder dairy cows in Himalayan regions experience diverse management and welfare conditions that may constrain both productivity and animal well-being. Quantifying how welfare-related practices relate to milk yield can help prioritise feasible improvements under resource-limited conditions. A cross-sectional survey was conducted on 208 lactating cows from smallholder farms in the Himalayan state of Himachal Pradesh, India, using structured welfare assessment tool to evaluate management practices across four domains: feeding, housing, health, and behaviour. Daily milk yield per cow was recorded based on farmer-reported estimates or including reference to household logbooks when available. Yield groups (low, medium, high) were formed using tertiles of the reported distribution ($n = 69-73$ per group). An overall Welfare Practice Index (WPI) was calculated from domain scores. Pearson correlations, one-way ANOVA across milk-yield groups, principal component analysis (PCA) of management items, and multivariable linear regression were used to examine associations between welfare-related practices and daily milk yield. Overall WPI was positively associated with milk yield ($r \approx 0.35$, $p < 0.001$). In multivariable regression, higher housing and health domain scores independently predicted increased milk yield (standardised $\beta \approx 0.21$ for each, $p \leq 0.003$), while feeding and behaviour scores showed weaker associations. PCA identified four clusters of welfare-related practices explaining 57.9% of variance: (1) routine care and hygiene; (2) nutritional supplementation and water access; (3) feeding system organisation; and (4) housing environment quality. In models using PCA-derived factors, the nutritional supplementation and water access cluster showed the largest positive association with milk yield, although this trend was only marginally non-significant ($p \approx 0.08$), likely due to limited sample size in the PCA-derived model ($n = 26$). Tethering (96.2%) was associated with lower housing scores and may contribute to an estimated ~ 0.9 L/day yield gap based on housing domain effects. Untethered cows (3.8%) had 18% higher housing scores and correspondingly higher yields. High-yielding cows had significantly higher WPI than low-yielding cows (15.7 ± 3.0 vs. 13.9 ± 2.2 ; $p = 0.001$). Welfare-related management, particularly housing comfort (including reduced tethering), animal health care, and reliable access to supplementary feed and water, is meaningfully associated with higher milk production in Himalayan smallholder dairy systems. Promoting low-cost interventions that improve housing, veterinary care and nutritional access may deliver concurrent gains in productivity and animal welfare.

Serotonin, temperament, and lactating dairy cow performance: Linking the autonomic nervous system and productivity

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Temperament influences productivity, health, and welfare in dairy cattle, and the autonomic nervous system (ANS), along with its serotonergic pathways, may represent a key link between behavioral and physiological traits. This study investigated the relationships among serotonin (5-hydroxytryptamine; 5-HT), the startle response (i.e., an ANS-regulated reflexive reaction to a sudden stimulus), productivity, behavior, and physiology in dairy cows managed in an automatic milking system (AMS). Lactating Holstein cows (n = 24) were observed over a 46 d period, and AMS-derived variables collected included dead milk time (DMT; s/visit), energy-corrected milk (ECM; lb/d), milk speed (MS; kg/min), milk yield (MY; kg/d), milk variability, fat: protein (FPR), Refusals (count/d), and rumination min (RUM; min/d). Drinking behaviors (drinking bouts (Bouts; count/d), milk: water, water: milk, and water intake (WI; l/d)) were recorded across the same 46 d using a commercially available bolus. A startle test was performed when the same cohort of cows reached the dry period, and behavioral reactions (Defecation (count), Freeze-like State, Jump, Post-Startle Magnitude-Activity (PSM-A), and Post-Startle Magnitude-Inactivity (PSM-I), and Startle Magnitude (SM)) were quantified. Blood samples were collected independently from the startle test for plasma 5-HT analysis. Mixed models in SAS (9.4) were used to evaluate the relationships among SM, 5-HT, production, drinking, and behavioral measures. Regression analyses were performed on key relationships, and Spearman correlations and factor analyses identified associations and latent dimensions among key variables. Startle magnitude positively affected MY ($P = 0.02$) and ECM ($P = 0.05$) and negatively influenced Refusals ($P < 0.01$). Startle magnitude tended to correlate positively with MY ($P = 0.07$) and milk: water ($P = 0.08$) and negatively with WI ($P = 0.05$). Moreover, 5-HT concentration tended to be positively correlated with SM ($P = 0.08$) and negatively with Freeze-like State ($P < 0.01$). Factor analysis identified three latent factors explaining 52.26% of the variance: 1) resource efficiency and physiology (DMT, Jump, milk: water, neutrophil lymphocyte, SM, and 5-HT), 2) AMS behavior and temperament (DMT, Defecation, RUM, Freeze-like State, and PSM-A), and 3) milking dynamics and ANS (DMT, FPR, MS, neutrophil: lymphocyte, and Jump). These findings suggest that serotonergic activity and startle responsivity may synergistically characterize multiple physiological and behavioral dimensions of temperament relevant to dairy cow welfare and productivity. Integrating behavioral and neurophysiological measures could improve assessment of resilience and coping ability in precision dairy systems.

Assessing animal welfare in Nigerian industrial farms: A case study of Ogun and Niger States

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1. Youth in Agroecology and Restoration Network

The rapid rise of industrial animal farming in Nigeria poses urgent challenges for animal welfare, public health, and sustainable livestock production. To investigate these impacts, the Youth in Agroecology and Restoration Network (YARN), a non-governmental organisation conducted a field study in Ogun and Niger states, assessing 10 industrial livestock farms representing different scales and management types. Using structured behavioral observations, housing assessment checklists, and interviews with farm managers, the study found that 80% of farms lacked environmental enrichment, 70% relied on routine antibiotic use, and most employed high-density confinement with limited veterinary oversight. These practices restricted animal movement, prevented natural behaviors, induced chronic stress, and increased susceptibility to disease. Weak regulatory frameworks and the absence of enforceable welfare standards exacerbate these risks, highlighting ethical and One Health concerns, including potential zoonotic disease transmission and antimicrobial resistance. These findings underscore an urgent need to prioritize animal welfare as a fundamental ethical, health, and sustainability responsibility in Nigeria's industrial livestock sector. The study recommends adopting comprehensive animal welfare legislation aligned with Food and Agriculture Organization (FAO) and the World Organisation for Animal Health mandatory welfare audits for industrial farms, building capacity for farm personnel, and incentivising investment in welfare-compliant systems. Strengthening welfare standards will protect animal well-being, enhance food safety, reduce public health risks, and ensure sustainable livestock production, aligning Nigeria's sector with international best practices and contributing to SDGs 3 and 12.

Assessment of knowledge, attitudes, and practices among pet owners regarding neutering and spaying of pet animals in Dhaka, Bangladesh

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1. Associate Professor, 2. MS Student

The study aimed to evaluate pet owners' knowledge, attitudes, and practices regarding the neutering and spaying of pet animals in Dhaka, Bangladesh, for designing effective interventions to address socio-economic barriers and promote sustainable pet population management. A cross-sectional survey was conducted among 152 pet owners in Dhaka, Bangladesh, ensuring geographic representation from both North and South Dhaka. For data collection, structured questions were implemented to assess sociodemographic factors and KAP variables. Responses were classified to evaluate comprehensive understanding, where quantitative scores were created to measure Knowledge, Attitudes, and Practices; these scores were divided into categories of good and poor knowledge, positive and negative attitudes, as well as good and poor practices. The analysis included the application of descriptive statistics, multivariable logistic regression to identify significant demographic determinants, and Pearson's correlation analysis to examine the linear relationships between knowledge, attitudes, and practices. This study found, revealing a predominantly young, female, and highly educated study population. The findings demonstrated high general awareness, with 96.7% of respondents familiar with the procedures and 92.8% recognizing their role in controlling the stray population, although significant knowledge gaps persisted regarding specific legal regulations and service organizations. Attitudes were largely favorable, as 85% supported the practice and 91.45% acknowledged its benefits for pet management; however, notable reservations were identified regarding cost (38.16%) and religious concerns (23.03%), which acted as barriers to acceptance. Practice levels were generally satisfactory, particularly regarding post-operative care, where 78.95% of owners consistently followed veterinary instructions, and multivariable analysis identified higher education, female gender, and longer duration of pet ownership as significant predictors of better practices. Pearson's correlation analysis revealed a significant positive relationship between knowledge and practice ($r=0.29$, $p<0.001$), while the correlation between attitude and practice was weak ($r=0.15$), suggesting that despite favorable attitudes, external barriers such as financial constraints limit practical implementation, thereby highlighting the need for targeted educational interventions and policy efforts to bridge knowledge gaps and reduce costs.

Effects of *Astragalus membranaceus* by-product on pellet quality, mold growth and resistance of Crucian carp (*Carassius auratus*) against *Aeromonas hydrophila*

Dr. Gangfu Chen*¹

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This study investigated the effects of *Astragalus membranaceus* by-product (AP) on feed quality, mold growth, fish disease-resistant ability and welfare. Seven fish diets were prepared with gradient levels of AP (0, 1.0, 2.0, 4.0, 8.0, 16 and 32 %). The Animal Care Use Committee of Neijiang Normal University has granted approval for the experimental plans. A total of 420 juvenile Crucian carp (7.17 ± 0.05 g) were randomly assigned and fed for 60 days. Results showed that AP supplementation decreased pellet hardness, and increased pellet durability index, as well as inhibited mold growth of pelleted fish feed ($P < 0.05$). Fish weight gain (WG), feed efficiency (FE), content of reduced glutathione, and the activity of anti-hydroxy radical and anti-superoxide anion, as well as enzymes such as trypsin, amylase, alkaline phosphatase, $\text{Na}^+/\text{K}^+-\text{ATPase}$, superoxide dismutase, glutathione reductase, lipase, and glutathione-S-transferase in fish digestive organs were all improved ($P < 0.05$), while malonaldehyde levels were decreased by dietary AP supplementation ($P < 0.05$). The optimal AP supplementation levels for Crucian carp were 1.02 % and 1.03 %, as determined by broken-line regression analysis of WG and FE. Furthermore, dietary AP supplementation decreased the mortality of crucian carp after challenge with *A. hydrophila* and increased lysozyme activity, and levels of total amino acids and protein in the plasma, and decreased content of ammonia, and activities of glutamate-oxaloacetate transaminase and glutamate-pyruvate transaminase in the plasma ($P < 0.05$). Our study suggested that dietary AP supplementation enhanced physical quality and inhibited mold growth of pelleted fish feed. Meanwhile, dietary inclusion of AP improved the fish growth. The favorable benefits of dietary AP on fish growth may be partially explained by the enhancement of fish digestion and absorption ability, as well as their antioxidant status. Dietary supplementation with AP enhanced non-specific immunity and antioxidant status so as to improve fish disease-resistant ability. Our study suggests that AP can be considered as a potential feed additive that improves fish welfare.

The role of applied ethology in science for animal welfare

Dr. Birte Nielsen*¹, **Dr. Huw Golledge**¹

1. Science for Animal Welfare

The science of animal welfare is a discipline that has developed greatly over time and, in the last couple of decades, affective state has been established as a core tenet of animal welfare assessment. The role of animal behaviour as an indicator of animal emotions is well known. In a recent publication in the Science for Animal Welfare (formerly UFAW) book series, titled *Assessment of Animal Welfare – a Guide to the Valid Use of Indicators of Affective State*, edited by Mason, Nielsen, and Mendl, several of the chapters each cover specific types of animal behaviour indicators for use in animal welfare assessment, including play behaviour, abnormal repetitive behaviour and vocalisations. The importance of applied ethology in the assessment of animal welfare is one of the many reasons why Science for Animal Welfare for a number of years has supported the International Society for Applied Ethology (ISAE) by funding a travel grant to the annual conference and organising events available to members of both societies. Although animal behaviour is an essential part of the assessment of animal welfare, a lot of applied ethology is not focused on animal welfare, and animal welfare science encompasses indicators and measures other than behaviour. Anyone working in ethology applied to animal welfare would therefore find it useful to belong to both the ISAE and Science for Animal Welfare (SciFAW) - two societies, who between them are covering this particular area of research. In this talk, we will present some of the many services offered by Science for Animal Welfare, including 1) possibilities for research funding; 2) *Animal Welfare* – the journal the society publishes together with Cambridge University Press; and 3) how our mentoring scheme and annual scholarships may be available to your students.

From evidence to impact: Applying animal welfare science to advance cage- and crate-free transitions globally

Dr. Vineeta Poojary*¹, **Dr. Anna Souza**¹, **Dr. Sara Shields**¹

1. Humane World For Animals

Over the past three decades, global cage- and crate-free movements have driven substantial changes in farm animal production systems. This analysis examines how scientific evidence has been integrated into advocacy strategies to accelerate legislative reform, stakeholder engagement, and production system transitions. Early research on farm animal behavior enhanced understanding of hen and pig welfare, strengthening the case for shifting housing systems and influencing public policy. This evidence-based advocacy work has contributed to legislative change in multiple jurisdictions, resulting in partial or full bans on cages and gestation crates. Across the globe, countries have initiated phaseouts of confinement systems, improving the lives of millions of animals every year. Several countries including Bhutan, Switzerland, the United Kingdom, France, Germany, Denmark, Luxembourg, and Austria have enacted legislative bans or gradual phaseouts of both conventional cages as well as furnished/enriched cages for hens. Several U.S. states have banned cages, and some have further banned the sale of eggs from caged hens. In Brazil, a normative effective in 2045 will require group housing for sows, limiting the use of gestation crates. In parallel, structured engagement with producers and supply chain actors has supported systems change, with major food companies committing to source exclusively cage-free eggs and crate-free pork and driving the market shift. The number of hens in cage-free systems is growing: the United States is over 45% cage-free and Europe is over 60% cage free. On-farm transitions further demonstrate improvements in key welfare indicators following conversion to cage- and crate-free systems. Beyond regulatory and industry metrics, civil society awareness has expanded considerably. Public opinion surveys in multiple regions show growing concern for farm animal welfare. This along and scientific backing has helped advocates around the world to convince approximately 2,000 private companies to make pledges to purchase only eggs from hens kept cage free or pork originating from sows in group housing systems, which has shifted supply chains and made tangible differences in the lives of farm animals. As more studies are conducted on optimizing these alternative production systems, acceptance by the conventional industry increases, enabling large-scale transformative change propelled by scientific evidence and crate-free systems-scale transformative change. All of this illustrates how animal behavior and welfare research can function as an applied science, generating not only knowledge but also actionable frameworks for systemic change. Strengthening collaborations between researchers, advocates, and industry stakeholders is essential to sustaining evidence-based progress in global farm animal welfare.

A five-realms framework for animal welfare

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1. National Chung Hsing University

Animal welfare science is increasingly recognizing the importance of animals' subjective experiences alongside traditional health, production, and behavioral measures. There are many animal welfare frameworks for conceptualizing, defining, categorizing and assessing welfare of animals. However, current welfare frameworks tend to consider the factors affecting animal welfare in isolation and do not explicitly capture the integration of multiple systems or the dynamic feedback processes through which they influence welfare. In this conceptual study, we critically review existing animal welfare frameworks, evaluate their strengths and limitations and propose a new integrative animal "Five Realms" framework for animal welfare. The proposed "Five Realms" framework comprises (1) Sensory Input, (2) Physiology and Health, (3) Microbiota, (4) Cognitive-Affective State, and (5) Behavior. This framework reconfigures existing models by explicitly integrating external sensory factors, internal physiological and health states, and microbiota as co-determinants of an animal's cognitive-affective experiences, which in turn drive behavioral responses, individual behaviors and interactions with conspecifics and the environment. Importantly, behavior is not treated as a passive outcome but as an active process that feeds back to the first three Realms that can either promote or undermine welfare over time. We discuss how these five Realms interact dynamically and bidirectionally, drawing on evidence from affective neuroscience, animal cognition, physiology, and emerging microbiome research. We further propose a conceptual model wherein sensory, internal physiological, and microbiota-related processes jointly shape cognitive-affective states that motivate behavior, creating feedback loops that can either promote or undermine welfare over time. By incorporating microbiota as a distinct yet interacting biological realm, this framework reflects recent advances in animal science and acknowledges the growing evidence for microbiota-gut-brain interactions in shaping health, cognitive and emotional processing, and behavior. Overall, this review offers a timely and conceptually rigorous contribution to animal welfare science. The proposed framework aims to fill gaps in current welfare assessments by improving integration across biological and psychological processes, thereby enhancing our understanding of animal affective states. This project was supported by National Science and Technology Council, R.O.C. (grant no. NSTC 114-2313-B-005 -049 -MY3).

Behaviour and welfare: Studies towards a sustainable future

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1. Cambridge University

Behaviour studies play an important part in assessing many of the components of sustainability, of which welfare is of particular importance. Scientific measures should be used as the basis for scoring each of the sustainability components of systems of production and other human activities. Behaviour is involved in the following areas. (1) Measuring cognition, awareness and feelings in order to find out which individuals are sentient. (2) Measuring pain and other aspects of poor and good welfare, e.g. grimace scores indicating pain in humans, farm, companion and laboratory animals. (3) Evaluating responses to restriction, e.g. trapped, snared, or closely confined animals. (4) Identifying behaviour disorders and their causes in humans, farmed, companion and laboratory animals. (5) Assessing strength of choice in relation to water usage. (6) Assessing strength of choice in relation to what food should be available and how to avoid land degradation. (7) Assessing strength of choice in relation to space for movement and particular activities. (8) Assessing strength of human consumer choice of products relevant to biodiversity loss, welfare of production animals, efficiency of use of world resources, carbon footprint or other pollution impacts. (9) Assessing emotional state using judgement bias methodology. (10) Assessing human attitudes e.g. to waste of food, recycling, non-target marine and land animals, 'pests', small animals. (11) Identifying and assessing previous behaviour using welfare outcome indicators. Recent examples of some of these areas of work will be described.

Farmers' awareness, perceptions, and on-farm management practices related to dairy cow lameness in smallholder dairy systems of Bangladesh

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Lameness is a major welfare and productivity problem in dairy cattle, but its control in smallholder systems largely depends on farmers' awareness, perceptions, and on-farm practices. This cross-sectional questionnaire study evaluated dairy farmers' knowledge of lameness, their perceptions of its impacts, and their current management and prevention practices in a major milk-producing area of Bangladesh. The study was conducted in Shahjadpur upazila, Sirajganj district, between July 2022 and June 2023. A total of 270 dairy farmers from 60 MilkVita Society-affiliated small- to medium-scale farms were interviewed through face-to-face administration of a structured, pre-tested questionnaire. Farmers' knowledge was quantified using a composite score based on 10 key items (causes, early signs, risk factors, impacts, and prevention) and categorized as low (0–4), moderate (5–7), or high (8–10). Associations between knowledge level and socio-demographic variables were examined using chi-square tests. Overall, farmers' knowledge of lameness was mainly low to moderate: 43.7% had low knowledge, 38.5% had moderate knowledge, and only 17.8% demonstrated high knowledge. Specific gaps were evident in recognition of early clinical signs (25.2%), understanding of major risk factors (35.6%), and knowledge of preventive approaches such as hoof trimming and hygiene (18.9%). While all farmers (100%) agreed that lameness causes pain, most did not associate it with reduced milk yield (74.8% disagreed) and relatively few regarded it as an important animal welfare concern (23.3% agreed). Awareness of key preventive concepts was limited; only 28.1% believed early detection was possible and 19.6% recognized hoof trimming as important for prevention. Higher knowledge was significantly associated with education level ($p = 0.005$), prior training on cattle health ($p < 0.001$), larger herd size ($p = 0.016$), and longer farming experience ($p = 0.045$). Lameness was managed largely through informal and reactive approaches: 82.48% of cases were treated by farmers themselves or local quacks, and only 17.52% involved qualified veterinarians. Although analgesics/anti-inflammatory drugs and antiseptic hoof washes were commonly used, formal training, routine preventive measures, and record keeping were entirely absent, and farmers reported that lame cows were not treated immediately. These findings indicate substantial knowledge and practice gaps and suggest that lameness remains under-recognized as a welfare and productivity issue in Bangladeshi smallholder dairies. Strengthening farmer-focused training, expanding veterinary extension services, and promoting practical low-cost prevention strategies are essential to improve dairy cow welfare and farm performance.

Effect of staggered single-entry of freshly calved water buffaloes into resident lactating buffaloes on their circadian ingestive and resting behaviours

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Direct introduction of freshly calved buffaloes into established milking group triggers intense agonistic interactions that disrupt circadian ingestive and resting behaviours, compromising welfare and productivity. Circadian patterns serve as sensitive stress indicators during social reorganization. Staggered introduction strategies may mitigate this social shock, enhancing animal well-being and farm efficiency. This study evaluated staggered single-entry effects on circadian ingestive and resting behavioural patterns in freshly calved water buffaloes during their integration into established resident lactating group. Eighty-two Murrah buffaloes, stratified by parity (primiparous: n=44; multiparous: n=38), were randomly assigned post 5-day colostrum period to two regrouping protocols within loose-housed resident group (69-117 animals) with standard rations (ICAR, 2013) and continuous water access. Control (T0; 22 primiparous, 22 multiparous) underwent direct full-time introduction on day 1. Treatment (T1; 19 primiparous, 19 multiparous) received staggered single-entry: 2, 4, 8 h exposure to resident group on days 1-3, respectively, returning to identical separate housing; full integration from day 4. Circadian behaviours—ingestive and resting were quantified via continuous close-circuit television cameras for 10 days, then alternate days to 60 days. Significance of difference in means of experimental variables were analysed using two-way ANOVA (parity × treatment) using SPSS 22.0. Staggered-entry (T1) buffaloes displayed enhanced ingestive patterns than T0, with overall feeding time ($P<0.05$) 333.84 ± 5.10 vs. 301.18 ± 4.88 min/d and feeding frequency 8.10 ± 0.41 vs. 6.38 ± 0.32 bouts/day (primiparous: $314.02\pm5.81/7.86\pm0.46$ vs. $287.02\pm4.06/6.48\pm0.35$; multiparous: $353.65\pm4.39/8.35\pm0.36$ vs. $315.34\pm5.69/6.29\pm0.30$) ($P<0.01$). Rumination time remained similar (373.97 ± 11.69 vs. 379.84 ± 8.70 min/d), but lying rumination time favoured ($P<0.05$) staggered entry (257.04 ± 9.09 vs. 231.57 ± 9.06 min/d; primiparous 239.09 ± 12.78 vs. 216.43 ± 12.21 ; multiparous 275.00 ± 12.39 vs. 246.71 ± 13.09 min/d), alongside modest frequency gains (10.31 ± 0.29 vs. 9.93 ± 0.27 bouts/d). Drinking time increased ($P<0.05$) (11.76 ± 0.94 vs. 8.55 ± 0.14 min/d; primiparous 13.52 ± 0.23 vs. 10.32 ± 0.33 ; multiparous 12.41 ± 0.57 vs. 11.66 ± 0.71 min/d), though overall drinking frequency (T1 vs. T0) was 8.86 ± 0.66 vs. 10.30 ± 0.61 bouts/day (day 1: 7.26 ± 0.57 vs. 4.61 ± 0.11 ; day 60: 6.42 ± 0.21 vs. 11.16 ± 1.08 bouts/d). Resting behaviours improved markedly ($P<0.01$): lying time 585.65 ± 6.22 vs. 517.52 ± 17.76 min/d (primiparous 536.74 ± 7.18 vs. 481.82 ± 23.93 ; multiparous 634.56 ± 8.09 vs. 553.22 ± 24.73 min/d), rising from day 1 (388.66 ± 3.31 vs. 344.36 ± 0.89) to day 60 (671.90 ± 11.69 vs. 618.57 ± 26.07 min/d); standing time decreased ($P<0.01$) (387.34 ± 12.74 vs. 418.48 ± 6.90 min/d; multiparous 379.08 ± 15.89 vs. 443.77 ± 9.64 min/d); loafing reduced (48.60 ± 1.27 vs. 53.94 ± 1.47 min/d; multiparous 48.64 ± 1.30 vs. 59.15 ± 1.55 min/d). In conclusion, staggered single-entry markedly enhanced circadian ingestive and resting behaviours in freshly calved buffaloes, promoting extended feeding/lying durations, reduced standing/loafing, and minimized regrouping stress across both primiparous and multiparous buffaloes.

Anticipating futures in applied ethology and animal welfare science: Exploring key uncertainties across contexts

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Animal welfare science has traditionally focused on assessing current conditions and improving management practices. Applied ethology, through the systematic study of behaviour in human-managed and human-influenced systems, has provided the empirical foundation for understanding animals' behavioural needs, adaptation and responses to environmental constraints. However, accelerating global changes—including technological innovation, climate change, shifting societal values, regulatory transformations and evolving human–animal relationships—are reshaping the contexts in which animals live and interact with humans. To remain relevant and proactive, the field must cultivate greater situational awareness of emerging disruptions, opportunities and structural uncertainties. These forces may redefine animal welfare and the behavioural questions that guide applied ethology in the coming decades. This interactive workshop invites participants to collectively explore plausible futures for different animal–human systems through structured futures-thinking approaches. Drawing inspiration from methodologies in the social sciences, design and the arts, the session aims to open space for diverse voices, perspectives and value systems. Creative and anticipatory approaches can help unpack complex problems, illuminate implicit assumptions and make underlying ethical tensions more tangible. Foresight requires imagination; by systematically engaging with uncertainty, participants can move beyond incremental thinking and explore transformative possibilities. During the 45-minute session, attendees will be divided into small interdisciplinary groups, each focusing on a specific scenario: companion animals, working animals, farm animals, research animals, free-living wildlife, and wild animals under human care. Guided by prompting questions, each group will identify key uncertainties and drivers of change affecting their scenario (e.g., technological developments, socio-economic shifts, governance changes, cultural transformations). Participants will then briefly outline contrasting future scenarios based on combinations of the most impactful and uncertain factors. A shared digital board will allow real-time visualization of emerging themes across groups. The workshop aims to: (1) identify key uncertainties and drivers of change shaping different animal–human systems; (2) explore how these factors may redefine research priorities and expose critical knowledge gaps in applied ethology and animal welfare science; and (3) generate forward-looking, interdisciplinary research questions and opportunities for collaboration. By creating a structured yet imaginative space to think beyond current paradigms, this session seeks to inspire participants to integrate anticipatory thinking into research, policy and practice. In doing so, it contributes to a more forward-looking, globally informed and ethically reflective research community. One that is better equipped to anticipate, rather than merely respond to, change.

Behaviour, body language, buckets and bananas: How to and how not to assess animals' affective states.

*Dr. Lucy Oldham*¹, Prof. Cathy Dwyer¹*

1. SRUC

Assessing animals' affective states is central to animal welfare science, yet designing and applying reliable measures and accurately interpreting the results brings many challenges. Intrepid ethologists setting out to measure affective state face the danger of constructing an elegant experimental set-up after reading an influential paper, only for the study subjects to break it, run away or produce bizarrely conflicting results. Even seemingly overt and simple measures of emotion such as vocalisation and approach/ avoidance require care to avoid misinterpretation. As an international society, we cannot publish every practical detail of our methods, and the store-cupboards full of hand-made first attempts, from guillotine gates to traffic cones, may never see the light of day. This highlights the importance of sharing our expertise with others who can benefit from our trial-and-error learning. In this workshop, we will share experiences to help us all navigate the mountain-pass of experimental design, resulting in more robust studies and a clearer view of what animals are telling us about their inner lives. Drawing on examples of tests designed to measure different aspects of animal's emotional lives (e.g. preference, mood, motivational conflict, behavioural needs, arousal, behavioural expression) we will address key themes such as ecological relevance, pseudo-replication and construct validity, but will focus mostly on practical aspects of test design and interpretation. We will consider testing animals in isolation or versus groups, the presence of handlers or owners, the benefits and downsides of automation, and the importance of pilot testing, among many factors affecting experimental outcomes. The workshop will be interactive, with short, focused presentations and video clips covering experiences with a variety of managed animal species, structured small-group discussions and voluntary sharing of experiences across different species and tests. Participants will be invited in advance to optionally contribute brief video clips or examples of successful outcomes and cunning designs to overcome methodological constraints. We will also draw on the collective experience in the room to compile a "top tips" list for affective state measurements. We will signpost useful reviews and resources and discuss the value of open repositories of protocols to improve reproducibility and comparability across laboratories and species. The goal of the workshop is to encourage constructive, open dialogue and to share practical tools for designing, evaluating and interpreting studies of animal affective state.

Exploring opportunities for behavior to support the convalescent veterinary patient

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1. Iowa State University

Convalescence refers to recovery from illness, trauma or surgery, and provision of evidence-based care is hampered by proxy assessment in veterinary patients. Whereas guidance for pain management and euthanasia decisions continue to develop in veterinary protocols and education, broader concepts relevant to the convalescent patient have received little attention. The overall objectives of this workshop are: (1) to explore opportunities to apply behavior to inform animal care protocols for the convalescent veterinary patient, (2) identify gaps in the scientific literature where further research is warranted. The format of the workshop will include a brief overview of pertinent scientific literature and husbandry guidelines. Participants will be split into groups to discuss veterinary case presentations across four categories of human-animal interaction: human companionship, food supply, biomedical research and wildlife conservation. Groups will be tasked with identifying opportunities and challenges associated with applying behavior to strengthen care, convalescence and welfare of the patient(s). Participants will discuss group findings to identify scientific evidence available or needed to support these recommendations. At the end of this workshop, participants will achieve greater understanding of principles of sickness behavior, pain and convalescence, appreciation for ethical and logistical considerations associated with categories of veterinary patients, and approaches for obtaining scientific evidence to inform veterinary and nursing care protocols. Key applied ethology research priorities will be identified to inform and strengthen evidence-based care of the veterinary patient.

Implementation of the 3Rs: National and international perspectives

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1. Charles River, 2. Tata Memorial Centre, ACTREC, 3. CSIR-Institute of Genomics & Integrative Biology, 4. Indian Institute of Science

The principles of Replacement, Reduction, and Refinement (3Rs), first proposed by Russell and Burch in 1959, remain the foundational ethical and scientific framework for the humane use of animals in research, education, and testing. This workshop will examine the implementation of the 3Rs from both national (Indian) and international perspectives, highlighting regulatory frameworks, practical challenges, successful change management strategies, and emerging opportunities for advancing animal welfare while maintaining scientific excellence. In India, the implementation of the 3Rs is governed by the Prevention of Cruelty to Animals Act, 1960, and operationalized through the Committee for the Control and Supervision of Experiments on Animals (CCSEA). Over the past three decades, CCSEA has significantly strengthened institutional oversight, laboratory animal care standards, and the adoption of alternatives. The Institutional Animal Ethics Committee (IAEC) serves as the primary mechanism for protocol review, ensuring that animal use is justified, minimized, and conducted with the highest standards of refinement. IAECs evaluate scientific merit, ethical considerations, and adherence to the 3Rs, mandating appropriate experimental design, biostatistics, and humane endpoints. The Replacement pillar has gained momentum with the availability of human cell-based systems, induced pluripotent stem cells (iPSCs), organoids, organ-on-chip technologies, computational modelling, artificial intelligence, and other New Approach Methodologies (NAMs). However, widespread adoption faces challenges related to validation, infrastructure development, training, and regulatory harmonization. Reduction strategies are supported through robust experimental design, data sharing, and optimized colony management. Refinement efforts focus on improved housing, husbandry, environmental enrichment, veterinary care, pain management, and personnel training—areas where CCSEA guidelines have driven measurable progress. Despite these advances, implementation in India encounters practical hurdles including resource variability across institutions, varying levels of awareness, and the need for sustained capacity building. Laboratory animal veterinarians and IAEC members play pivotal roles in bridging regulatory compliance with on-ground welfare improvements. This workshop will review the evolution of CCSEA's contributions, compare Indian practices with global benchmarks, and discuss strategies for integrating NAMs into biomedical research without compromising scientific rigor. A compelling case study will be presented on the transition from traditional tail handling to refined handling of mice and rats. This large-scale change initiative utilized structured change management frameworks, specifically the Prosci ADKAR model (Awareness, Desire, Knowledge, Ability, Reinforcement) and the Results Pyramid approach. These frameworks guided a systematic, value-driven rollout. Participants will gain deeper understanding of 3Rs implementation strategies, exposure to proven change management frameworks, knowledge of Indian and global regulatory landscapes.

Non-invasive infrared thermography as a tool for assessing emotion and productivity in dairy cows

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Behavioural laterality, or side preference when passing a threat, is used to assess cows' emotional states. Cows passing an unfamiliar person in the lane to their right often show more anxiety-related behaviours (raised or tucked tail, sniff the ground, walk slowly, and exit more quickly when released from a crush) than those passing to the left. However, this approach of estimating behavioural laterality is time consuming, labour intensive, and potentially stressful for the cows. Infrared Thermography (IRT) detects heat emissions from body surfaces, with these emissions reflecting changes in blood flow due to emotional state. We hypothesised that higher IRT readings on key body regions would be associated with cows displaying more anxious behaviour (right side passing, or R cows) and reduced milk yield. In the first experiment, we assessed 31 cows for a month. These cows were determined as 15 extreme left side passing (L cows, less anxious) and 16 extreme right side passing (R cows, more anxious) cows in a series of studies. Cow behaviours were recorded during a forced lateralisation test as they exited the milking parlour towards their feeding area for 10 consecutive days. We captured infrared images of the cows' heads and forelimbs during milking, alongside daily milk production records for six consecutive days. Results showed that R cows had higher IRT readings at the eyes and forelimb coronary bands, supporting our hypothesis. Maximum IRT values, rather than averages, were more strongly predictive of anxious behaviours and milk production. Statistical analysis indicated that reliable group estimates could be made with 14-16 cows sampled over two days or 10-12 cows over three days. A second experiment involved 50 cows monitored over three months/periods by the forced lateralisation test, Infrared Images, and milk production as outlined the time frame of the first experiment, and addition of flight speed and crush score measures of those cows for 2 days in each period, also considered confounders: days in milk and temperature-humidity index carefully. This study found positive associations between IRT, anxious behaviours, and rectal temperature, but IRT measures generally outperformed rectal temperature in predicting behavioural and productive outcomes. No strong link was found between IRT and laterality index in this broader sample, but IRT of the eyes and limbs, as well as behavioural measures like flight speed and waiting time, were found to be repeatable. Future research should examine the relationships among IRT, waiting time, and oxytocin levels.

Individual piglets identification based on dorsal keypoint detection during behavioral tests

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Computer vision has been used for automatically assessing behavior, health and productive indicators through precision livestock farming (PLF) applied at herd-level. To fully leverage this data, continuous individual identification is required for animal-level monitoring. However, individual identification is challenging for uniform, solid-colored animals such as pigs. Individual identification through anatomical keypoints is a promising alternative. By measuring the geometric relationships (normalized distances and angles) between rigid body prominences, the model captures the unique structural proportions of each individual. Therefore, the objective of this proof-of-concept study was to explore the viability of an individual identification system for piglets based on dorsal keypoint detection and static geometric features. The proposed framework consists of two sequential parts. First, video recordings of piglets in nursery phase (age between 35 and 45 days) in an open arena behavioral test were labeled to train a pose estimation model using the software DeepLabCut. A keypoint was annotated in the head, neck, scapular right/left, thoracic, middle, lumbar, pelvic right/left, and rump whenever it was visible in the image. The model, based on a ResNet-50 architecture initialized with pre-trained ImageNet weights, achieved a root mean square error (RMSE) of 10.34 pixels and a Mean Average Precision (mAP) of 83.38%. In the second phase, the pose estimation model was deployed to extract tracking coordinates. To ensure geometric stability, a dual-threshold temporal smoothing pipeline was applied. Only frames maintaining a strict keypoint confidence threshold of >85% were retained. To overcome the confounding effects of some features, dimensionality reduction was performed to isolate ten core structural features, calculated using normalized distances and angular cosines between the rigid mid-to-lower dorsal keypoints. A final balanced dataset of 3,750 high-confidence frames across 16 piglets was used to train a Multilayer Perceptron (MLP) model with Triplet Loss. To evaluate the model's ability to recognize these specific individuals, frames from all 16 piglets were present in both the training and testing sets, with strict separation ensuring no overlapping frames between the two. The identification model achieved an accuracy of 90.53% on the testing set in a closed-set scenario, demonstrating the viability of 2D pose estimation as a proof-of-concept for piglet identification. However, because this initial assessment utilized a relatively small dataset, future work must validate the approach on larger populations. Additionally, longitudinal testing is required to determine if the model can robustly identify individuals as their structural biometrics alter with growth.

What can sound analysis of broiler chickens vocalizations tell us?

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1. Poulpharm, 2. Ghent University, 3. Vetworks, 4. ILVO

Acoustic monitoring has been suggested as a promising non-invasive approach for monitoring the health and welfare of broiler chickens. However, careful selection of target vocalizations, proper validation and testing in different setups are essential for correct interpretation. The present work addressed a sequence of aims: (1) to systematically identify chickens vocalizations reported in the literature using sound analysis; (2) to select call types that are well characterized in literature to reliably develop and validate a convolutional neural-network recognizer; (3) to explore unsupervised clusters of potential new call types beyond the vocalizations selected in the previous step; (4) to analyze the effects of key diseases (coccidiosis, infectious bronchitis, and reovirus) on vocal patterns across age in a small-scale setup (11 birds/pen), four rounds were conducted (44 Ross 308/round; 11 broilers/microphone); and (5) to quantify age-related patterns of the selected vocalizations and changes under heat stress in a medium-scale setup (140 birds/pen) with experiments comprising three rounds (560 Ross 308 per round; around 70 broilers/microphone). Experiments were approved by the Ethics Committees of the Flemish Research Institute for Agriculture, Fisheries and Food (ILVO; Belgium; 2022/414) and Ghent University (Belgium; 2023-084). Statistical analyses (for goals 4 and 5) were conducted using least-squares linear regression and Tukey's HSD for post hoc comparisons. The results of the aforementioned aims are: 1) The review identified 17 different types of vocalizations. 2) Four vocalizations were selected for automatic detection: short peeps (SP, related to activity level), distress calls (DC, related to stress), warbles (W, related to somnolence), and pleasure notes (PN, related to positive state). The recognizer achieved 87.9% balanced accuracy with limited confusion. 3) Clustering indicated 10 potentially novel types of vocalizations. 4) No significant effects of disease challenges were detected on the occurrence of the 4 vocalizations (all $p > 0.05$). However, age differences in vocalization patterns were observed: PN and SP were higher in the first week, whereas DC and "other sounds" increased over time, and W were rare. 5) No change was observed under high environmental temperature ($p > 0.05$). However, similar age-related patterns to the previous study were observed. No changes in the four vocalization types were observed under the challenges, suggesting limited suitability for detecting these aversive conditions by simply monitoring their occurrence, while subtle within-type vocal differences require further investigation. However, age-patterns were consistent across setups, providing baseline references, and the increase in "other sounds" suggests additional vocal patterns remain to be explored.

A deep learning system for automating head direction annotation in ungulates

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Behavioural paradigms that assess looking time hold significant potential for investigating cognitive processes and welfare states in farm animals, particularly through attention bias tasks. However, the subsequent data analysis typically relies on laborious manual annotation, creating a significant bottleneck for scalability. In this study, we present a Deep Learning-based system to fully automate the annotation of head direction in dwarf goats (*Capra aegagrus hircus*) in an experimental looking-time paradigm. In this setup, the looking direction is classified as 'Left Screen' or 'Right Screen' (where visual stimuli are presented) and a neutral state defined as 'No Screen'. Our system utilises computer vision to detect key facial features (eyes, nose, and horns) and calculates a looking direction vector based on their geometric relationship. To address lateral eye placement and occlusion, we integrated a fallback mechanism utilising horn position to estimate gaze when eyes are not visible. We evaluated three object detection architectures: a one-stage detector (YOLOv8-Medium), a two-stage Faster R-CNN with a ResNet-101 backbone, and a two-stage Faster R-CNN with a Vision Transformer (ViT) backbone. Models were trained and validated on 3,500 frames extracted from 3 video sessions involving 6 animals (80/20 split), and evaluated on a manually annotated test set of 2,566 frames from 5 independent sessions involving 8 different animals that were not part of the training or validation sets. To account for ambiguous edge cases, manual ground-truth coding followed established protocols with high inter-observer reliability (Pearson's $r = 0.96$). The ViT-based model achieved the highest global accuracy (90.2%; 95% CI: 89.1-91.3%), substantially outperforming YOLOv8-Medium (81.7%; 95% CI: 80.2-83.2%) and ResNet-101 (80.8%; 95% CI: 79.2-82.4%). Crucially, ViT demonstrated superior reliability with F1-scores ranging from 0.873 to 0.962 across classes, compared to 0.784-0.870 for YOLOv8 and 0.781-0.858 for ResNet-101. While the 'No Screen' class proved the most difficult to predict across all architectures (Precision: 0.69-0.78), the ViT model minimized false positives, achieving near-perfect precision for 'Left' (0.997) and 'Right' (0.993) looking directions. These results indicate that the Vision Transformer's attention mechanisms, which capture global context rather than local features, are significantly more effective for pose estimation in ungulates than traditional CNN baselines. We demonstrate that automated computer vision systems can achieve high reliability in unconstrained animal settings, drastically reducing analysis time for robust animal welfare research.

Human perceptions of coexistence with Sri Lankan leopards (*Panthera pardus kotiya*) across multiple landscapes

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Human-leopard interactions are increasing across Sri Lanka's human-dominated landscapes as habitat loss, fragmentation, and prey depletion drive leopards to use agricultural and plantation mosaics outside protected areas. While most ecological studies have focused on protected areas, limited information exists on distribution, interactions, and social dimensions of coexistence in multi-use landscapes. Using a large-scale citizen science approach, this study documents leopard occurrence, patterns of interaction, and stakeholder perceptions across six regions of Sri Lanka to inform locally tailored conflict-mitigation strategies. Between August 2022 and April 2024, 1,029 semi-structured interviews were conducted with government field officers (Department of Wildlife Conservation and Forest Department) and residents from areas with confirmed or suspected leopard presence; 1,005 valid questionnaires were analyzed. In addition, occurrence and incident data were compiled through opportunistic observations and monitoring between August 2022 and March 2025. Overall, 72.9% of field officers confirmed the presence of leopards outside protected areas, and 75.5% of residents acknowledged leopards in their neighborhoods. Domestic animal predation was the most frequently reported interaction by the officers: (37.9% dog predation, 31.7% livestock predation), whereas reports of human injury encountered were comparatively low (officers: 10.3%; residents: 8.9%). Perceptions of leopards varied spatially. Across regions, 42.9% of respondents considered leopard presence a threat, while others recognized ecological or economic value. In high-interaction landscapes, particularly tea-estate and forest-edge mosaics, over 70% of respondents reported increased leopard use of human-dominated areas over time, often attributing this to declining prey and habitat availability. Knowledge of precautionary measures was uneven, with many respondents relying on reactive deterrents, while fewer identified habitat protection, waste management, or improved animal husbandry as long-term solutions. Despite concerns, willingness to support initiatives that improve public safety and leopard conservation was high (90.3%). Our findings indicate strong potential for coexistence if mitigation prioritizes community awareness, predator-proof livestock and dog management, rapid response to incidents, and targeted interventions in spatially identified high-risk zones. Treating multi-use landscapes as critical conservation space is essential for sustaining *Panthera pardus kotiya* in Sri Lanka.

Understanding reward preferences in Indian free-ranging dogs

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Reward preferences have been widely studied in companion dogs, yet remain largely unexplored in free-ranging dogs (FRDs) that constitute around 80% of the global dog population. They inhabit human-dominated environments without direct human supervision, despite relying primarily on human-generated waste for sustenance. This study investigated reward preferences in Indian FRDs to understand how different incentives influence dog-human interactions. We first examined the effects of five reward types using a between-subjects design during single, short-term interactions with unfamiliar humans: high-value food (chicken), low-value food (biscuits), petting, human gaze, and passive human presence. Motivation was assessed in 150 adult FRDs from West Bengal, India, using a between-subjects design. Measures included reward acceptance rate, approach latency, proximity duration, and affiliative behaviour, quantified through Socialization Index (SI). Next, we did another experiment to evaluate reward preference stability over time in 61 adult FRDs through repeated interactions. Only chicken (high-value food) and petting were selected. During a five-day familiarization phase, two unfamiliar individuals consistently provided either food (chicken) or petting. Choice tests were conducted following the familiarization phase from Day 1 to 5 and then from Day 6 to 10. High-value food (chicken) elicited the strongest reward-acceptance behaviour (cumulative link model) and sustained proximity (beta regression), indicating its potency as a short-term motivator. Petting produced higher SI scores (cumulative link model), reflecting greater affiliative engagement, but showed signs of faster satiation. Human gaze functioned as a subtle reinforcer, maintaining attention longer than passive presence alone. Repeatability experiments showed patterns similar to the short-term interaction results. On Day 1, the food provider was chosen above chance ($\chi^2 = 5.00$, $p = 0.025$). However, from the second day onward, preferences between food and petting provider did not differ from chance. Overall, while high-value food serves as a stronger short-term motivator, repeated interactions involving either food or petting appear equally effective in fostering positive social associations. These findings indicate that FRDs prioritise energy acquisition consistent with optimal foraging strategies, yet retain behavioural flexibility to form social bonds with unfamiliar humans. By studying dogs in their natural ecological context, this research provides novel insights into how non-owned dogs evaluate food and social rewards over time, challenging the assumption that food is universally the dominant motivator and highlighting the adaptive value of social interaction. This study suggests that small food rewards and consistent social interaction can build trust in free-ranging dogs, reduce dog-human conflict and support coexistence.

Predictable resource pulses alter space use and behavioural budgets of free-ranging dogs at public fairs

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Seasonal fairs generate predictable, short-term pulses of human activity and anthropogenic food resources that may reshape free-ranging dog (FRD) aggregation and behaviour in crowded public spaces. Across 14 fairs in West Bengal, India (sampled in two winter–spring phases, December–March, 2021–22 and 2022–23), we examined how human flux and resource availability influence FRD abundance, space use, and behavioural budgets, with relevance to managing human–dog interactions and welfare risk. Each fair was sampled on three randomly selected days, with three sessions per day (initial 16:30–18:00, middle 20:00–21:30, end 22:30–00:00). Using spot census and video-based scan sampling (~2 scans/min), we recorded GPS locations, sex/life stage, and instantaneous behaviours; human flux was quantified as people/min at ≥ 3 locations per session, and resource points were mapped. We sampled 167 unique dogs. Human activity varied strongly across sessions (Kruskal–Wallis: $\chi^2 = 59.29$, $df = 2$, $P < 0.001$), peaking in the middle session (85.09 ± 38.84 people/min) compared with initial (29.09 ± 18.73) and end sessions (19.84 ± 7.89). Dog abundance also differed by session ($\chi^2 = 6.27$, $df = 2$, $P < 0.05$), peaking in the end session (7.63 ± 5.06 dogs) versus initial (5.44 ± 3.99) and middle (5.02 ± 3.68). Dogs remained closer to resources than to the fair periphery (resource: 10.69 ± 15.08 m; periphery: 29.43 ± 19.41 m; Wilcoxon: $V = 11972$, $P < 0.001$), and resource availability positively predicted dog abundance (Gamma GLM: $t = 3.577$, $P < 0.001$). Behavioural budgets were dominated by foraging (0.44 ± 0.22), gait (0.14 ± 0.09), and vigilance (0.14 ± 0.08) (Kruskal–Wallis: $\chi^2 = 279.46$, $df = 6$, $P < 0.001$); vigilance increased across sessions ($\chi^2 = 11.91$, $df = 2$, $P < 0.01$). Dogs from distant territories (>150 m) were under-represented at fairs ($\chi^2 = 30.52$, $df = 2$, $P < 0.001$) and showed lower attendance consistency (e.g., CLMM day-level consistency: $Z = -4.857$, $P < 0.001$). Together, these results show that FRDs exploit transient resource pulses while shifting attendance away from peak human flux. Dogs prioritised foraging over territorial behaviour, suggesting that predictable resource pulses can temporarily reduce territorial defence and attract dogs from beyond nearby territories—an important consideration for managing aggregation, welfare risk, and human–dog interactions at public events. Methods were non-invasive and conformed to ISAE Ethical Guidelines.

Breed and feedlot phase shape feeding behaviours in steers: Insights from beef-on-dairy and Holstein cattle

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Although beef-on-dairy (BxD) systems are expanding, differences in feeding behaviour between BxD and dairy cattle remain unclear. This study compared feeding behaviours in Holstein and Angus×Holstein steers during the feedlot period. Forty steers (20 Holstein, 20 Angus×Holstein) were monitored during the growing (13-32 wk) and finishing (33-56 wk) phases. Individual feeding behaviours, including feeding (intake>0 kg) and non-feeding (intake=0kg) visit frequency, meal criterion (the maximum interval between feeding-visits considered part of the same meal), meal size, and dry matter intake (DMI/%BW), were recorded using automated feeders (10 steers/pen, mixed pens). Data were aggregated to weekly means per animal and analyzed in RStudio using mixed-effects models, with BW, breed, age, and pen as fixed effects and animal as a random effect. Meal criterion differed between breeds during the growing phase, with BxD steers showing a greater meal criterion than Holsteins (19.7 ± 1.90 vs. 13.7 ± 1.32 min), whereas no breed effect was observed during finishing ($P=0.10$). BW did not affect the meal criterion for either phase. During growing, Holsteins had more feeding visits than BxD steers (31.8 ± 1.42 vs. 37.7 ± 1.67 visits/d; $P=0.01$), with no effects of age or BW. In finishing, feeding visits were not affected by breed or age, but decreased with BW ($P < 0.01$). Holsteins also had more non-feeding visits in both phases (growing: 17.8 ± 1.33 vs. 11.8 ± 0.89 visits/d, $P < 0.01$; finishing: 3.03 ± 0.30 vs. 1.68 ± 0.18 visits/d, $P < 0.01$). Non-feeding visits decreased with age in growing ($P < 0.01$) and with BW in finishing ($P < 0.01$). Meal size showed a breed*age interaction during growing, with BxD steers consuming larger meals from wk 19 onward (all $P \leq 0.04$). A similar interaction was observed during finishing ($P < 0.001$), with BxD consuming larger meals in wk 35–39 and 41–42 (all $P \leq 0.04$). BW negatively affected meal size in growing ($P=0.01$), but positively in finishing ($P < 0.01$). During growing, BxD steers had greater DMI/%BW in wk 18, 20–21, 27–31, and 33, whereas no breed differences were detected during finishing. DMI (%BW) declined with age in both phases (growing: $P < 0.01$, $\beta = -0.06$; finishing: $P < 0.01$, $\beta = -0.04$). These results indicate that breed-related variation in feeding behaviour may be ethologically relevant, suggesting that BxD and Holstein steers adopt distinct behavioural strategies in the temporal organization of feeding, which may also have practical implications for nutritional management in feedlot systems.

Staggered paired integration modulates social synchrony, agonistic interactions and milking-time behaviour in freshly calved water buffaloes

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Freshly calved buffaloes experience substantial social disruption when integrated into established lactating herds, predisposing them to agonistic encounters, impaired milking-time behaviour and altered milk quality. This study examined whether staggered entry in familiar pairs, compared with direct single entry, modifies agonistic interactions, feeding and resting synchrony, milking temperament, let-down dynamics and milk composition in Murrah buffaloes. Thirty-six freshly calved Murrah buffaloes were allocated to two groups and introduced 5 days post-partum into a resident loose-housed herd of 70–80 lactating buffaloes. Control animals (T0, n=12) were integrated individually on a full-time basis, whereas treatment animals (T1, n=24) were introduced as 12 familiar pairs in a staggered schedule over 4 days, with 2, 4 and 8 hours of group exposure on days 1, 2 and 3, followed by full integration on day 4. Behaviour was recorded from CCTV during the first 4 days and then weekly up to 100 days, with continuous scoring of agonistic events and feeding/resting synchrony at fixed times. Milking parameters were measured, and group differences evaluated by t-tests and analysis of variance. T1 buffaloes showed a significantly lower overall mean frequency of bunting, pushing, fighting, threatening and avoiding (20.31 ± 1.13 interactions/day) than T0 (28.41 ± 1.48 interactions/day). On day 1, directly introduced T0 buffaloes experienced 38.50 ± 3.15 agonistic encounters versus only 9.67 ± 1.56 in T1, with both groups converging at 25 interactions/day by day 10–11. T1 buffaloes attained feeding and resting synchrony with the resident herd within 1–2 weeks at all observation times (8:30, 10:00, 14:00, 20:00 for feeding; 11:00, 14:00, 22:00, 3:30 for resting), whereas T0 required 3–4 weeks. Milk let-down was shorter in T1 (3.44 ± 0.59 vs. 5.75 ± 0.99 min initially, declining to 1.04 ± 0.15 vs 1.96 ± 0.44 min by day 100), while total milking time averaged 8.86 ± 0.40 min in T1 and 6.98 ± 0.95 min in T0, the shorter time in T0 reflecting lower yield rather than better efficiency. Milk flow rate was higher in T1 (0.977 ± 0.040 kg/min) than T0 (0.861 ± 0.037 kg/min). Milking temperament started at 5.0 ± 0.72 in T0 and 3.0 ± 0.492 in T1, with T1 animals becoming consistently docile (score <2) by day 28, while T0 needed >70 days. Mean protein content was $3.34 \pm 0.08\%$ in T0 and $3.54 \pm 0.04\%$ in T1, lactose $4.82 \pm 0.03\%$ and $4.94 \pm 0.03\%$, and milk fat $5.98 \pm 0.43\%$ and $6.82 \pm 0.17\%$, respectively. In conclusion, staggered-paired integration reduced aggression and stress, hastens social synchrony, improves milking behaviour and milk quality, and enhances post-partum integration into resident herd.

Beyond locomotion: Chronic pain, affective states, and the potential of electroencephalography in lame dairy cows

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Lameness is a welfare challenge in dairy cattle and has traditionally been treated as a predominantly locomotor condition; it is increasingly recognized as involving central nervous system sensitization and chronic pain. This review aims to integrate evidence from pain neuroscience and animal welfare science to discuss the potential of electroencephalography (EEG) as a tool for assessing and understanding the affective states associated with lameness. While chronic pain modulates neural circuits linked to emotion, leading to reduced exploratory behavior and altered social interactions, current diagnostic protocols for lameness rely primarily on biomechanical indicators and locomotion scores. These traditional methods, while essential for clinical detection, may not fully capture the subjective or affective dimension of the animal's pain. We argue that this assessment gap limits a comprehensive understanding of the severity of the animal's experience and may constrain the development of more refined welfare assessment approaches. EEG is a promising technique to address this limitation, as it allows inference of emotional valence and intensity from specific patterns of brain activity. Our analysis suggests that integrating neurophysiological measures such as EEG into welfare research could provide a more holistic view of the cow's internal state, complementing existing behavioral and clinical indicators. While management and economic factors are key drivers of delayed treatment of lame cows, advancing the objective assessment of affective pain may support the development of improved welfare monitoring frameworks. The implementation of such approaches could contribute to more resilient and ethically aligned food production systems, benefiting animals, producers, and society.

Behavioral and postural assessment of affective state in buffalo calves housed on slatted-bedded flooring

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Housing surface characteristics influence comfort, behavior, and welfare of young livestock, yet behavioral indicators associated with affective states in buffalo calves under different flooring systems remain poorly documented. The present study evaluated whether slatted-bedded flooring alters behavioral and postural indicators associated with affective state in pre-weaned buffalo calves. Sixteen calves (8 control; 8 slatted-bedded flooring) were housed in group pens and individually identified using paint markings to allow behavioral observations at the animal level. The treatment floor consisted of PVC slatted panels placed over a concrete base and covered with a 5-cm layer of unchopped paddy straw to maintain dry conditions. Behavioral observations were conducted between December and February using CCTV recordings. Each calf was observed during approximately ten sessions (480 min each) distributed across morning, afternoon, and evening periods. Time-budget behaviors (lying, rumination), play activity, restlessness, and vocalization were quantified and standardized relative to observation duration. Postural indicators (ear position, head position, tail posture) were recorded using scan sampling as supporting measures of affective expression. A composite affective state score (ASS) was constructed by integrating standardized positive behavioral indicators (lying, rumination, play) and negative indicators (restlessness, vocalization). Behavioral measures were averaged at the calf level prior to statistical analysis. Calves housed on slatted-bedded flooring exhibited significantly higher ASS compared with calves housed on conventional concrete flooring (Treatment: 0.96; Control: -0.97; Wilcoxon rank-sum test: $W = 0$, $p = 0.00016$; Cohen's $d = 2.62$). Treatment calves spent a greater proportion of time lying (49.5% vs. 35.1%) and showed lower restlessness rates (0.31 vs. 0.62 events/h), while play behavior increased (2.26 vs. 1.26 events/h). Vocalization frequency was also reduced (0.25 vs. 0.73 events/h). Behavioral differences were driven by increased lying time and reduced restlessness, suggesting improved resting comfort as the main mechanism underlying affective state change. Postural observations supported these findings, with treatment calves displaying more relaxed ear and tail positions and fewer indicators of heightened arousal. Exploratory principal component analysis of calf-level behavioral means identified a dominant behavioral dimension (PC1) explaining 71% of total variance, characterized by strong contributions from vocalization, restlessness, and lying behavior, indicating a structured comfort–arousal behavioral axis underlying treatment differences. These findings demonstrate that slatted flooring with bedding can significantly influence behavioral indicators associated with affective valence in buffalo calves highlighting value of integrating behavioral time budgets and postural measures for assessing affective state in applied ethology studies.

Inter-observer reliability of adapted Qualitative Behaviour Assessment in beef cattle welfare protocols: Effects of methodological variations

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Qualitative Behaviour Assessment (QBA) is increasingly used to explore the affective domain within animal welfare assessment protocols. However, adapted QBA approaches implemented in these contexts have yielded heterogeneous levels of inter-observer reliability. This study evaluated whether two methodological variations—the provision of written descriptor definitions and the use of weighted scoring based on the estimated number of animals observed—would influence inter-observer concordance when assessing groups of beef cattle. Eight observers independently assessed five pre-selected videos (1–3 min each) depicting groups of 10 to 50 beef cattle, selected to reflect conditions commonly encountered in group welfare assessments. The use of video ensured that all observers evaluated identical behavioural events under standardized conditions, while assessments were conducted asynchronously in a virtual format. In Test 1, observers estimated the number of animals visible and scored the intensity of 20 descriptors using a continuous scale. In Test 2 (7–15 days later), the same procedure was repeated with written definitions provided for each descriptor. In both tests, descriptors were presented in a fixed order and scored independently. Inter-observer reliability was calculated using Kendall's coefficient of concordance (W) ($n = 8$), considering both mean descriptor scores per video and scores weighted according to the estimated number of animals visible in each video. A $W \geq 0.60$ was considered indicative of good agreement. Without descriptor definitions, concordance was moderate for both unweighted ($W = 0.535$; $\chi^2 = 91.4$; $p < 0.001$) and weighted scores ($W = 0.568$; $\chi^2 = 97.1$; $p < 0.001$). When definitions were provided, concordance remained moderate for unweighted scores ($W = 0.517$; $\chi^2 = 98.3$; $p < 0.001$) but showed the highest level of concordance when combined with weighted scoring ($W = 0.607$; $\chi^2 = 84.98$; $p < 0.001$). Descriptor means ranged from 0.3 (SD = 0.3) to 9.6 (SD = 1.3), reflecting variability in the expressive qualities observed across videos. These results suggest that methodological adjustments may influence inter-observer reliability in descriptor-based approaches derived from QBA and applied to group welfare assessments. The highest concordance was observed under the condition in which descriptor definitions were provided and scores were weighted according to estimated group size. Agreement may also differ across descriptors depending on their valence or intensity range, highlighting an area for future research. Rather than implying a single optimal approach, these findings underscore the importance of methodological transparency and contextual adaptation when integrating QBA into welfare assessment protocols.

Behavioral indicators associated with thermotolerance in dairy cattle

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Thermotolerance is a multi-factorial characteristic that influences cow behavior and contributes to a dairy cow's ability to maintain productivity while exposed to heat stress, yet behaviors associated with thermotolerance are poorly defined. The objective of this study was to identify thermotolerant cows based on milk production and water use and to evaluate associated differences in rumination, drinking, robot interactions, and milk traits. Multiparous dairy cows ($n = 125$) housed in a free-stall barn in Snyder, Texas (May 2024–November 2025) were equipped with rumen boluses (smaXtec) to measure water intake and had free-flow access to an automatic milking system (Lely A4). Temperature humidity index (THI), calculated from environmental data recorded by temperature and humidity loggers (HOBO U23), ranged from 60.4 to 83.7 (mean $\pm$ SD = 76.6 ± 3.8). Behavioral and production data were evaluated during early lactation (DIM < 100). Thermotolerance was quantified using a composite z-score combining daily milk yield (kg/d) and water efficiency (kg milk/L water) calculated on days when THI exceeded 72. Higher scores identified cows that sustained greater milk production while using less water under heat load. Linear mixed-effects models included mean thermotolerance score, DIM, and THI as fixed effects, with cow as a random effect. Principal component analysis (PCA) evaluated relationships among behavioral and production variables at the cow level. Cows with higher thermotolerance scores ruminated 6.2 more minutes per day ($P < 0.05$) and exhibited fewer drinking events (rate ratio (RR) = 0.96, $P < 0.01$). Thermotolerant cows also tended to have fewer robot refusals (RR = 0.91, $P = 0.09$). Fat percent, milk speed (kg/min), milk time (sec), and dead milk time (sec) were not associated with thermotolerance ($P > 0.1$), whereas protein percent was slightly lower in more thermotolerant cows ($P < 0.05$). The PCA showed that the first two principal components explained 53.3% of total variation. The first component (30.4%) was driven by thermotolerance score, rumination time, daily drinking frequency, daily robot refusal frequency, and protein percent, indicating that these metrics clustered and were not independent responses. The second component (22.8%) was driven by rumination and drinking events with a weaker association to thermotolerance; that is, these behaviors can be influenced by other factors, such as diet. These results suggest that rumination, drinking events, and robot refusals may be linked with thermotolerance. These behaviors, and their contextual interpretation, may be valuable metrics for identifying thermotolerant cows.

Behavioural consequences of keel bone damage on night-time perching in laying hens: An exploratory RFID pilot study

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Keel bone damage is a widespread and persistent welfare issue in laying hens, yet its behavioural consequences, particularly during the night, remain poorly quantified. Night-time perching is a highly motivated, species-typical behaviour associated with rest and recovery, and may therefore provide a sensitive behavioural indicator of welfare impairment. This pilot study explored the association between keel bone condition and night-time perching behaviour using automated RFID-based monitoring. Twenty-one 45-week-old Lohmann Brown laying hens, housed in a mobile barn, were monitored longitudinally over 7.5 weeks under practical housing conditions. Night-time perch use was continuously recorded using a validated ultra-high-frequency RFID system with leg-mounted tags and antenna cables positioned beneath perches. Keel bone condition was assessed by manual palpation at baseline and follow-up and classified as no deformity, mild deformity, or severe deformity. Keel bone damage was found to be cumulative and persistent over the study period, with no evidence of recovery in severely affected hens. Clear behavioural tendencies were observed across keel bone condition groups. Hens with mild deformities spent approximately 9% less time perching at night compared to hens without deformities, while hens with severe deformities spent approximately 35% less time perching. In addition, increasing keel bone damage was associated with delayed settling on perches, with mild and severe deformity groups settling around 75 and 135 minutes later, respectively, than hens without deformities. Due to the exploratory nature and small sample size, no inferential statistics were performed. Nevertheless, these findings provide indicative evidence that keel bone damage constrains night-time perching behaviour, likely reflecting pain-related avoidance and physical limitation. This pilot study highlights the potential of night-time behaviour as a welfare-relevant behavioural marker and demonstrates the value of automated RFID monitoring for longitudinal assessment of welfare outcomes in laying hens.

Individual characteristics of piling behaviour

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Piling is the abnormal aggregation of laying hens at high densities. Recurring piling, the most common subtype, lacks an obvious trigger, unlike panic or nest box piling. When piling results in deaths, it is termed smothering and is a frequent, unpredictable concern for egg producers. As recurring piling may arise from both environmental influences and individual behavioural differences, isolating their effects is essential. This study investigated inter-individual differences in piling behaviour throughout the laying cycle, assessing the influence of age and genetics. Five pens of brown hens ($n = 225/\text{pen}$) from 40 sires ($n = 4\text{--}6$ hens/sire/pen) were continuously monitored over three days at 20, 27, 47, and 75 weeks of age (WoA) using video cameras to identify piles and RFID tracking to identify individuals that participated in piles. Mixed-model analysis revealed that age significantly affected the probability of piling ($p < 0.001$), latency to join a pile ($p < 0.001$), and duration spent in a pile ($p < 0.001$). Specifically, the probability of piling (20 WoA = 0.16 [0.13, 0.20], 27 WoA = 0.23 [0.19, 0.28], 47 WoA = 0.40 [0.36, 0.48], 75 WoA = 0.38 [0.32, 0.44]) and time spent in piles increased with age (20 WoA = 697.62 seconds (s) [660.32, 737.03], 27 WoA = 784.03 s [754.47, 814.74], 47 WoA = 970.38 s [939.48, 1002.30], 75 WoA = 958.42 s [0.32, 0.44]) until 47 WoA after which it slightly reduced, while latency to join followed the opposite trend (20 WoA = 502.68 s [471.12, 536.36], 27 WoA = 427.35 s [408.23, 447.35], 47 WoA = 334.99 s [319.84, 350.85], 75 WoA = 418.15 s [394.85, 442.83]). Sire had a significant but small effect on the probability of piling ($p < 0.001$), with sire accounting for only 1.9% of the total variance. Sire did not affect latency to join a pile or time spent in a pile. Individual repeatability was moderate for the probability to pile (Repeatability (R) = 0.17 [0.15, 0.19]) and negligible for latency to join a pile (R = 0.02 [0.01, 0.03]) and time spent in a pile (R = 0.05 [0.04, 0.06]). Our findings indicate that individual differences in piling characteristics are moderate and only slightly influenced by genetics (sire). Further studies are required to elucidate the role of environment in piling behaviour.

To cluster or not: Estimation of distance thresholds in laying hens

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Social clustering is widely used to infer social preferences in group-housed farm animals. Animals preferring close proximity to conspecifics form clusters, having highly variable interindividual distances (IIDs) i.e. low distances within clusters and high distances between clusters. In contrast, animals avoiding close proximity distribute more evenly, producing lower IID variance. From an animal-welfare perspective, it is important to understand whether clustering reflects true social preference or is enforced by limited space availability. This relies on measuring social clustering accurately. Clustering is often quantified based on a pre-defined threshold distance e.g. animal's body length, whereby two animals belong to the same cluster if their IID is below this threshold. However, it remains unclear whether pre-defined thresholds meaningfully reflect animals' voluntary spacing behaviour across different contexts. Therefore, as part of an experiment with laying hens, we derived a threshold based on the hens' voluntary spacing behaviour within their housing environment (i.e. by measuring their IIDs) and evaluated how it compares with commonly-used pre-defined thresholds. For this assessment, 100 one-day-old chicks (brown/white hybrid, 50 per hybrid) housed in groups of 10 (i.e. 5 groups per hybrid) were used. Every group was housed in a 40,000 cm² pen providing 400 cm² of physical space per hen. At three time points (weeks 7-8, 10-11, 13-14 of life), screenshots were taken every 15 min during the light period (07:00-16:00) for 10 days per time point to measure IIDs between every pair of hens in each group, using ImageJ software. Distances from all time points were pooled and visualized using a density plot, which fitted a bimodal distribution i.e. two distinct peaks separated by a valley. The mean of the lower-distance peak (44 ± 19 cm) reflected hens in closer proximity, interpreted as individuals within the same cluster, while the mean of the higher-distance peak (132 ± 33 cm) represented hens in different clusters. An IID of 80 cm at the valley between the two peaks represented the threshold distance. To compare this with commonly-used thresholds, we measured the body length of 20 hens for both hybrids per time point. Mean body length was 37 cm for either hybrid. Thus, our IID-based threshold corresponded to approximately twice a hen's body length, indicating that pre-defined thresholds could potentially bias interpretation of social clustering. Our findings allow a conceptual comparison of observed IID-based thresholds with commonly-used pre-defined thresholds, especially in the context of limited space allowance.

Piling behavior is associated with farm technological level in cage-free egg production

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Piling — the abnormal clustering of laying hens that can lead to asphyxiation — remains a persistent challenge in cage-free egg production, with significant welfare and economic implications. Despite its impact, systematic investigations into the underlying factors across different management systems remain limited. This study utilized a structured questionnaire answered by 79 Brazilian cage-free farmers to assess how farm characteristics, housing design, and management practices relate to piling. Cluster analysis was used to identify three distinct technological profiles, and subsequent statistical tests were applied to evaluate differences between clusters. The low-technology profile (43.03%) typically manages flocks of up to 5,000 birds. In these systems, smothering occurs predominantly at barn walls and corners ($p < 0.0001$), frequently associated with predatory pressure and environmental disturbances such as wind, thunder, and light spots. These producers rely on manual nests kept open at night and commonly apply abrupt light-off routines. The medium-technology profile (35.44%) manages flocks between 5,001 and 10,000 birds, with piling primarily occurring along walls and often attributed to multiple or unspecified causes. Although automatic nests are used and closed at night, abrupt lighting shutdown remains common. The high-technology profile (21.52%) reported piling in multiple locations within the barn, including inside nests. This group showed reduced reliance on abrupt light-off programs, indicating more gradual transitions to darkness. No differences were observed between clusters for variables such as genetics, nutritional management, bird transfer age, or reported piling frequency ($p = 0.102$), suggesting that piling is a multifactorial phenomenon present across all technical levels. However, qualitative responses highlighted light infiltration, shed adaptation, and thermal stress as key perceived contributing factors. These findings indicate that technological level is associated with differences in the spatial distribution and contextual characteristics of piling behavior, rather than its overall frequency. The identification of distinct production profiles provides a basis for targeted management strategies and technical interventions aimed at mitigating piling-related mortality in cage-free systems.

Does manipulation of nest enclosure or uniformity of light affect hens' spatial navigation?

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Resource arrangement in cage-free systems influences laying hens' use of such resources as well as the achievement of satisfactory animal welfare. We explored the effect of improving lighting uniformity in the housing room and manipulating nest enclosure on hens' ability to perform a navigation test (NT). Social reinstatement and/or fear were used to stimulate birds' navigation of the environment. 2,624 Hy-Line Brown hens were divided into 4 rooms equipped with 3-tier aviary systems (4 units/room, 164 birds/unit) and followed from 18 to 27 weeks of age (WOA). The system provided litter on each side, feed in bottom and top tiers, water in bottom and middle tiers, and nests in the middle tier. In two rooms, light bars were mounted horizontally on the wall ~30cm above the litter to make lighting more uniform from ceiling to floor. In 2 units/room, every other nest flap was removed, allowing more light into the nest. Nine birds/unit were randomly selected from top, middle, and bottom tiers and the litter at each sampling time (18, 21, and 27 WOA). For the NT, hens were placed individually into one end of an arena (2.4×0.6×1.2m) which included a 60×30cm grid in front of a 75-cm-tall fence. Two hens were placed in a cage at the other end of the arena as a social stimulus to encourage test hens to fly over the fence. Hens were given 5 min to fly; if they did not the tester introduced a small flag to the arena and waved it to encourage the hen. Successful flight over the fence, latency to approach the grid, total test duration, and expression of comfort (e.g., tail wagging, wing flapping), and fear behaviors (e.g., defecation) were evaluated using GLM and Cox regressions. Age and treatment were fixed effects. Neither light nor nest treatment significantly affected NT results. However, all variables were affected by hens' age. Hens' latency to approach the grid was greater at 27 versus 18-21 WOA ($P<0.05$ and $P<0.001$, respectively) and a trend was noted between 18 and 21 WOA (18>21 WOA; $P=0.080$). Hens completed the test faster at 18-21 WOA compared to 27 WOA ($P<0.001$). Hens showed more comfort behaviors at 21-27 WOA compared to 18 WOA ($P<0.001$ and $P<0.05$, respectively). Finally, birds defecated more at 18 compared to 21 WOA ($P<0.01$). In conclusion, age rather than uniformity of housing light and degree of nest enclosure affected birds' completion of a NT.

Chicken play – individual variation and connection to affective state

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Chickens are known to engage in play behaviours, but how these relates to affective state is not fully understood. The affective state of an animal can be assessed e.g., with a cognitive judgement bias (CJB) test, or an attention bias (AB) test. How different measures of affective state correlate, and whether they indicate a short or long-term reflection of the affective state of an animal is not well known. Hence, our aim was to further investigate the connection between playfulness and affective states. Moreover, we aimed to compare the outcome of the CJB and AB test, to deepen our knowledge of how they relate to one another. The birds used were of an intercross between ancestral Red Junglefowl and domesticated White Leghorn chickens. All chicks ($n = 48$) were allowed to play twice in groups of three, two days in a row (day 26-27), in different group constellations each time. The groups were created within cage. The CJB test was carried out over days 28-30, and the AB test day 31-32. In the CJB test, we calculated a pessimism index as a measure of cognitive state, and in the AB test, we used latency to first step and to begin feeding as measures of anxiety. The results show consistency in overall individual play activity across the two test days (males: $r = 0.508$, $p = 0.019$; females: $r = 0.727$, $p < 0.001$), and no correlation between individual total play frequency and cognitive state for either sex (males: $r = -0.087$, $p = 0.707$; females: $r = 0.217$, $p = 0.277$). An initial analysis of the AB test reveals no correlation between individual total play frequency and latency to first step (males: $r = 0.03$, $p = 0.898$; females: $r = -0.041$, $p = 0.840$), or latency to begin feeding (males: $r = -0.238$, $p = 0.299$; females: $r = -0.174$, $p = 0.387$). Furthermore, we found no correlation between cognitive state and latency to first step (males: $r = 0.069$, $p = 0.765$; females: $r = 0.137$, $p = 0.497$), but a tendency of a positive correlation between cognitive state and latency to begin feeding (males: $r = -0.105$, $p = 0.65$; females: $r = 0.369$, $p = 0.058$). To the best of our knowledge, this is the first study to explore the connection between play and AB, as well as the relationship between CJB and AB, in chickens.

From smell to emotion – can we measure how odours affect farm animal behaviour and welfare?

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Olfaction and wellbeing are closely linked in humans and rodents, where odours can modulate emotional experience and influence behaviour. Although olfaction and odours are important for human mental health, our olfactory abilities differ from many non-human mammals. Despite their smaller brain size relative to humans, farm animals' olfactory bulb, the brain region responsible for processing odours, is significantly larger, highlighting their reliance on information from odours. Approx. 70 billion animals are kept in farm settings where the olfactory environment may be aversive or maladapted to their sense of smell. With olfaction being such an important sensory modality, the olfactory environment is likely of great importance for the wellbeing of many farm species. Yet this remains largely unexplored. In a line of projects, we are working on filling gaps in our knowledge. The applied aim of these projects is to investigate if odours can be used as a form of biologically relevant enrichment of the environment and potentially as salient sensory cues helping animals regulate their emotions. The more fundamental aim is to understand the link between olfaction and animal emotions, the latter being the core tenet of animal welfare. In this talk, we will summarise a series of experimental and applied studies investigating how pigs, cattle, and horses perceive, discriminate, and behaviourally respond to odours. From that summary, we will expand to our ongoing interdisciplinary work investigating whether cattle and horses can form positive odour memories that may buffer stress during challenging situations and improve human–animal interactions, as well as how the olfactory environment affects emotional states of animals using the pig as the model species. Lastly, we will discuss some of the many remaining gaps of knowledge to be filled in this research topic, in order to improve the lived experiences of farm animals. We will discuss questions such as what is odour preference, what does it mean to the animal, and how can it be measured?

What does current neurophysiological evidence tell us about the cause and function of environmentally induced stereotypic behaviour in animals?

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Environmentally-induced animal stereotypy and animal welfare have been interlinked since the domestication of animals with veterinary records discussing these behaviours as far back as 1664. Whilst the environmental causes of stereotypy in most species are generally well understood, a number of questions about these abnormal behaviours are still unanswered, specifically 1) why do only some animals in the same environment develop stereotypy?, 2) why do some stereotypies persist even when the underlying causal factors are removed? and 3) are stereotypies in any way functional to the animal? Answering these questions has important implications for how we view, treat and interpret these behaviours from an animal welfare perspective. Research has increasingly been directed towards understanding the neurophysiological mechanisms underpinning this group of repetitive behaviours. This presentation reviews and discusses this neurophysiological information in the context of an ever-growing understanding of how the animal brain selects, initiates and terminates behavioural sequences with specific regard to the neurocircuitry of the basal ganglia. Taking this neurophysiological synthesis approach has the potential to answer persisting questions about environmentally-induced animal stereotypy as well as help set the direction of future studies.

Replacement of laboratory animals in cancer research using 3D spheroid model

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Three-Dimensional (3D) spheroids have become an essential and more physiologically relevant in vitro system in cancer research and drug development. In contrast to traditional 2D cell culture methods, 3D spheroids replicate the structure, function, and microenvironment of solid tumors. A key characteristic of 3D spheroids is cellular heterogeneity, which allows for a more precise examination of tumor behaviour. 3D spheroids demonstrate gradients of oxygen, nutrients, extracellular matrix, and drug diffusion. 3D spheroids display morphologies and properties of solid tumor tissues with a proliferative outer layer, a resting zone, and a hypoxic or necrotic centre. These characteristics allow spheroids to mimic tumor behaviours like proliferation, invasion, and chemoresistance, which are vital for comprehending cancer biology and assessing drug effectiveness. 3D spheroids provide benefits for drug screening and validation in preclinical studies. The development of spheroids from cancer cell lines or patient-derived cells enables researchers to investigate tumor formation, drug response, and metastatic capability in an environment that closely mimics in vivo conditions. Utilizing materials like ultra-low attachment surfaces, hydrogels, and basement scaffolds facilitates the organization of cells into more tissue-like spheroids. Incorporating a 3D spheroid model into the drug testing assay process could improve the precision of preclinical cancer therapeutic studies. Consequently, 3D spheroids serve as an encouraging instrument in connecting traditional cell culture methods with in vivo models, enhancing the credibility of preclinical cancer studies.

Advancing animal welfare in Asia-Pacific by AAALAC International accreditation – 30 years of achievement

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AAALAC International is a private, non-profit organization that promotes the humane and ethical treatment of animals in science through voluntary program assessment, accreditation and education. AAALAC International's mission is to improve the welfare of animals in science and education through accrediting organizations that meet high standards of humane and responsible animal care and use. AAALAC International has been recognized around the world as a symbol of high-quality animal care and use for research, teaching and testing, as well as promoting animal welfare and maintaining safety. More than 1,180 institutions in 52 countries have earned AAALAC accreditation, including more than 310 accredited programs in Asia and Australia. AAALAC International applies the same rigorous evaluation process at institutions worldwide. Over 500 international experts conduct onsite performance evaluations covering all aspects of an animal care and use program, known as the "site visit." This in-depth, multi-layered peer-review process culminates in the Council on Accreditation's final deliberations. In every country, AAALAC International considers compliance with applicable local animal legislation and institutional policies as the foundation. Following the Rules of Accreditation, AAALAC experts apply a customized approach using the relevant Accreditation Standards, the Guide for the Care and Use of Laboratory Animals (2011) or the Guide for the Care and Use of Agricultural Animals in Research and Teaching (2020), along with Position Statements, Guidance Statements, and Reference Resources. Guidance Statements clarify the Council's expectations for specific aspects of animal care and use. In Asia-Pacific, countries have very different rules, resources, and traditions when it comes to animal care in research. AAALAC International has worked closely with institutions in this region, especially those going through accreditation for the first time. Many started with basic facilities and limited experience in areas like housing, veterinary care, or staff safety programs. Through repeated site visits, face-to-face guidance, and training, these programs have made real, lasting improvements in how animals are cared for and how research is conducted. AAALAC has also helped train local experts who understand the animals, farming methods, and laws specific to their own countries. Growing from just a few accredited programs to over 310 today shows that this progress comes from genuine commitment, not just following outside rules. This presentation provides an overview of the AAALAC International accreditation program and its achievements across the Asia-Pacific region.

Behavioural and physiological stress responses as integrated welfare indicators in farmed African catfish (*Clarias gariepinus*)

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Assessing animal welfare requires attention to how animals behave as well as how they respond physiologically to their environment. In aquaculture systems, behavioural changes often provide early signs of welfare compromise, yet welfare assessments frequently rely on physiological indicators. This study evaluated whether combining behavioural observations with physiological stress responses provides a practical approach for assessing welfare in farmed African catfish (*Clarias gariepinus*). A sixteen-week feeding trial was conducted using 180 juvenile African catfish (50 ± 0.5 g) randomly distributed into four dietary treatments with three replicates each (15 fish per tank). Fish were maintained under standard aquaculture conditions including routine feeding, tank management, water quality monitoring, and husbandry practices. Diets (41.42% crude protein) were supplemented with turmeric (*Curcuma longa*) powder extract at 0% (control), 0.5%, 1%, and 2%. Welfare-related behaviours including feeding responsiveness, swimming activity patterns, and reactions during routine handling were recorded through direct observation during feeding and farm management activities. Physiological stress responses were assessed through serum cortisol measurement following controlled exposure to the bacterial pathogen *Aeromonas hydrophila*. Blood samples (0.5 mL) were collected by trained personnel from briefly netted and manually restrained fish without anaesthesia using rapid handling procedures designed to minimize stress. Handling duration was kept below one minute per fish, after which fish were returned to tanks and monitored for behaviour, health status, and survival. Three fish were sampled per replicate ($n = 9$ per treatment). Growth performance, feed utilization, and survival were also evaluated. Growth performance differed significantly among treatments (one-way ANOVA followed by LSD test, $p < 0.05$). Fish fed diets supplemented with 1% turmeric extract achieved the highest mean final weight (794 g) compared with the control group (642 g) with improved feed conversion efficiency. Behavioural observations showed reduced feeding responsiveness and stronger escape reactions in the control group, while supplemented fish displayed more stable swimming behaviour and faster feeding responses. Following bacterial exposure, serum cortisol levels were highest in the control group (44.47 ± 0.68 ng/mL at 1 h post-exposure) and lower in turmeric treatments, reaching 25.70 ± 0.68 ng/mL in the 2% group. After seven days, cortisol declined to 31.33 ± 0.35 ng/mL in the control compared with 14.77 ± 0.35 ng/mL in the 2% treatment. Post-exposure survival was also higher in supplemented groups. These findings indicate that behavioural observations combined with physiological stress measures provide practical indicators for monitoring welfare in African catfish aquaculture.

Long-term husbandry records reveal individual and life-history drivers of daily fish consumption in zoo-managed penguins

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Daily diet records are collected in most zoo-managed penguin colonies as part of routine husbandry, yet these data are rarely examined in a way that quantifies how diet composition and life-history context relate to individual feeding outcomes over time. Here, we used longitudinal husbandry records from a zoo-managed penguin colony to evaluate daily fish consumption patterns across two consecutive years (2024–2025), with the goal of identifying biological and management factors associated with variation in estimated daily intake. Individual feeding sheets recorded daily counts of multiple fish types offered, including capelin, herring, smelt, sardine, and silversides, along with an estimated total daily intake (g/day). Data were available for 30 individually identified penguins in each year (2024: 10,932 daily records; 2025: 8,728 daily records). Keeper notes were systematically reviewed and coded to capture biologically relevant contexts, including egg presence (reproductive activity) and molt status (pre-molt or active molt). Because observations were collected daily and repeatedly within individuals, analyses accounted for individual identity and seasonal effects. Across all penguins, mean estimated daily intake was 193.1 g/day in 2024 and 206.6 g/day in 2025. After controlling for month and repeated measures within individuals, intake remained significantly higher in 2025 (+5.93 g/day, $p = 0.048$). Capelin availability differed between years, with the proportion of days in which capelin was offered declining from 0.83 in 2024 to 0.74 in 2025 (paired comparison across individuals, $p < 0.001$). Within 2025, capelin presence was strongly associated with increased daily intake (+84.0 g/day, $p < 0.001$), even after accounting for individual differences and seasonal patterns. Life-history context further explained intake variation. Days associated with egg presence were characterized by lower intake relative to non-egg days (-78.4 g/day, $p = 0.011$), while pre-molt periods were associated with substantially higher intake (+135.4 g/day, $p = 0.002$), consistent with increased energetic demands prior to molt. These relationships remained evident when fish availability and individual identity were included in the models. Overall, these results show that routinely collected feeding records and husbandry notes can be used to generate meaningful, individual-level insights into diet, reproductive context, and seasonal energetics in zoo-managed penguins. When systematically structured and analyzed, such data offer a practical and underutilized tool for informing evidence-based management decisions during periods of dietary change, breeding, and molt.

Balancing foraging engagement and caretaker usability: Evaluating automated feeding strategies for zoo-managed Japanese macaques

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Providing opportunities for animals to engage in species-typical foraging behavior is a central goal of zoo management, yet feeder design can influence not only animal behavior but also caretaker workload and long-term feasibility. We evaluated four automated feeding strategies for a zoo-managed troop of Japanese macaques (*Macaca fuscata*, $n = 25$) to identify feeder designs that balance foraging engagement, social outcomes, and caretaker usability. Feeders were tested sequentially across four one-week trials: (1) a QuickFeed automatic feeder that dropped food at a fixed location and schedule, (2) a Moultrie game feeder that broadcast food across the habitat on a fixed schedule, (3) a Pentair belt feeder that released food at a fixed location on a variable schedule, and (4) a combined presentation of the Moultrie and belt feeders. Behavioral data were collected using ZooMonitor and included foraging participation, aggression, and anticipatory “stare up” behavior. In parallel, caretakers completed structured post-trial surveys rating feeder usability, reliability, ease of maintenance, and suitability for long-term use. Mean foraging participation differed across feeder types, with the highest number of macaques foraging during QuickFeed trials (mean = 7.11 individuals), followed by the Moultrie feeder (6.09), the combined condition (3.30), and the belt feeder alone (1.65). Anticipatory staring was 2.7 times higher during QuickFeed trials compared to Moultrie trials ($p = 0.03$). Aggression rates varied by feeder type, with the broadcast Moultrie feeder associated with approximately twofold higher aggression compared to the belt feeder ($p = 0.01$). Caretaker ratings revealed clear differences in feeder usability. The Moultrie feeder was consistently rated highest for reliability, ease of refill, and ease of cleaning, and was unanimously recommended for long-term use. Belt feeders were also recommended despite moderate maintenance demands, while the QuickFeed was rated lowest for practicality and outdoor suitability and was not recommended for continued use. Notably, the feeder associated with the highest foraging participation (QuickFeed) was not the preferred option for long-term management due to usability constraints. These results demonstrate that selecting automated feeders requires integrating animal behavior outcomes with caretaker experience. Combining behavioral metrics with structured caretaker feedback provides a practical, evidence-based framework for feeder selection that supports animal welfare while remaining operationally sustainable.

How applied ethologists experience and cope with internal conflicts resulting from using animals in their research

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The goal for many in the field of applied ethology and animal welfare is to improve the lives of animals, yet for some, pursuing this goal involves causing animals harm. Internal conflicts arise when people make decisions or act in such a way that conflicts with their moral values, which can ultimately affect their emotional well-being. The aim of our study was to explore how researchers are affected by internal conflicts caused by using animals in ways conflicting with their values and the strategies they use to cope. We conducted a workshop at the 2025 International Society for Applied Ethology conference in Utrecht, Netherlands. A total of 24 participants attended the workshop and were divided among 5 focus groups (n = 4-5 per group). Participants included university professors, graduate students, and industry researchers. The aims of the workshop were to provide a chance for researchers to discuss: 1) internal struggles they may have encountered in their research using animals, and 2) how they experienced and coped with these conflicts. Here, we report preliminary findings related to the second aim. Participants provided informed consent, and focus group conversations were audio recorded, transcribed, and collaborative inductive reflexive thematic analysis was performed. We developed two overarching themes; the first describes how researchers were affected by situations in which they grappled with causing harm to animals. This included feeling emotionally taxed and desensitized to animal emotions; experiencing moral conflicts about the rightness of their actions; and consequences to their relationships with peers, supervisors, and students. The second theme encompassed strategies that researchers found useful or not useful in navigating these challenges. Less helpful strategies included burying or internalizing their feelings. Helpful strategies included shifting research goals to avoid methods that made them feel uncomfortable and towards positive animal welfare; expanding dialogue about these conflicts within their teams and among broader networks; and more deeply reflecting upon the extent to which their research supported their own moral values. Collectively, our preliminary findings offer a foundation for the development of recommendations to better support applied ethologists and animal welfare scientists in navigating moral challenges in their research, including shifting research culture to embed ethical reflection and dialogue within animal research.

Role of human posture in free-ranging dogs' approachability towards unfamiliar humans

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Social interactions vary from gratifying to detrimental, necessitating individuals discern beneficial exchanges from perilous ones. Understanding human-animal interactions is essential for animal welfare and management in urban ecosystems. Dogs, the first domesticated animals, co-evolved alongside humans and actively seek human interactions resulting in cooperation and conflict especially in free-ranging dog (FRD) populations which comprises around 80% of the global demographics. With this ambivalent bond being increasingly disrupted, presenting unfamiliar humans positively may reduce aggressive reactions from FRDs. This study explores the role of certain elements of affiliative human postures in approachability shown by FRDs. We identified using three basic human postures involving variations in head - torso heights (commonly used by humans in habitual interactions with FRDs involving standing, squatting and bending while looking at the subjects' eyes). Using independent-groups design, we conducted isolated choice tests of approachability on 712 solitary FRDs. Choice presented was one identified posture (in combination with an affiliative hand gesture or independently) against neutral posture (standing still, arms by sides, soft gaze). 243 were considered successful approaches (voluntarily approach the experimenter from a distance of 3-5 metres to within approximately one FRD body length of either choice, without displaying signs of aggression or distraction). Cues were overall either positive or neutral to control for variations. Individual response variables quantified were postural configuration choice, approach latency and sociability (tail wag, engagement with chosen experimenter - lick, paw, jump, proximity). Experimenters (females aged 27, 24) and attire were kept the same throughout to account for inter-experimenter bias, with neutral-neutral trials used to control for baseline preference. Results indicated FRDs were increasingly likely to approach when experimenters' head was positioned closer to FRDs' eye level accompanying an affiliative hand-outstretched gesture (logistic regression). Overall dataset was compared using Chi square test of independence ($\chi^2 = 50.5279$, $k = 1$, $p \text{ value} < 0.01$, $N = 243$), indicating that choice of affiliative postures was significantly above chance. However, the overall success rate was less than fifty percent, indicating that dogs' responses are not solely dictated by human cues but also by their individuality and immediate behavioral states. These findings underscore that FRDs exhibit context dependent hyper-social behavior and cognitive adaptability in understanding human postural intent. As this study was done in their natural ecological context, results directly showcase how inculcating positive social cues in human body language can potentially reduce human-FRD conflicts, ultimately promoting a harmonious coexistence between humans and FRDs.

How do mothers influence their offspring? An exploration of the role of suckling and maternal care in the development of young animals

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1. SRUC

Maternal care is widely expressed across different species and taxa, where it serves to improve offspring survival and fitness. In mammals, maternal care delivers multi-faceted support for offspring: providing nutrition, warmth, comfort, entrainment of circadian rhythms, immunological and physical protection, learning and transfer of information. However, in managed animals, the period of maternal care may be disrupted, curtailed or entirely absent. Care of young animals has focused on nutrition and provision of colostrum and milk, but the other impacts of maternal care are often absent or ignored. Sucking is seen as a means of acquiring nutrition, but the comforting aspects of this behaviour can lead to behavioural frustration and oral stereotypy in animals denied opportunities for sucking. Our research, and that of others, has shown that when young animals are deprived of maternal contact, even if reared in a social group, there is a reduction in play behaviour, reduced activity and increased competition for milk resources. This is accompanied by delays and structural impacts on the development and maturation of the brain. In sheep studies, mothers regulate access to the udder and suckling in their offspring, and this plays a role in learning and transmission of knowledge about species specific communication. In addition to its role in nutrition, colostrum and milk ingestion play significant roles in immunological protection, gut maturation and offspring learning. However, there is also evidence from studies of human breastmilk, that the composition of milk changes over the course of lactation, and even diurnally, as a means of transferring information to the offspring, ensuring that the infant receives appropriate nutrition for different stages of development. Circadian changes in milk composition, such as concentrations of melatonin and cortisol, may play a role in entraining a biological clock in human infants. However, in artificial rearing of animals, studies of milk replacer have largely focused on volume, method of delivery, nutritional components and how readily the animal can be transitioned to solid foods. Studies of maternal deprivation and artificial rearing almost invariably confound nutritional changes with the psychological impacts of loss of the mother, which make it hard to disentangle the separate impacts of feeding and the other facets of maternal care. It is clear, however, that current artificial rearing practices do not provide young animals with the complexity and comfort of maternal rearing, and suggest we are still far from achieving good welfare in these animals.

Investigating the welfare challenges and benefits for re-homed ex-research rats: Mid-term results from a longitudinal survey

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Re-homing ex-research animals is thought to promote their welfare and demonstrates culture of care. Rats are the laboratory species most frequently re-homed in Europe. However, no research exists that examines the welfare challenges and benefits for re-homed rats. We present here mid-term results from a longitudinal (2024-2027) survey investigating welfare outcomes in rats re-homed from our institution. The rats (49% females, 52% males, aged 9.94 ± 3.05 months at re-homing) were re-homed to 36 homes. Their health and behaviour were surveyed ≈ 1 month (baseline), ≈ 3 months (follow-up ('FU')1), then every ≈ 6 months post-rehoming (FU2, FU3), using online questionnaires. Rats were recruited on a rolling basis (on-going), currently yielding 84 rats at baseline, 50 at FU1, 29 at FU2 and 10 at FU3. Rats' health unsurprisingly degraded as rats aged (e.g. hind leg degeneration baseline and FU1: 0% of rats, FU2: 3.7%, FU3: 70%). However, common rat health issues overall seem less frequent than in a general pet rat population previously studied (Neville et al 2021). E.g., respiratory issues -reported by 60.4% of respondents in previous research- were reported here in 3.7% of rats at baseline, 14% at FU1, 11% at FU2 and 30% at FU3. Masses -reported by 67.8% of respondents in previous research- were reported here in 1.2% of rats at baseline, 8% at FU1, 29.6% at FU2 and 20% at FU3. Chromodacryorrhea ('red tears') -reported by 67.8% of respondents in previous research- was reported in $\leq 10\%$ of rats here (baseline: 2.4%, FU1: 2%, FU2: 3.7%, FU3: 10%). Health issues were predominantly (64%) resolved by veterinary intervention/medication (including euthanasia), 13% spontaneously resolved, and 23% were reported on-going/unresolved. Most behavioural issues (apathy/inactivity, excessive grooming, aggression towards other rats, excessive vocalisations and hiding/isolating) were predominantly reported as being rare or absent for all surveying periods (% of rarely/unaffected rats, baseline: 64%-93%, FU1: 54%-98%, FU2: 75%-92%, FU3: 70%-80%). However, $\geq 50\%$ of the rats were reported as difficult to handle at each surveying period (% of rats sometimes+often/constantly difficult: baseline 66%, FU1: 54%, FU2: 50%, FU3: 50%). Exposure to predator species (dogs, cats), either to their smells (28.4% of rats) or predators sometimes accessing the rats' room (12.3%), was also reported. These preliminary results cautiously support endorsing rats re-homing. We discuss how they relate to barriers to re-homing (e.g. welfare concerns about the animal's health/welfare if rehomed, fear of attracting negative media attention) and future research directions (e.g. to reduce handling difficulties and exposure to predators).

Scars of the past or signs of the present? Investigating persistent stereotypic behaviours in laboratory mice

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Stereotypic behaviours (SBs) are widely-used indicators of poor welfare. However, they can persist after attempts to improve well-being (e.g. via environmental 'enrichment'). Furthermore, Tilly et al. (2010) found that in ageing, conventionally-housed (CH) laboratory mice provided with large well-resourced enclosures, being little-motivated to use these enclosures predicted persistent, treatment-resistant SBs. This raises the question: are treatment-resistant SBs merely 'scars of the past' that fail to reflect welfare improvements (as often assumed), or do they instead indicate that attempts to improve welfare have failed? To investigate, two complementary studies assessed behavioural correlates of SB reduction following 'enrichment'. Study 1 longitudinally investigated predictors of SB treatment-resistance (inferred from absolute and proportional SB reductions, and residuals from regressing post-treatment SB time budgets against pre-treatment SB) following transfer of DBA-strain CH mice to large, well-resourced enclosures. This reduced SB with great individual variation. Mice with the most treatment-resistant SBs engaged less with 'enrichments', according to two of the three metrics (proportional SB reduction: $t_{34}=4.084$, $p=0.00025$; residuals measure of SB reduction: $t_{34}=-3.38$, $p=0.0018$). Furthermore, SB reductions significantly exceeded the time spent using enrichments ($t_{35}=2.50$, $p=0.009$), indicating effects beyond mere behavioural competition. Mice with treatment-resistant SBs may thus have benefitted less from the new resources. Study 2 used judgement bias (JB) tests to investigate whether mice with treatment-resistant SBs benefit less in terms of improved mood. CH mice (Balbs and DBAs) were again transferred to large well-resourced cages. Before and after transfer, affective states were assessed using validated tests for mouse JB (responses to ambiguous olfactory cues in a digging task). Again, this transfer typically reduced SBs, and by extents exceeding the time spent using the new resources ($t_{22}=5.18$, $p<0.0001$; although this engagement now only predicted the residuals measure of SB-reduction: $t_{5.71}=-3.13$, $p=0.022$). Furthermore, mice with less SB reduction exhibited less improvement in JB (absolute SB reduction: $t_{16}=2.64$, $p=0.012$; proportional SB reduction: latency x strain interaction [$t_{6.19}=-3.67$, $p=0.0099$], with effects present in Balbs only [$\beta=0.23 \pm 0.08$, $p=0.023$]; residuals measure: $t_{15.94}=1.82$, $p=0.087$). This again suggests that mice with treatment-resistant SBs benefitted less from the new resources. More research is now needed, perhaps refining how SB, 'enrichment'-use, and affective states are all assessed; investigating whether anhedonia helps explain such patterns; and understanding the underlying neurological changes. Nevertheless, together such studies indicate that treatment-resistant SBs may reflect treatment-resistant negative affective states, and thence worrying failures of attempts to rectify animal welfare.

Behaviour of non-human primates in captivity

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Non-Human Primates (NHPs) are highly social and intelligent, and live in complex, structured groups. Several species of Non-Human Primates are used in biomedical research worldwide, especially the Macaques, due to several advantages. These NHPs are housed indoors or kept in captivity for a prolonged duration during experimentation. The housing conditions and use of non-human primates (NHPs) in biomedical research require a thorough understanding of the behavioural changes induced by captive environments. Prolonged captivity imposes significant constraints on the expression of natural behaviours, such as adequate physical activity, foraging and complex social grooming. In the absence of these activities, monkeys often undergo stress and develop maladaptive coping mechanisms. It has been reported that these behaviours are influenced by husbandry practices, housing density, hierarchical structure, etc. It was also reported that early separation of babies from their mothers in research facilities led to the development of "Self-Abusive" and "Stimulatory" behavioural clusters. It has been reported that factors such as housing type, rearing history, enrichment and space significantly influence the behaviour in NHPs. The prevalence of behaviours such as self-sucking, hair-plucking, hunched posture, and threat-biting serves as a critical biomarker of animal welfare. Single-housing remains the most significant risk factor for the manifestation of pacing and hair-plucking. On the contrary, the implementation of social housing and environmental enrichment, such as foraging, toys, vertical space utilisation, perches, etc., has been shown to significantly reduce the frequency of motor stereotypies. Understanding the behaviour of captive monkeys is essential for both ethical animal husbandry and the integrity of scientific data. Stress-induced behavioural abnormalities can lead to physiological changes, including altered immune responses and neurochemistry, that may confound experimental results. This abstract reviews previous findings regarding the development and mitigation of abnormal behaviours in captive conditions, primarily focusing on rhesus macaques (*Macaca mulatta*) and bonnet monkeys (*Macaca radiata*).

Maternal protective behaviour and handling reactivity in Angus cows are independent behavioural traits

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Cattle reactivity is a behavioural response to human handling, while maternal protective behaviour reflects the cow's motivation to care for and defend her calf. Both behavioural traits are relevant to animal welfare and stockpeople's safety. This study aimed to evaluate the association between Angus cows' handling reactivity and maternal protective behaviours. A total of 89 cows were assessed at the University of Calgary ranch (WA Ranches) in Alberta, Canada. Reactivity was assessed during routine handling in the corral using flight speed (FS) and composite reactivity score (REA), evaluated within the first 4 seconds of entering the squeeze chute, by assigning scores for: movement (1–5), tension (1–4), body posture (1–3) and occurrences of kicks and vocalizations. Maternal protective behaviours were assessed when stockpeople interacted with the calf within 12h after parturition, scoring maternal protectiveness (MPS), displacement (DIS), agitation (AGI), and attention (ATT). A principal component analysis (PCA) with Oblimin rotation was conducted to all behavioural variables. The PCA yielded three principal components (PCs) with eigenvalues >1. PC1, maternal activation, explained 28.3% of the total variance and presented high loadings for DIS (0.83) and AGI (0.81). PC2, maternal attention (22.7%), presented high loadings for ATT (0.86) and MPS (0.68). PC3, handling reactivity (19.8%), was defined by FS (-0.78) and REA (0.80). Based on PCA results, two standardized maternal protection domains were created: maternal activation (MPS, DIS) and maternal attention (AGI, ATT), and one for reactivity (FS, REA). A canonical correlation analysis was performed to evaluate their association. The canonical correlation between standardized domains was low ($\rho = 0.165$; $p^2 = 0.027$) and not significant (Wilks' $\Lambda = 0.973$; $F(2,84) = 1.17$; $p = 0.315$), indicating that cows that were more protective or more attentive to their calves were not necessarily more reactive during routine handling. Maternal activation contributed more to the small shared variance than maternal attention, but neither domain had meaningful associations with reactivity. Results indicate that the phenotypic expression of Angus cows' maternal protective behaviours is independent of their handling reactivity, contradicting our hypothesis that more protective cows would also be more reactive. This phenotypic independence does not necessarily imply genetic independence, and therefore, it cannot be assumed that selecting for calmer cattle would leave maternal care unaffected. Rather, this study represents an initial step toward clarifying the relationship between these traits and highlights the need for future research assessing genetic covariation before informing breeding decisions.

Descriptive analysis of calving site selection, postpartum behaviours, and mismothering across different calving environments in beef cattle.

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Calving in western Canadian cow-calf operations often occurs in designated outdoor areas with high cattle density, which limits voluntary isolation, increases disturbance from humans and other cattle, potentially contributing to mismothering. Dairy research has explored artificial isolation areas (i.e., hides) to support bonding, but this remains uninvestigated in beef cattle. This study aimed to evaluate how variation in the calving environment influences cow-calf bonding and mismothering. Specifically, we compared four pasture environments with different hide densities, group sizes, and roadway proximity (i.e., disturbance), to 1) describe hide usage by periparturient cows across these environments, and 2) explore whether environmental factors reduce mismothering, treatment rates, and mortalities. Pregnant multiparous beef cows (n=102) were randomly allocated to one of four pasture groups, each maintained on similar-sized paddocks (= 12.8 ha) for 30 days. The four environments were: 24 cows with 4 hides, no roadway; 24 cows with 7 hides, a roadway (along the east side); 27 cows with 4 hides, a roadway; 27 cows with 7 hides, no roadway. Hides were windbreaks (7.3x2.4m) and one calf-crawler (similar size, inclined with a bar allowing calves to crawl under). Infrared trail cameras mounted above each hide recorded use, cattle IDs and activity every 5 minutes. A trained observer analyzed recordings to quantify cow behaviours (affiliative, aggressive towards calf, nursing, allonursing, lying, standing) and calf behaviours (affiliative towards dam, lying, playing, standing, suckling, allosuckling). Treatment for disease, mortality, and mismothering were recorded twice daily (08:00;13:00). No mismothering, calf treatment, or mortality occurred. Descriptive observations reveal consistent hide-usage patterns across environments, regardless of hide density, group size, or roadway proximity. Calves used calf-crawlers more frequently than windbreaks (1.6 vs 0.7 calf/hour), whereas cows preferred windbreaks (0.9 vs 0.7 cow/hour). Calves appeared more active in windbreaks (average time spent lying: 48.4%; standing: 44.1%) than calf-crawlers (lying: 73.0%; standing: 24.9%). They nursed more in calf-crawlers (3.4%) than windbreaks (1.6%). Cows' behaviours appeared consistent across hide types (standing: 63.8%; lying: 29.2%). No cow calved in hides, and only 5/102 used them for bonding (4/5 in pastures near the roadway). Low cattle density (2 cows/ha) may have provided sufficient natural isolation around calving, limiting observable differences across environments. While mismothering and adverse health outcomes were absent across environments, calves may have preferred different hide types for different activities. Given consistent occupancy across environments, hides are recommended in calving pastures. Further research under higher stocking rates may clarify their benefits.

Two-year-old rams born to shorn ewes display more homogeneous physical activity than those born to non-sheared ewes

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Farmers frequently use pre-lambing shearing to promote fetal development, increase lamb weight, and thereby, the survival rate. However, this practice also serves as a model of fetal programming, as it increases the energetic availability for the placenta-fetus unit. Therefore, the aim of this study was to compare body weight and the daily pattern of Overall Dynamic Body Acceleration (ODBA) in 2-year-old rams born to shorn or non-shorn ewes. Ten Merino ewes were shorn during mid-gestation (day 77, group RSE), while eight ewes remained non-shorn as controls (CON). All ewes carried a single male fetus, and after lambing, ewes and their lambs grazed the same pastures and had access to identical feeding conditions. Lambs were weaned at 2.5 months of age and thereafter maintained on sheep supplement and alfalfa hay, grazing also in paddocks with natural pasture. The paddock included 82 m² of shaded area and an additional open area of approximately 700 m². At 2-years of age, rams were weighed, and ODBA was recorded for six consecutive days using tri-axial accelerometers mounted in custom-made collars positioned on the upper neck, with ODBA computed over 50-s time windows in all RSE and six CON rams. As a complement, a nutritional supplement and alfalfa hay were provided. Mean ODBA values were calculated hourly and daily for analysis. Rams born to shorn ewes tended to be heavier than CON rams (83.4 ± 8.2 kg vs 73.8 ± 11.2 kg; $P=0.059$). Daily ODBA did not differ between groups but tended to be more homogeneous in RSE than in CON rams (0.70 ± 0.05 g vs 0.71 ± 0.11 g; SD, $P = 0.052$). When ODBA was analyzed hourly, mean values did not differ at any hour. However, the SD was lower in RSE than in CON rams at 00:00 (0.046 ± 0.005 g vs 0.044 ± 0.128 g; P of SD = 0.025), 02:00 (0.040 ± 0.006 g vs 0.045 ± 0.016 g; P of SD = 0.018), 10:00 (0.136 ± 0.014 g vs 0.131 ± 0.034 g; P of SD = 0.025), and 15:00 (0.122 ± 0.017 g vs 0.112 ± 0.041 g; P of SD = 0.027), and tended to differ at 03:00 (0.038 ± 0.008 g vs 0.044 ± 0.017 g; P of SD = 0.056). The differences were observed during periods of stable activity, even when activity was low or high, but not when activity intensity was changing or stabilizing. Despite the limited number of animals available, these results demonstrate that shearing pregnant ewes acts as a fetal programmer with long-term effects, including a more homogeneous pattern of physical activity in rams and a trend in birth weights.

Working donkey welfare in West Africa: A case study in Zuarungu, upper east region of Ghana

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Donkeys are among the most widely used working animals in Africa, particularly for the transportation of goods, agricultural produce, and ploughing. Despite their economic importance, their welfare remains largely overlooked in livestock policy and development planning. This mixed-methods study assessed the welfare conditions of working donkeys in the Upper East Region of Ghana through structured physical observations conducted at Bolgatanga Market. Observations were carried out over a seven-day period by trained volunteers from the West Africa Centre for the Protection of Animal Welfare (WACPAW). The assessment focused on both animal-based and management-based welfare indicators, including visible wounds, harness condition, workload, hydration status, lameness, access to veterinary care, and transport methods. Visible wounds were observed in 77% of donkeys assessed. These ranged from small superficial abrasions at harness contact points to larger open lesions suggestive of prolonged friction, pressure necrosis, or untreated injury. Poor harnessing was recorded in 33% of animals, characterised by ill-fitting, worn, or inadequately padded equipment likely to cause chronic skin damage. Suspected overloading was identified in 57% of donkeys based on load size relative to body condition, spinal posture, and observable signs of physical strain. Clinical indicators consistent with dehydration including reduced skin elasticity, dull mucous membranes, and apparent fatigue were observed in 67% of animals. Lameness was present in 43%, primarily manifesting as limping, shortened stride length, or uneven weight bearing rather than complete non-ambulation. Furthermore, 33% of the donkeys had no recent history of veterinary care despite visible health concerns. The use of inappropriate transport vehicles, particularly tricycles (“motor-kings”), to convey donkeys to and from market locations was also documented. These vehicles are not designed for live animal transport and may increase stress, injury risk, and poor handling during loading and transit. The findings indicate that compromised donkey welfare in the region is systemic rather than incidental, driven by structural constraints including poverty, limited technical knowledge, and weak institutional recognition of working equids. Poor welfare directly affects working capacity, longevity, and owner livelihoods, reinforcing the economic case for intervention. Strengthening donkey welfare through low-cost, context-appropriate measures such as owner education, improved harness design, workload management, veterinary outreach at markets, and safer transport regulation should be integrated into regional livestock development and animal welfare policy frameworks in the districts.

Effects of emersion in water on behaviour, morphometric development, reproductive endocrinology and body surface thermoregulation in water buffalo heifers

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Buffaloes (*Bubalus bubalis*), adapted to semi-aquatic environments, exhibits compromised thermoregulation during tropical summer seasons, culminating in behavioural modifications and developmental constraints. This investigation evaluated the influence of continuous wallowing access on circadian behavioural rhythmicity, somatic morphometric accretion, reproductive endocrine profiles, and surface thermoregulatory dynamics in growing buffalo heifers during heat stress. Fourteen Murrah buffalo heifers (mean age 14.71 months) at ICAR-NDRI, Karnal were randomly divided into two groups (n=7 each) during summer months (May–October). Treatment heifers (T1) had 24-hour water pond access for wallowing, while control heifers (T0) followed conventional management without access to water body. Circadian behaviours were recorded continuously over 24-hour periods at fortnightly intervals. Morphometric measurements were taken fortnightly using standard landmarks. Serum cortisol, estradiol-17 β , and progesterone were assayed weekly by radioimmunoassay; face and thorax temperatures were measured pre- and post-wallowing via infrared thermography. Reproductive cyclicity was tracked fortnightly by transrectal ultrasonography for follicular wave detection. Data were analyzed using independent t-tests in SPSS v22. Wallowing access generated substantial modifications in circadian behavioural patterns. T1 heifers demonstrated higher feeding time (284.82 ± 2.98 versus 257.25 ± 3.55 min/day in T0, $P < 0.05$) and feeding frequency (12.66 ± 0.41 versus 9.84 ± 0.65 episodes/day, $P < 0.05$). Ruminating time remained comparable between groups (338.42 ± 2.99 versus 336.69 ± 2.99 min/day), whereas ruminating frequency was elevated in T1 heifers (14.87 ± 1.83 versus 11.52 ± 1.25 bouts/day, $P < 0.05$). Morphometric development exhibited marked enhancement in wallowing-access heifers. Body length demonstrated superiority in T1 heifers (120.24 ± 2.83 versus 116.65 ± 5.93 cm, $P < 0.05$). Greater heart girth (159.37 ± 3.63 versus 150.77 ± 4.08 cm, $P < 0.05$), height at withers (122.77 ± 1.34 versus 117.83 ± 1.76 cm, $P < 0.05$), and abdominal girth (112.94 ± 1.21 versus 109.51 ± 1.54 cm, $P < 0.05$) collectively indicated accelerated somatic growth. Reproductive endocrine profiles revealed favourable hormonal milieu in wallowing-access heifers. Serum cortisol concentrations were significantly reduced in T1 heifers (7.35 ± 0.27 versus 8.51 ± 0.48 ng/ml in T0, $P < 0.01$). Estradiol-17 β concentrations were elevated in T1 heifers (6.25 ± 0.21 versus 4.77 ± 0.12 pg/ml, $P < 0.1$), alongside higher progesterone concentrations (0.72 ± 0.05 versus 0.44 ± 0.05 ng/ml, $P < 0.05$). Infrared thermographic assessment demonstrated pronounced thermoregulatory efficacy of wallowing behaviour. Facial surface temperature declined from $100.90 \pm 0.47^\circ\text{F}$ pre-wallowing to $99.55 \pm 0.34^\circ\text{F}$ post-wallowing, while thoracic surface temperature exhibited substantial reduction from $103.50 \pm 0.58^\circ\text{F}$ to $98.14 \pm 0.38^\circ\text{F}$ (mean decreases of 1.35°F and 5.36°F). Reproductive cyclicity monitoring revealed marked advancement in pubertal development, with four T1 heifers exhibiting first follicular wave emergence during the observation period, compared to none in T0 heifers. In conclusion, wallowing provision enhances circadian feeding rhythmicity, accelerates morphometric growth, optimizes reproductive endocrine environment, facilitates thermoregulatory homeostasis, and advances pubertal transition in buffalo heifers.

What does the meow say? Investigation of the bioacoustics and frequency of vocalisations during behavioural tests and their association with the veterinary consultation

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Cats' vocalisations communicate internal states, offering valuable insights for optimal veterinary management and animal welfare. This study evaluated the association between auditory parameters of cats' vocalizations and their behavioural traits in veterinary consultation and behavioural tests. We hypothesized that distinct behavioural traits are associated with specific bioacoustic signatures, which manifest as divergent vocalisation patterns during clinical veterinary consultations. Twenty-six healthy cats were included. Initially, cats were individually subjected to behavioural assessments: an open-field test, a novel-object test, and an unknown human test, each lasting 3 to 5 minutes. Subsequently, a simulated veterinary consultation was conducted, starting with an anamnesis and followed by the measurement of physiological parameters (respiratory rate, heart rate, blood pressure, and rectal temperature) with minimal handling. Procedures were discontinued if cats showed signs of intolerance. Behaviours during the tests and the clinical evaluation were recorded and then ethogram-coded via BORIS software for subsequent analysis. The acoustic properties of the first vocalization, including duration, mean fundamental frequency, and peak frequency, were extracted in Python, selecting the first meow from the open-field test to represent initial contact with a novel environment and to exclude overlapping sounds. Additionally, to assess vocalization frequency during the clinical evaluation, the total number of vocalizations was counted. Statistical analyses in R used Principal Component Analysis to extract traits from behavioural tests. Linear regressions were then performed to determine whether these traits were associated with the acoustic parameters of the first meow during the open field test and with total vocalization frequency during the subsequent clinical evaluation. Three traits were extracted: Sociable, Bolder, and Extraversion. More extroverted cats had higher acoustic characteristics of the first meow during the open field test, with higher mean acoustic frequency ($p = 0.05$) and higher acoustic peak frequency ($p = 0.04$). Additionally, more bold cats had shorter vocalization duration during this test ($p = 0.04$). Regarding the clinical evaluation, more sociable cats vocalised more during both the anamnesis and the measurement of physiological parameters ($p < 0.01$). While some traits are linked to distinct acoustic parameters during the tests, the sociable trait was the primary factor associated with increased vocalisation frequency during the veterinary consultation. These findings suggest that although certain vocal patterns are linked to individual profiles, this relationship requires further analysis, considering that they could be influenced by the context of stress. Understanding vocal patterns across diverse situations may provide deeper insights into cats' behaviour and welfare.

Impact of slaughter techniques on animal welfare and ethical meat production: A comprehensive review focusing on the context of Bangladesh

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Ensuring animal welfare at slaughter is a fundamental ethical and scientific challenge, particularly in regions where traditional and religious slaughter methods are mainly in practice. This review synthesises current research on the impact of slaughter techniques on animal welfare, with a particular focus on practices in Bangladesh: a country where halal slaughter without prior stunning is widespread and modern stunning methods are only gradually being adopted. We evaluated physiological, neurological, and behavioural indicators of welfare in relation to both traditional and modern slaughter methods. The evidence demonstrates that non humane techniques and poor preslaughter handling result in elevated stress hormones, delayed loss of consciousness, and overt behavioural signs of distress, all of which compromise animal welfare and meat quality. In contrast, the adoption of effective stunning and careful handling practices significantly reduces pain, fear, and distress, while improving meat quality such as pH, tenderness, and shelf life. However, the implementation of welfare based slaughter remains limited in Bangladesh due to infrastructural, educational, and socio cultural barriers, including resistance to stunning and insufficient regulatory implementation. The review highlights the moral responsibility of meat producers to minimise suffering and stresses of animals which essentially require the relevant training to the related people, investment in modern slaughterhouse infrastructure, and collaboration between stakeholders: religious authorities, farmers, scientists, consumers and policymakers. Promoting the integration of humane slaughter techniques is essential not only for animal welfare but also for food safety, meat quality, and public trust in the wellbeing of farming animals and meat quality. This comprehensive analysis underscores the urgent need for context sensitive, welfare focused interventions in slaughter practices and calls for a balanced approach that respects both ethical norms and cultural values. The findings provide a framework for advancing humane slaughter and ethical meat production in Bangladesh.

Animals at work, welfare in context: Linking human practices to animal well-being

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1. Egerton University

Integrating animal welfare into human cultural and livelihood systems requires evidence that reflects both biological outcomes and social realities. This study examined working donkey welfare within diverse human cultural and economic contexts across six wards of Njoro Sub-County, Kenya. The study used household surveys and direct animal observations. Data was collected from 69 HHs and 146 donkeys, of which 63.7% were male, with an average age of 6.4 years. Donkeys were drawn from both rural (n=70) and urban (n=76) settings, allowing comparison of welfare outcomes across contrasting cultural and livelihood environments. Results demonstrated that donkey welfare is embedded within human economic practices and spatial context. Income derived from donkey work showed a strong positive association with total household income ($r=0.771$, $p<0.001$), underscoring the role of donkeys in livelihood strategies. Urban households earned higher donkey-related income and owned more donkeys while rural households had greater access to land. Donkeys in urban households exhibited better body condition scores and fewer harness-related injuries, reflecting context-specific management adaptations driven by security concerns, workload demand and income incentives. Multivariate regression analysis identified practical husbandry practices rather than socio-economic status alone as key determinants of welfare. Effective ectoparasite control was the strongest predictor of improved welfare ($\beta = -3.534$, $p = 0.0016$), while wound management practices ($p = 0.083$) and use of padded harnesses ($p = 0.127$) showed beneficial associations. Variables such as education level, training exposure and attitudes did not independently predict welfare outcomes. This highlights a gap between knowledge and practice. The findings provided evidence that animal welfare interventions are most effective when grounded in everyday human practices, economic incentives and local cultural contexts. Integrating welfare into livelihoods, rather than treating it as a standalone ethical issue, offers more sustainable pathway for improving the well-being of working animals and the communities that depend on them.

Using tri-axial accelerometers to evaluate the lying time of working donkeys in Mwea Sub-County, Kenya

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Lying is a normal maintenance behaviour in donkeys, and its evaluation offers an important reference for understanding typical activity patterns and assessing positive welfare. However, limited information exists on the lying behaviour of working donkeys, restricting our understanding of whether this behaviour is adequately expressed under working conditions. The objective of this study was to investigate the lying behaviour of working donkeys and identify the factors associated with its expression. This was a cross-sectional study involving 356 donkeys from 120 donkey users/owners in Mwea Sub-County, Kenya. Lying behaviour was recorded using tri-axial accelerometers, which were placed and secured to the right lateral aspect of the metatarsal region of each donkey. The data loggers continuously recorded the donkey's posture at one-minute intervals across three successive 24-hour periods. Questionnaires were used to capture the other animal- and farm-level factors. Daily lying time was analyzed using multilevel linear mixed-effects regression, incorporating farm/user identification number as a random effect. Working donkeys had an average lying time of 2.6 ± 1.94 hrs/day (median 2.04 hrs, range 0.19-11.72 hrs). In the multivariable model, several workload-related factors were significantly associated with log-transformed lying time in donkeys. Engagement in additional crop and livestock farming activities alongside donkey use was associated with a significant reduction in lying time ($\beta = -0.37$, 95% CI: -0.63 to -0.12 , $p = 0.004$), corresponding to an approximate 31% decrease in lying time compared to donkeys whose owners did not engage in additional farming activities. Donkeys transporting water had an estimated 19% reduction in lying time ($\beta = -0.21$, 95% CI: -0.42 to -0.01 , $p = 0.041$), those carrying rice had a 26% reduction ($\beta = -0.30$, 95% CI: -0.55 to -0.05 , $p = 0.018$), and those transporting livestock feed had a 27% reduction in lying time ($\beta = -0.32$, 95% CI: -0.54 to -0.10 , $p = 0.004$), compared with donkeys not carrying these respective loads. Higher daily earnings from donkey (the highest amount of money earned per day in Kenya shillings) use were also negatively associated with lying time ($\beta = -0.001$, $p = 0.001$), corresponding to an approximate 0.1% decrease in lying time per unit increase in earnings. The residual intraclass correlation coefficient was 0.21 (95% CI: 0.11–0.36). We conclude that donkeys in the study area lie for a short duration each day and engage in economically demanding tasks, which are associated with reduced lying time and possibly compromised welfare.

Efficacy of electrical stunning and halal slaughter on broiler stress physiology and meat quality: A meta-analysis

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Pre-slaughter stunning is a critical welfare intervention aimed at rendering broiler chickens insensible to pain during slaughter. However, inconsistencies in stunning application can compromise both welfare and subsequent meat quality. This meta-analysis quantitatively evaluated the effects of electrical stunning and halal slaughter on broiler stress physiology using muscle metabolism as a validated indicator of acute stress responses and subsequent meat quality outcomes. A systematic search of five databases identified studies published between 2010 and 2024. Eight studies met the inclusion criteria. Standardized mean differences (SMD) with 95% CI were calculated using random effects models. Heterogeneity was explored via subgroup and meta-regression analyses conducted in R software. Welfare-relevant parameters examined included electrical current intensity, stunning duration, and slaughter age. The meta-analysis revealed that electrical stunning significantly improved early pH ($\leq 4h$), ultimate pH (24h), water holding capacity (WHC), yellowness, and fat content, while halal slaughter resulted in higher redness. Notably, water bath electrical stunning (WBES) significantly increased early pH, indicating more stable postmortem metabolism and reduced stress-induced metabolic disruption. Lower electrical current intensity significantly increased early and ultimate pH, and yellowness of broiler breast muscle, while longer stunning durations were positively correlated with higher early pH (Estimate = 1.5959; $R^2 = 82.65\%$) and fat content (Estimate = 0.6284; $R^2 = 91.73\%$), but decreased redness (Estimate = -0.2871; $R^2 = 30.74\%$), suggesting reduced acute stress. Furthermore, slaughter age explained all of the between-study variation observed in yellowness (Estimate = 0.1581; $R^2 = 100\%$), with older birds producing more yellowish meat due to increased fat deposition. Genetic factors also played a role, with the Cobb 500 strain showing greater responsiveness to stunning in early pH, WHC, and yellowness, suggesting differential stress tolerance and genetic influence on stunning efficacy. This meta-analysis demonstrates that the physiological benefits of electrical stunning, reflected in reduced stress-induced metabolic disruption, are highly dependent on optimization of technical parameters, including stunning method, current intensity, and duration. Electrical stunning, when appropriately applied, enhances meat quality by mitigating stress-induced metabolic disruptions. These findings provide quantitative, evidence-based guidance for refining stunning protocols to improve stunning efficacy and minimize peri-mortem distress, thereby enhancing animal welfare outcomes.

One Welfare at home: Caregiver challenges and cat welfare during home-based treatment of feline sporotrichosis in Brazil

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Sporotrichosis, caused by *Sporothrix* spp., is the most common mycosis in South America and a relevant One Welfare concern. In Brazil, home-based management of feline sporotrichosis may directly influence treatment outcomes, zoonotic transmission, and environmental contamination, linking One Welfare and One Health risks. This study aimed to identify caregiver barriers during treatment, assess access to support, and describe waste-disposal practices, with emphasis on cat behaviour. An anonymous mixed-method questionnaire (objective and open-ended questions) was developed in Qualtrics XM® and made available online from May to July 2025. The survey was publicised via social media (Instagram, Facebook, WhatsApp, and X), email to researchers in the field, and posters to reach caregivers who treated cats with sporotrichosis. Exclusion criteria were individuals under 18 years of age and respondents who had not treated a cat with sporotrichosis. The questionnaire comprised 33 items across five sections: (1) general knowledge of sporotrichosis; (2) information on the cat undergoing treatment; (3) animal health and treatment-associated challenges; (4) human health and interspecies relationship; and (5) respondent demographics, plus one attention-check item. Here, we will focus on the results regarding cat behaviour barriers. A total of 247 complete responses were obtained. Among 238 respondents who reached the eligibility question, 208 (87.4%) reported treating at least one cat with diagnosed or suspected sporotrichosis. Management was predominantly home-based (80.6%), and 30.6% reported their cat was still under treatment at survey closure. Caregivers frequently reported barriers related to cat isolation and handling; 31.7% reported difficulty maintaining isolation from other animals and reducing human contact. Behavioural changes during treatment were commonly perceived as cat stress behaviour and often led to complicated handling and daily care, particularly in households with limited space for adequate isolation. Although knowledge was high (95.3% identified sporotrichosis as a fungal disease; 98.4% recognised zoonotic risk), 41.8% discarded contaminated waste in regular household trash. Home-based treatment of feline sporotrichosis is shaped by cat behaviour, particularly stress during isolation and handling, which directly affects daily care. Practical support and behaviour-informed management are essential to reduce caregiver burden, improve treatment adherence, and protect cat welfare and household biosafety.

Water quality as a determinant of welfare indicators in semi-intensive Nile tilapia farms in Egypt

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Water quality is a key environmental determinant of fish welfare in aquaculture, yet its role in shaping chronic welfare outcomes under commercial conditions is often insufficiently characterised. In semi-intensive Nile tilapia (*Oreochromis niloticus*) systems, limited routine monitoring of dissolved oxygen, ammonia and related parameters may result in prolonged exposure to suboptimal conditions with behavioural and physiological consequences for fish welfare. This study examined associations between water quality parameters and welfare indicators in commercial tilapia farms in Egypt. An applied field study was conducted across 12 semi-intensive tilapia farms distributed across four major production regions. Water quality parameters including temperature, dissolved oxygen, total ammonia nitrogen, pH, nitrite, alkalinity and water transparency were measured at regular intervals using standard farm-level methods. Fish welfare was assessed using non-invasive, routinely collected indicators recorded through a structured digital welfare assessment tool, capturing environmental conditions, fish condition and observable welfare-relevant outcomes over the production cycle. Data collection was embedded within normal farm management practices and did not involve experimental manipulation. Variation in water quality was observed both within and between farms, with recurring periods of low dissolved oxygen and elevated ammonia detected in multiple sites. These conditions were associated with patterns indicative of compromised welfare, including increased mortality and poorer fish condition scores. Farms that consistently identified and responded to emerging water quality risks demonstrated shorter durations of suboptimal exposure and more stable welfare indicator profiles over time. Farmer interpretation of water quality data in relation to fish condition and behaviour improved during the study period, supporting more timely management responses during high-risk periods. The findings highlight water quality as a central driver of welfare-relevant outcomes in semi-intensive tilapia aquaculture under real-world conditions. Routine monitoring of key parameters provides valuable information for identifying chronic welfare risks and interpreting welfare indicators in commercial systems. Integrating water quality assessment with welfare monitoring offers a practical framework for advancing applied ethological assessment of fish welfare in low and middle income aquaculture contexts.

Incorporating animal welfare assessment as a criteria to promote improvements in small scale pig farms in the South of Brazil

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Animal welfare is not part of the conventional rural extension activities in Brazil. We evaluated the impact of rural extension practices, teaching strategies, including animal welfare, in 133 pig farms, in the south of Brazil. The compliance with the existing Brazilian legal framework, was assessed by five rural extension agents, who carried out six repeated visits to each one pig farms associated with a Cooperative. Together with the producers, the rural extension agents, who are experts in animal science, carried out a checklist assessment of the criteria for compliance or non-compliance in five categories: a) overall organization strategy, b) biosecurity, c) health management, d) animal welfare, e) nutritional management. For animal welfare the baseline assessments were, carried out in the third visit. The evaluation criteria were based on resource evaluations using 7 items, derived from the Brazilian governmental normative 113: 1) Do the animals have adequate thermal comfort. 2) Do the facilities have windows with sufficient opening and adequate curtain management to ensure good air circulation and a low concentration of ammonia in the environment? 3) Is the area available in the installation consistent with the animal density used? 4) Are the farm curtains in good condition? Is adequate curtain management carried out? 5) Some technique to enrich the environment is available. 6) Are the facilities built in accordance with recommended welfare standards, thus preventing animals from suffering injuries? 7) Do people responsible for loading, unloading, and handling pigs receive training on good practices and animal welfare? In the 4th, 5th and 6th visits the baseline indicators collected were contrasted with baseline data, in the 133 pig farms, to gather a level of compliance. Initially, we applied the Shapiro-Wilk test, evaluating the normality of the data. Considering that both frequencies and percentages did not present a normal distribution (Shapiro-Wilk test), it was decided to use a non-parametric test (Wilcoxon Signed Rank) to verify whether there was an improvement in the indices after the intervention was carried out. When contrasting the answers to the 7 animal welfare questions, before and after the intervention the 931 possible answers, the sum, mean and median showed significant improvements. 62.73%, Post intervention, compliance with animal welfare criteria, represented by appropriated environmental conditions, space allowance, environmental enrichment, lesion score, improved from 700 out of 931 positive compliance questions, 75.18%, adding 12.45% with the extension interventions. Adding animal welfare into extension activities, for pig producers, yielded positive outcomes.

Towards a dialogue between multispecies ethnography and animal welfare science: Insights from pasture-based systems in Southern Brazil

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Applied ethology and animal welfare science have developed robust quantitative approaches that prioritize generalizable patterns and population-level physiological metrics. While these approaches are fundamental for large-scale assessments, they may overlook behaviors that fall outside the norm, where such divergence may be treated as statistical "noise" or sampling error. Focusing on pasture-based cattle systems, this paper proposes an interdisciplinary approach informed by multispecies ethnography - here understood as examining interactions between human and non-human actors - introducing situationality and contingency as analytical lenses that contribute to a more nuanced understanding of animal welfare. To explore how these relational dynamics unfold, the study draws on ethnographic conversations with producers and direct observations of cattle and management practices across eight farms in Southern Brazil. Rather than challenging the foundations of applied ethology, this study builds on existing approaches in animal welfare science, particularly in relation to animals' experience of their living conditions within the constraints of production systems. Animals cannot be fully reduced to passive objects of management; they may express context-dependent responses through interactions with humans, other non-human species, and their environment. It is within contingency, the situated events that do not fully conform to expected patterns, that such responses become particularly visible. Central to understanding these dynamics is the recognition of producers' situated expertise. This knowledge, cultivated through ongoing, localized co-presence, can be understood as a form of practical, field-based ethnography. Producers' observed attentiveness to subtle, non-routine animal responses highlights the role of situated knowledge in identifying welfare-relevant changes that may otherwise go unnoticed in formal welfare assessment approaches. However, recognizing that such situated expertise operates within the boundaries of economic and production constraints, we suggest its integration as a complementary layer to established biological welfare indicators. This perspective enables "situated management," in which decisions are continuously adjusted to local environmental and economic conditions and to observed animal responses. In this sense, welfare is not only measured but also enacted through relational attentiveness in everyday practice. Attention to contingency and situated expertise thus offers an additional lens for context-sensitive animal welfare assessment in pasture-based systems.

Understanding tick prevention gaps through one health lens: Evidence from companion animal owners in Kerala, India

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Tick-borne diseases represent an increasing threat at the human–animal–environment interface, particularly in tropical regions such as Kerala, India. Despite close human–pet interactions, evidence on how pet owners perceive and respond to tick-borne risks remains limited. This study adopted a One Health–oriented Knowledge, Attitude, and Practice (KAP) approach to identify gaps that may undermine effective tick control. A cross-sectional survey was conducted among 405 pet animal owners using a structured, pre-validated questionnaire. KAP scores were computed using standardized criteria. Associations between socio-demographic variables, veterinary engagement, and preventive practices were examined using chi-square tests and multivariable logistic regression. While 58.3% of respondents demonstrated good knowledge and 76.0% expressed positive attitudes toward tick control and zoonotic risk, only 37.0% reported good preventive practices. Awareness of zoonotic transmission was high (82.1%); however, misconceptions regarding year-round tick occurrence persisted. A knowledge–practice gap was identified. Receipt of information from veterinarians emerged as the strongest predictor of good practices (adjusted OR = 2.71; $p < 0.001$), exceeding the influence of education and attitudes. Respondents showed strong support (88.1%) for inter-sectoral collaboration, reflecting receptiveness toward One Health strategies. This study indicates that high awareness and favorable attitudes do not translate into effective tick-prevention behavior. The findings emphasize the role of veterinarians as behavioral change agents and highlight the need to move beyond awareness-based interventions toward practice-focused strategies. By demonstrating a knowledge–practice disconnect in high-risk tropical setting, this study provides evidence to support integrated tick-borne disease control policies.

Impact of confinement on behavior and cortisol chronobiology in gilts

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Breeding/gestation stalls were developed to enhance individual-animal care and were globally adopted across the swine industry. Despite welfare-related concerns in many countries, most farms still confine non-lactating sows in crates for part of their cycle. To gain deeper insight into the animal's experience during confinement, we examined naïve replacement gilts' initial transition from group-housing to individual stalls, focusing on behavior and the circadian rhythm of cortisol. We employed a within-subject repeated-measures design using 12 commercial gilts (TN70–24 weeks old). The animals were group-housed in a pen for 3-weeks and then moved to individual stalls for 4-weeks. Behavior was video-recorded weekly via continuous recording and focal sampling to observe posture (stand, sit, kneel, lie individually or collectively) and activity (moving, oral stereotypies, pawing/snooting/biting surfaces, scratching, drinking, other). Continuous recordings were analyzed using scan sampling at 5-minute intervals between 7:30 AM and 4:30 PM, three days/week. Focal sampling involved collecting a 6-minute recording per gilt each morning (8:00 AM) and afternoon (4:30 PM), over three consecutive days/week. Scan-sampling data were converted to binary and analyzed using GLMM. Focal sampling data were extracted as point events and durations and then analyzed using LMM. Saliva samples were collected individually using cotton rolls on three consecutive days each week at 7:30 AM and 5:00 PM. Cortisol concentrations were measured using a commercial ELISA Kit. The organization of the cortisol circadian rhythm was evaluated by analyzing the AM/PM concentration ratio. Only significant findings at $p < 0.05$ are reported. Transitioning gilts to crates significantly altered their behavior and the organization of their cortisol circadian rhythm. The behavioral scan sampling revealed that after moving to stalls, abnormal behaviors, such as sitting and oral stereotypies, increased, as did excessive snout interactions with surfaces. Group-housed gilts showed a clear preference for resting collectively rather than alone, while crated gilts rested less despite the stall confinement. Focal behavioral sampling confirmed a marked rise in kneeling, pawing at surfaces, and snout interactions with surfaces after being housed individually. While gilts were group-housed, the AM/PM cortisol ratio remained above 1, consistent with an organized circadian rhythm in which AM cortisol exceeds PM levels. However, during the first two weeks in crates, this ratio decreased, indicating a disruption of the normal cortisol rhythm. Our findings demonstrate that introducing naïve gilts into individual housing for the first time altered their behavior and cortisol chronobiology, consistent with at least immediate negative affective states and compromised welfare.

Epidemiological trends of bovine viral diseases: Welfare implications for cattle in smallholder systems of Bangladesh

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This retrospective five-year analysis (2020–2024) examines the epidemiological trends and welfare impacts of major bovine viral diseases in smallholder cattle production systems of Rajshahi District, Bangladesh. Data were extracted from official disease registers and passive surveillance reports maintained by the Department of Livestock Services, comprising 240 data entry points (12 months x 4 upazilas x 5 years). An upazila is an administrative sub-district; in this study, Durgapur, Puthia, Charghat, and Paba represented the four focal upazilas under the Rajshahi District. The mean cattle population per upazila, based on annual census estimates, was approximately 200,000, totaling 800,000 across the study area. Prevalence for each disease was calculated as the number of reported cases divided by the estimated cattle population per upazila per year. Lumpy Skin Disease (LSD), Foot-and-Mouth Disease (FMD), Bovine Viral Diarrhoea (BVD), and Rabies were the most common viral diseases documented. LSD emerged as the predominant welfare threat, with an annual prevalence of 4.92% (± 0.09), inflicting significant pain, distress, skin lesions, and secondary infections that compromised animal comfort and productivity. FMD, with a prevalence of 1.02% (± 0.07), was also a key source of acute suffering, causing lameness, reduced mobility, and feeding difficulties. Although BVD (0.05%) and Rabies (0.01%) were infrequent, BVD's chronic effects on health and productivity, and Rabies' severe zoonotic risk and welfare consequences, present ongoing challenges. Notably, seasonal peaks in LSD cases (72–78% of annual cases occurring from March to August) coincided with climatic conditions favoring vector proliferation. Adult and crossbred cattle were disproportionately affected by LSD and FMD, likely reflecting increased vulnerability associated with higher production intensity, genetic susceptibility, and management practices typical of intensified systems. The persistent endemicity of LSD and FMD underscores their role as major constraints on animal welfare, milk yield, and smallholder livelihoods. This study underscores the urgent need for integrated, welfare-oriented disease control strategies—including improved vaccination coverage, targeted vector management, and enhanced passive surveillance—to mitigate animal suffering and promote sustainable smallholder cattle production. These findings provide a critical baseline for developing welfare-focused interventions and research in north-western Bangladesh.

Lessons learnt from developing a machine learnable ethogram

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Indicators to assess dairy cow's ability to get up unhindered in free stalls include "lunge and bob room" and side lunge. These rely on resource based and visual observations respectively. Attempts to automate their assessment have revealed a tension between dichotomous behavioural categories and continuous sensor data. The aim was to explore indicators of comfortable rising that were adapted to sensor data and behaviourally meaningful. 7 cameras were placed to record over 12 cubicles in a free stall barn. 75 cows were recorded for 14 days in the standard cubicles and then for 14 more days after replacing the head and neck rails by flexible straps with 10 days of adaptation in between. Anatomical landmarks (muzzle, poll, withers, and sacrum) were tracked at 30 Hz during rising motions using pose estimation in 3D. The following indicators were investigated: head lunge distance, vertical bobbing amplitude, lunge angle, the forward displacement of the centre of mass (COM), and estimated peak reaction forces on the hind limbs. There was a significant effect of the flexible straps on head-bob room ($+0.10\text{m} \pm 0.03$, $p = 0.001$) and on head lunge angle ($+2.73^\circ \pm 1.01$, $p = 0.014$). Greater angle here means straighter neck). There was a significant effect on the forward displacement of the COM ($+2.8\% \pm 1.0$, $p = 0.006$) that was more pronounced in cows that originally had a low displacement in the rigid cubicles ($0.29 - (0.80 \pm 0.12)$ * (baseline COM shift), $p < 0.001$). There was no effect on head lunge distance, duration nor estimated work at the rear limbs. We also descriptively investigated displacement profiles and found that head forward acceleration during lunge peaked 1.1s earlier under the flexible configuration. The standard deviation of maximum head velocity increased from 0.19 m.s^{-1} under rigid bars to 0.29 m.s^{-1} under flexible straps. Lunge angle had a flatter distribution under flexible straps (kurtosis = 0.36 and 2.4). The first conclusion is that flexible straps allow for greater involvement of the of the head in displacing the COM forward and better accommodate diversity in cows. In terms of novel metrics to evaluate rising behaviour using sensors, we conclude that lunge straightness, head-bobs and displacement of the centre of mass are good candidate indicators. Benchmarking is necessary to understand the behaviour of these indicators and establish scales that can inform on improvements perceptible by the animal.

Prevalence and risk factors of lameness and it's underlying causes in lactating dairy cows in Bangladesh

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Lameness is a leading health and welfare disorder in dairy cattle and contributes substantially to production losses; however, systematic epidemiological evidence from Bangladesh is limited. This cross-sectional study estimated the prevalence of lameness, identified associated cow- and management-level risk factors, and described underlying causes of lameness in lactating dairy cows maintained under tie-stall systems. The study was conducted from July 2023 to June 2024 in Shahjadpur upazila, Sirajganj district, one of Bangladesh's major milk-producing regions. A total of 643 lactating crossbred cows (Holstein–Friesian × indigenous zebu) from 60 MilkVita-affiliated smallholder farms were examined. Lameness was assessed using a standardized 5-point locomotion scoring system (score 1–5), and cows with scores ≥ 2 were classified as lame. Data on potential risk factors were collected through structured farmer interviews and direct farm observations. Univariable screening (χ^2 tests) was followed by multivariable logistic regression to identify independent predictors of lameness, with results expressed as adjusted odds ratios (OR) and 95% confidence intervals (CI). Overall, 137 of 643 cows were lame, giving a cow-level lameness prevalence of 21.69% (95% CI: 18.6–24.9%), indicating that approximately one in five lactating cows was affected at the time of assessment. Hind limbs were significantly more frequently affected than forelimbs ($p = 0.005$), with the left hind limb showing the highest involvement. Farmers consistently underestimated the herd-level prevalence compared with veterinary assessment (median: 14.25% vs. 21.82%), suggesting that mild-to-moderate cases were commonly missed at the farm level. In the final multivariable model, higher parity (>4) (OR = 2.31; $p = 0.005$), active milking status (OR = 1.87; $p = 0.037$), milking frequency >2 times/day (OR = 2.14; $p = 0.012$), low body condition score (<2.5) (OR = 3.76; $p < 0.001$), and feeding concentrate plus roughage (vs. total mixed ration) (OR = 2.02; $p = 0.016$) were independently associated with increased odds of lameness. Clinical examinations indicated that hoof- and claw-related disorders predominated, including claw horn lesions such as sole ulceration and haemorrhage, alongside joint lesions and traumatic injuries. These findings demonstrate a moderate lameness burden in Bangladeshi tie-stall smallholder dairies and highlight the importance of improving nutrition and body condition management, reducing metabolic stress, and strengthening farmer detection and preventive hoof-care practices.

Pre-lamb shearing: Effects on ewe-lamb behavioral responses to early post-partum handling

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Pre-lamb shearing constitutes an acute management-related stressor involving close human handling and sustained increased thermoregulatory demand. Although this practice has been associated with improved neonatal performance, its potential effects on ewe-lamb behavioral responses to human handling remain unclear. The aim of this study was to evaluate whether pre-lamb shearing modifies behavioral responses of ewes and their lambs during a standardized handling test in the early post-partum. On day 80 of gestation, 35 multiparous Merino ewes carrying single fetuses were randomly allocated to shorn (Sh; n=17) or unshorn (Con; n=18) groups. All animals were managed together in the same outdoor paddock. Between 24 and 36 h post-partum, each lamb was separated from its mother by a familiar caregiver and restrained on the ground for 3 min. During this period, the number of vocalizations from both, the ewe and the lamb, were recorded. Immediately before lamb release, ewe-lamb distance was measured using a laser distance meter. Lamb body weight was recorded. Data were analyzed using PROC MIXED or GLIMMIX, depending on the variable distribution. Treatment and lamb sex were included as fixed effects in the model, and lamb sex did not affect any of the evaluated variables. Lamb body weight did not differ between groups (Sh: 5.18 ± 0.19 kg; Con: 4.97 ± 0.19 kg; $P > 0.05$). The number of ewe vocalizations (Sh: 28.94 ± 4.42 ; Con: 34.28 ± 4.30 ; $P > 0.05$) and lamb vocalizations (Sh: 2.59 ± 0.18 ; Con: 2.65 ± 0.18 ; $P > 0.05$) during the 3 min of separation were not affected by treatments. Ewe-lamb distance did not differ between groups (Sh: 1.62 ± 0.24 m; Con: 2.05 ± 0.24 m; $P > 0.05$). These results suggest that pre-lamb shearing did not affect ewe-lamb behavioral responses to human handling in the early post-partum. However, given the limited number of indicators assessed, caution is warranted when extrapolating these findings to broader maternal-offspring interactions.

Effect of a calming supplementation on tail biting: An ethological approach

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1. Nor Feed, 2. Epidalis

Tail biting, a major behavioral issue in farmed pigs, was historically managed through tail docking, but this procedure has adverse effects on animal welfare. Ethology is a powerful tool for understanding this abnormal behavior and evaluating management strategies such as dietary supplementation. This study aims to examine the effects of a dietary supplement containing *Melissa officinalis* and magnesium on pig behavior in a commercial gilt breeding farm with recurrent tail biting outbreaks. After weaning at 28 days, tail-docked pigs were randomly allocated to a supplemented (S, n=103) or control (C, n=102) group housed in similar rooms (4 pens/room, ~25 pigs/pen post-weaning; 8 pens/room, 13 pigs/pen in finishing). Pig tails were checked three times a week, without systematic analgesic treatment, consistent with farm practices. When fresh blood was observed in any pen, the supplement (Care Zen®) was added to drinking water (1 L/1000 L) for 5 days to all pens as a reactive strategy to evaluate effectiveness under outbreak conditions. Supplementation occurred at weeks 9 and 14 (2 pens with blood in S). For behavioral analysis, one pen per room was filmed for 5 days across weeks 9, 12, and 16 of age, periods defined before the trial started. Videos were analyzed by a blinded evaluator using 7-minute scan sampling, recording all pigs at each scan. Behavioral data were averaged across pigs and scan time points to obtain one value per pen and per hour (observation periods, OPs), avoiding pseudo-replication. Three behaviors were recorded using scan sampling: resting, exploring, and feeding. Tail biting events were quantified separately through continuous video observation and expressed per pen and per hour to ensure comparability. All variables were included in multivariate analyses using PCA and HAC, without time factor. Resting and feeding frequencies were consistent with the literature (Lebret et al., 2004), while exploratory behavior appeared lower than expected in both groups. Three clusters were identified: high-, medium-, and low-activity. The high-activity cluster, mainly associated with the control group, showed higher exploratory and tail-biting behaviors (Dunn, $p < 0.05$). The low-activity cluster showed higher resting frequency (Dunn, $p < 0.05$), mainly in the supplemented group. The distribution of OPs among clusters differed between groups (Chi-square on OP frequencies, $p < 0.05$). Tail biting events were more frequent in the control group. These results suggest that liquid supplementation may influence activity patterns and reduce damaging behaviors in pigs, although the observational design and farm constraints should be considered when interpreting outcomes.

Saving the next generation: Understanding the struggles of newborn buffalo calves in the Bathan (coastal pasture) areas of Bangladesh

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The Bathan (coastal pasture) system of Bangladesh is home to a significant buffalo population, crucial for the livelihood of thousands of pastoralist families. It is a family's savings account, a source of milk and meat, and a way of life passed down through generations. This study was born from the stories of the herders themselves, who watch helplessly as their future walks away with every calf that doesn't make it. We spent a year, from January to December 2025, living and working alongside 100 farming families in the Bathan of Bhola, monitoring 150 calf births. We didn't just bring checklists; we brought tea and a listening ear, learning about their joys, their struggles, and the harsh reality of bringing a new life into this challenging environment. We asked about the first milk, the shelters, the sicknesses, and we held our breath with them when a calf was born weak. What we found broke our hearts, but it also gave us a roadmap. The loss of young calves is devastating, with nearly one in five (18%) dying before they are a month old. We saw it happen—a tiny life lost to simple diarrhea or a lung infection because there was no shelter from the biting cold or the relentless sun. The root cause, we realized, isn't a lack of love for the animals; it's a lack of a safe space. Over 70% of the camps had no proper shelter for these newborns. Most heartbreaking of all, we saw that many calves never got that golden first milk—colostrum—simply because the calf was born in the dead of night, out on the open pasture, with no one there to help. But here is the hope. The solutions are not complicated or expensive. They are deeply human. They are about being there at the right time. If we can help families bring their expecting mothers closer to home when birth is near, if we can help them build simple, warm shelters from local materials, and if we can share the simple, lifesaving knowledge of colostrum, we can change this story. This isn't about high-tech science; it's about protecting a legacy. By saving these calves, we aren't just saving animals; we are securing the future of the families who have called the Bathan home for centuries, ensuring their unique way of life can survive for generations to come.

Wallowing improves thermoregulatory and reproductive response of geese during high temperature-humidity index

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The changing climate affects the management of animals and resultant heat stress can impaired the welfare, metabolic and immune response of the animals leading to reduced egg production and reproductive efficiency in farm animals. In this study, wallowing was considered as a promising coping strategy that deserves investigations. Twenty-four geese (12 males and 12 females) were used to assess the effect of wallowing on geese thermoregulatory response and reproductive characteristics during high temperature-humidity index within their breeding season. Each of the gender was divided into two groups: Wallowed and Non-wallowed groups to assess gender effect. Wallowing in pool of water in concrete wallow tank was done by the geese every alternate day for 5 weeks. Respiratory rate, pulse rate, rectal temperature, relative humidity and temperature were measured 48hours interval alternate to the wallowing day. Ambient temperature, relative humidity and thermoregulatory parameters were measured at morning (7-9am), afternoon (12-2pm) and evening (5-7pm) on the day of measurement. Semen were collected from individual gander (male geese) at 2 and 4 weeks post-wallowing, and evaluated for semen volume, mass activity, spermatozoa motility, livability and spermatozoa concentration. This measured the treatment effect on reproductive soundness of the ganders. Egg production by the geese in the female groups was recorded. Data obtained were analyzed using descriptive statistics and ANOVA at $\alpha 0.05$. The experimental protocol was approved by the institutional committee on Animal Care and Use and conformed with ISAE ethical guidelines. Wallowing, gender and post-wallowing time significantly ($P < 0.05$) reduced respiratory rate (19.68 ± 3.57 breaths/minute) and pulse rate (143.55 ± 15.86 beats/minute) for wallowed group compared with the non-wallowed (22.04 ± 2.69 ; 166.81 ± 14.20 beats/minute, respectively). Respiratory rate and rectal temperature were higher in the afternoon and evening periods than morning. Gender did not influence the thermoregulatory response measured. Semen quality parameters except semen volume were not significantly affected by wallowing. Their values were 56.5 ± 15.7 - $62.3 \pm 7.7\%$, 50.6 ± 15.7 - $53.1 \pm 9.1\%$, 84.9 ± 12.9 - $86.0 \pm 12.9\%$ and $115 \pm 133 \times 10^6$ - $223 \pm 15.6 \times 10^6$ spermatozoa/mL, respectively for mass activity, spermatozoa motility, livability and concentration. Post-wallowing time significantly ($P < 0.05$) increased semen volume. Higher volume was recorded at 2 weeks post-wallowing (0.68 ± 0.21 mL) compared with 4 weeks post-wallowing (0.36 ± 0.11). Wallowing x post-wallowing time increased ($P < 0.05$) semen volume at 4 weeks (0.70 ± 0.21 mL) than at 2 weeks (0.35 ± 0.06 mL) for non-wallowed group. The mean egg production was apparently higher in wallowed geese than the non-wallowed. In conclusion, exposure of geese to wallowing in water mitigated effect of heat stress by reducing the thermoregulatory variables, improved welfare, semen volume and egg production.

From science to policy: Applied ethology and global south collaboration to end the donkey skin trade

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The global donkey skin trade, driven primarily by demand for ejiao, has expanded rapidly over the past decade and now constitutes a major animal welfare, sustainability, and governance challenge across the Global South. Its impacts are most acute in Latin America and the Caribbean (LAC), Africa, and parts of Asia, where donkeys are essential to rural livelihoods, transport, food systems, and small-scale agriculture. While a strong body of applied ethology and animal welfare science now documents the behavioural, physiological, and population-level harms associated with donkey farming, transport, and slaughter, this evidence remains fragmented across regions and insufficiently mobilised in policy and regulatory processes. As a result, decisions affecting donkeys continue to be taken without species-specific welfare standards or coordinated scientific input, allowing the trade to persist and shift geographically. This satellite meeting responds to the need to join scientific and policy-facing forces across the Global South, with particular emphasis on LAC leadership, to consolidate and mobilise robust scientific arguments capable of supporting policy bans on the donkey skin trade. Convened within ISAE 2026, the meeting provides a neutral, high-level platform for South–South exchange, enabling scientists and allied actors to align evidence, messaging, and governance strategies.

Comparative physiological responses of Nigerian indigenous goat breeds to varying durations of heat stress exposure

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This study evaluated the physiological responses of three Nigerian indigenous goat breeds to different durations of heat stress exposure under tropical environmental conditions. The objective was to determine the effects of exposure duration, breed, and sex on thermoregulatory and stress-related behavioural responses, and to identify potential breed resilience to heat stress. A total of 90 goats (3–5 months old), comprising 30 each of West African Dwarf (WAD), Sahel, and Red Sokoto breeds, were randomly assigned to three treatment groups: T1 (0 h heat exposure, control), T2 (4 h exposure; 10:00–14:00 h), and T3 (8 h exposure; 09:00–17:00 h). Each treatment group consisted of four males and six females per breed. Data were collected on days 0, 3, 6, 9, and 12. Environmental parameters were recorded thrice daily. Mean ambient temperatures were 29.26°C (morning), 34.76°C (afternoon), and 25.56°C (evening), with corresponding relative humidity values of 75.60%, 61.00%, and 84.12%. The calculated Temperature–Humidity Index (THI) averaged 85.50 in the afternoon, indicating severe heat stress. Physiological parameters measured included body temperature (BT), rectal temperature (RT), pulse rate (PR), and respiratory rate (RR). Data were subjected to two-way analysis of variance (ANOVA) using breed and exposure duration as fixed effects. Means were separated using Duncan's multiple range test at $P < 0.05$. Results showed no significant breed effect ($P > 0.05$) on BT, RT, PR, or RR. Mean rectal temperatures were $39.57 \pm 1.14^\circ\text{C}$ (Sahel), $39.58 \pm 1.44^\circ\text{C}$ (Red Sokoto), and $39.84 \pm 1.42^\circ\text{C}$ (WAD). Similarly, pulse rates were 74.73 ± 22.29 bpm (Sahel), 73.13 ± 24.89 bpm (Red Sokoto), and 77.23 ± 26.23 bpm (WAD). However, exposure duration significantly influenced all physiological parameters ($P < 0.05$). Goats exposed for 8 h (T3) recorded the highest BT ($39.50 \pm 2.23^\circ\text{C}$), RT ($40.21 \pm 1.38^\circ\text{C}$), and PR (93.50 ± 27.01 bpm), compared with T2 and T1. A progressive increase in physiological indices was observed with increasing days of exposure, indicating cumulative heat load. Sex had no significant effect ($P > 0.05$) on measured parameters. The findings demonstrate that while Nigerian indigenous goat breeds exhibit comparable thermotolerance under heat stress conditions, prolonged exposure significantly elevates physiological stress responses. The absence of breed differences suggests similar adaptive capacity among the studied breeds under moderate to severe heat load. These results underscore the importance of managing duration of heat exposure in tropical goat production systems to maintain animal welfare and productivity.

The effect of straw bale packaging on slower growing broiler behaviour

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Within broiler production, meeting legislative and consumer expectations for welfare standards, while balancing sustainability goals and maintaining strict biosecurity requires an integrated management approach. Enrichment bales enhance broiler welfare by stimulating exploratory and comfort behaviours and increasing activity levels. However, traditional straw bales can pose higher biosecurity risks and concerns, particularly relating to Avian Influenza. Wrapped bales represent an alternative method of bale presentation, though there is a need to establish parity in their enrichment value. The current study investigated how slower growing broiler chickens interacted with two types of enrichment bales. Trials were conducted at Nottingham Trent University following favourable ethical approval. Redbro broilers (n=600) were allocated as hatched to four pens (4.8m x 2.8m, 150 per pen) and reared to d42. Birds were fed ad libitum and each pen was provided with 2 enrichment bales, either processed wrapped straw with the packaging slit to allow birds straw access (PROC) or traditional string tied straw (TRAD). Bale interaction was determined by scan sampling twice a day (am and pm) for 5 minutes per pen (d1-42). Each minute an observer noted the number of birds interacting with the bales in the following ways: pecking at bales, pulling at straw, carrying or running with straw and perching on bales. Ten birds per pen were selected at random and weighed every week. Litter was scored on d42 on a 10-point scoring system. Statistical analysis was carried out using SPSS v.30. Data was analysed using a one-way ANOVA to compare litter scores between bale types and weekly weights (g). The total number of birds observed interacting with bales during the 5-minutes was compared using a 2-Way ANOVA with bale type and bird age as factors. Broilers interacted with both bale types, with no differences in pecking (11.3 PROC, 10.1 TRAD, SEM 0.53, $p = 0.122$) pulling, (1.8 PROC, 2.1 TRAD, SEM 0.28, $p = 0.446$) straw carrying (1.64 PROC, 1.72 TRAD, SEM 0.207, $p = 0.786$) or running with straw (0.02 PROC, 0.09 TRAD, SEM 0.05, $p = 0.373$). Perching behaviour (22 PROC, 36.6 TRAD, SEM 0.97, $p < 0.001$) occurred more on the traditional bales, though interaction effects ($p < 0.001$) show more perching on processed bales for younger birds. Bird growth and litter quality were not impacted by bale type. Overall, the study suggests wrapped processed bales designed for improved biosecurity could deliver similar behavioural opportunities as traditional string-tied bales.

Mapping pig welfare best practices across the five domains model along the production chain, with emphasis on behaviour

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Within the five domains model, behaviour is one of the four physical domains (Nutrition, Environment, Health, and Behaviour) that influence the Mental State domain. However, the relative emphasis placed on behavioural interventions across the production chain is rarely quantified. We mapped pig welfare best practices (BPs) across all five domains in three locations (on farm, during transport, at slaughter), while quantifying the relative representation of the behavioural domain. A desk-based inventory of BPs was compiled within the internal project (SOA17) of the European Partnership on Animal Health and Welfare. Fourteen animal-welfare researchers first identified key welfare topics for each location through literature review and then compiled candidate BPs. BPs were defined as human-made actions or strategies aiming to fulfill animals' physiological and behavioural needs. BPs were included if supported by scientific evidence of welfare improvement and not classified as "unacceptable" in European Food Safety Authority (EFSA) guidelines (i.e., not conflicting with European Union (EU) legislation and EFSA recommendations); implementation in commercial systems was not required. On-farm BPs were further allocated to six production stages: dry/gestation sows, farrowing/lactation sows, piglets, weaners, fatteners, and boars. For comparative purposes, each BP was allocated to one predominant welfare domain based on expert consensus on the direct welfare mechanism targeted, acknowledging potential cross-domain effects; results were summarised as counts and percentages. Domain distributions (Nutrition, Environment, Health, Behaviour, and Mental State) were: (1) on-farm (n = 117): 15.4% (17), 20.8% (25), 33.6% (40), 14.5% (17), and 15.8% (18); (2) during transport (n = 51): 15.9% (8), 19.6% (10), 21.6% (11), 11.8% (6), and 31.4% (16); (3) at slaughter (n = 26): 7.7% (2), 19.2% (5), 11.5% (3), 11.5% (3), and 50% (13). Across locations, the behavioural domain remained relatively stable (12-15%), yet lower than health/environment, whereas the Mental State domain increased markedly from farm to slaughter. Behaviour-domain BPs often aimed to promote positive animal welfare (e.g., enrichment, opportunities for exploration/foraging, early socialisation, play behaviour, nesting). Overall, this mapping suggests behaviour-domain BPs represent a stable, but currently under-represented lever for promoting positive welfare across contexts, complementing measures that reduce negative states. These findings support integrating behavioural BPs alongside health- and environment-focused measures to balance prevention of negative states with promotion of positive experiences. Work was co-funded by the EU Horizon Project 101136346 EUPAHW. Views and opinions expressed are those of the author(s) only and do not necessarily reflect those of EU or the European Research Executive Agency.

Wildlife welfare: Centering the conversation around behavioral biology

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Scientific study of animal welfare has almost exclusively focused on animals living in captive conditions. This reflects our ethical and moral obligations to ensure good quality of life particularly when captive conditions lead to poor welfare. But what about animals experiencing other types of anthropogenic exposures? Does our moral obligation extend to animals not under our care but coping with consequences of our actions? Nowadays, no part of the world remains truly untouched by humans, and all wild animals experience some degree of human contact or are indirectly influenced by humans. Consequently, there is growing interest from conservationists and wildlife managers in assessing not only the health of populations but also wild individuals' health and welfare. However, pursuing this aim across free-living animals' biological and environmental diversity presents challenges. Further, welfare indicators used with captive animals might not be suitable for biological realities of wild animals. As applied ethologists, we often examine whether captive animals can fully express their behavioral repertoire in ways similar to free-living counterparts, and if not, whether this negatively impacts their ability to live a full life. Concern for wild animals has instead traditionally focused on conservation/management of species, health or fitness of individuals, and/or changes in ecosystem as a result of human actions. Evolution has shaped every aspect of wild animals over generations to fit their environment, including their behavior. As the outward expression of internal states, behavior is a primary tool animals use to respond to and thus survive in complex and often unpredictable environments. Studying behavior of wild animals in the environments they have evolved over millennia to inhabit can help us understand variability occurring within populations as a reflection of age, sex, social status, health, affective state and even personality. Comparing behavioral profiles of individuals over time, in different groups, or in habitats with vary degrees of human impact will provide insight into how animals are thriving or merely coping or experiencing distress. Behavioral profiles of individuals, in addition to population averages, could serve as fundamental knowledge to help validate other biomarkers. To capture this information, we will need to use remote sensing technologies to automate capture of relevant behavioral activities such as movements, social interactions, sounds, and chemical signals from many individuals. To conclude, understanding how wild animals' behavioral biology connects to feelings, physiology, and physical states will be fundamental to assessing and improving their welfare.

Associations between judgement bias and other indicators of affective state: A way to advance wild animal welfare science?

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1. Wild Animal Initiative

Judgement bias tests are now widely used and considered valid tools for assessing affective state across animal species. However, their application is not yet feasible outside captive settings, which strongly limits our ability to precisely assess how the countless animals living in the wild experience their lives. Identifying other markers commonly measured in the wild and that reliably correlate with judgement bias outcomes may help overcome this limitation by clarifying their validity as welfare indicators. To this end, we conducted a systematic review followed by a meta analysis to quantify associations between judgement bias test outcomes and somatic, behavioural or cognitive markers measured across species and experimental settings. Our systematic literature search was conducted in PubMed and Web of Science. Studies were included if they reported conclusive judgement bias testing and at least one additional somatic, behavioural or cognitive marker measured under specific experimental conditions. Only markers, which measurement is feasible in wild settings, were retained for further analyses. With this approach, the most common measures that we found to be reported at the same time as judgement bias test outcomes were glucocorticoids, temperature and body condition among somatic markers, locomotor activity and vocalisations among behavioural measures, and attention bias among cognitive measures. Meta-analytic models were then used to quantify the associations between these markers and judgement bias outcome. Our systematic review revealed substantial variability in the judgement bias paradigms and methods used across studies, highlighting a lack of standardisation in the field. The most frequently measured additional indicators reported alongside judgement bias outcomes were activity, glucocorticoids (CORT), exploration, boldness, body condition, vocalisations, fearfulness, neurological measures, stereotypy, and neophilia. Taxonomically, the literature was dominated by rodents, pigs, and sheep, revealing a striking gap in knowledge across the vast majority of animal species. During this talk, we will present the results of our systematic review and meta-analysis, and discuss the potential use of markers reflecting judgement bias outcome for assessing affective state and welfare in wild animal populations. We will conclude with a discussion of less common indicators that, although not included in the statistical analyses due to limited data availability, appear promising and show patterns consistent with judgement bias outcomes.

Using mice as models to improve conservation captive breeding: Females prefer males from higher-welfare, well-resourced housing

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When it comes to mate choice, females have typically evolved to be selective; and many studies of wild animals show that females prefer males demonstrating signs of low stress, good health and/or high libido. This suggests that captive conditions that reduce male welfare may reduce their attractiveness to females. We tested this hypothesis using mice (*Mus musculus*), predicting that compared to males conventionally-housed (CH) in small lab cages, females will preferentially court higher welfare males from well-resourced (WR) 'enriched' conditions. First, a small-scale pilot opportunistically used 12 DBA/2 males and 22 DBA/2 females, both sexes differentially-raised (half CH, half WR), but with heterogeneous reproductive experience. In T-maze mate choice tests, CH females preferred males from WR housing, spending significantly more time near them than CH males ($F_{1, 10} = 8.383$, $p = 0.016$) and sniffing them more ($F_{1, 5} = 33.197$, $p = 0.002$). Next, the main study used 12 dyads of DBA/2 male litter-mates, differentially-raised from 4 to 12 weeks old. Twelve virgin oestrous DBA/2 female sister pairs were each presented with a dyad of differentially-raised virgin brothers. Mate choice behaviour was videoed and analyzed blind to housing. Ultrasonic recording confirmed courtship singing in all trials. Females spent on average 1.5 times longer near males from WR housing than their CH brothers ($F_{1, 20} = 12.653$, $p = 0.002$), and sniffed them for nearly twice as long ($F_{1, 20} = 20.290$, $p = 0.002$): a significant preference consistent across differentially-housed females. Furthermore, when subsequently co-housed for mating in male-sister-pair trios (6 WR and 6 CH), WR trios also tended to be more likely to have litters. Thus as predicted, WR housing rendered males more attractive. How females identify WR males remains unclear. Effects here were not explained by male body weight, testis weight nor anogenital distance. However subsequent research suggests that compared to CH males, WR males may sing more readily to female cues, and produce songs more likely be attractive to females. Whatever the mechanisms, female mice clearly use housing-sensitive cues when assessing potential mates. This adds to previous studies across diverse taxa, including fruit flies, zebra fish, rats and mink, that demonstrate that males raised in sub-optimal housing are, compared to males from higher-welfare environments, less successful with females. Females are thus skilled at assessing male welfare state; and raising and housing males in higher quality environments may help improve the success of captive breeding.

Housing alters piglet vocalization during handling

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Questions remain about the impact of housing on the welfare of pigs, especially younger animals. Vocalizations can provide insights into the affective state of pigs, including their ability to cope with stressors, such as handling. This study aims to evaluate the effect of three contrasting housing conditions on piglets' vocalization during handling. In this study, 76 weaned piglets Large White x Landrace (male = 38; female = 38) were assigned to 3 treatments for 7 days: conventional (C; n=24), enriched (E; n=24; straw), and high-density (D; n=28; 16.6% more pigs). To prevent acoustic interference, the different treatments were never applied simultaneously. The handling consisted of randomly picking up each piglet from the ground and, while holding it gently, drawing a one-digit number on its back with a non-toxic marker. Marking procedures were conducted every other day at 10 am. Sounds were collected with a unidirectional microphone connected to a TASCAM recorder located in the center of the pen, 1m above the floor. A single trained researcher used Raven® Pro 1.6 to identify recorded non-overlapping vocalizations and then quantified parameters of calls recorded during the experiment. Based on the observed peak frequency distribution, three categories of calls were identified: Low (LF < 1600Hz), High (HF 1600-4000Hz), and Very High (VHF ≥ 4000Hz). The number and total duration of these calls were tallied and analyzed using linear mixed models. A total of 3911 vocalizations were examined, and only significant findings at $p < 0.05$ are reported here. Most calls when picking up the piglets were HF (81%), followed by LF (11%) and VHF (8%). No differences were observed between treatment D and the others. The total amount of time piglets spent making these HF calls during the catch was less for E compared to C. Conversely, LF calls were most common during lap-holding (64%), followed by HF (28%), and VHF (8%). E piglets had both more LF calls and spent more time making LF calls than C piglets during lap-holding. Thus, HF calls appeared to reflect the initial stress of being caught, whereas LF calls expressed the reduction of stress once the animals were more gently restrained. Interestingly, the degree of these responses was modulated by housing treatment as E piglets vocalized less HF during catching but more LF during lap-holding, consistent with an enhanced housing condition promoting better environmental coping mechanisms and improved welfare.

Effects of crate opening from day 4 postpartum until weaning on postural changes and piglet trapping in lactating sows

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The housing of lactating sows remains a persistent animal welfare concern. Temporary crating may offer a compromise that supports the welfare of both sows and piglets in the farrowing pen. In temporary crating systems, crates are opened 3–4 days postpartum (pp), allowing sows to use the full pen area. However, farmers are concerned that piglet mortality may increase once the crate is opened, as sow movements are no longer restricted. This study examined whether the free movement of the sow influences her activity and, specifically, its impact on piglet trapping and fatal crushing during postural changes compared with permanently crated sows. Eight healthy sows without leg problems were housed in temporary farrowing crates from five days before farrowing until three days pp, after which the crates were opened on the morning of day 4. These sows were compared with eight sows that were permanently crated throughout lactation. Sow and piglet behaviours were video-recorded for 24 h at two time points: 24 h after crate opening and on day 25 pp. Analysed behaviours included the number of postural changes (lying down and rolling), use of supports, and piglet trapping during postural changes. Data were analysed using generalized linear mixed-effects models; binomially distributed outcomes were fitted with a logit link function. The results showed a significant interaction between housing system and time point ($F_{3,32} = 20.26$; $p < 0.001$). Sows in temporary crating systems showed more postural changes on day 25 pp ($p < 0.001$) compared with sows in permanent crates, whereas no differences were observed 24 h after crate opening (ns). A higher proportion of piglet trapping events occurred in temporary crating systems ($n=34$ trapping events) compared to permanent crated sows ($n=4$ trapping events) ($F_{1,2425} = 7.00$; $p < 0.01$); however, only two piglets died during postural changes in temporary crates and no piglet in permanent crates. These results suggest that postural changes in temporary crating systems are rarely fatal for piglets, even when trapping events are more frequent, indicating that temporary crating may be a promising alternative housing system. Furthermore, the higher number of postural changes observed on day 25 pp was associated with increased activity in sows housed in temporary crating systems, which may reflect improved welfare.

