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El comportamiento natural
como factor clave para el
bienestar animal

**13-14
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2ª Jornadas 13-14 Julio 2023. León



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Final program

Jueves 13 Julio (Día 1)	
08:30-09:30	Registro
09:30-10:00	Ceremonia apertura
10:00-11:00	Plenaria 1: Xavier Manteca (UAB) <i>"Lo que la domesticación no ha cambiado: ¿cómo podemos garantizar el bienestar de los animales de producción en sistemas intensivos?"</i>
11:00-12:00	Café <i>Networking</i>
12:00-14:00	Comunicaciones orales Sesión 1
14:00-15:30	Comida de Trabajo
15:30-17:00	Taller: <i>"Herramientas digitales para la gestión de rebaños en áreas pastoreadas: perspectivas desde el punto de vista del bienestar"</i> con Ainhoa Urkijo (Neiker) y Nerea Mandaluniz (Neiker)
17:00-17:30	Café + Sesión de posters
17:30-19:00	Comunicaciones orales Sesión 2
20:00	Cena en el Palacio de los Guzmanes
Viernes 14 julio (Día 2)	
09:00-10:00	Plenaria 2: Samantha Ward (Nottingham Trent University) <i>"Should we use natural behaviour to assess zoo animal welfare?"</i>
10:00-11:30	Comunicaciones orales Sesión 3
11:30-12:30	Café + Sesión de posters
12:30-13:30	Asamblea General Red CIBA
13:30-14:00	Clausura de las jornadas y premios
14:00	Comida de Trabajo

Miembros del Comité Organizador:

- Alonso Díez, Ángel Javier; Universidad de León (Spain)
- Alonso de la Varga, Marta; Universidad de León (Spain)
- Averós, Xavier; Neiker (Spain)
- Blanco Penedo, Isabel; Universitat de Lleida (Spain) and Swedish University of Agricultural Sciences (Sweden)
- Liste, Guiomar; ESIC University (Spain)
- Llonch, Pol; Universitat Autònoma de Barcelona (Spain)
- Lomillos, Juan Manuel, CEU Cardenal Herrera, Valencia (Spain)
- Villagrà, Arantxa; Instituto Valenciano de Investigaciones Agrarias (Spain)

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Oral session schedule

Oral session 1		Oral session 2		Oral session 3	
Time	Presentation's title	Time	Presentation's title	Time	Presentation's title
12:00-12:15	INVESTIGATION OF CORRELATIONS BETWEEN SKIN LESION COUNT AND CONCENTRATIONS OF SALIVARY BIOMARKERS IN PIGS FROM SUCKLING TO FATTENING	17:30-17:45	PROLACTIN IN SALIVA OF PIGS AS A POSSIBLE BIOMARKER OF STRESS: ANALYTICAL VALIDATION OF AN IMMUNOASSAY AND CHANGES AT SLAUGHTERHOUSE	10:00-10:15	COWS VOCALIZATION AND BEHAVIORAL CHARACTERIZATION DURING EUTOCIC AND DYSTOCIC CALVINGS
12:15-12:30	SCRUBBER SYSTEMS TO IMPROVE AIR QUALITY AND ANIMAL WELFARE IN INTENSIVE PIG FARMS	17:45-18:00	OXYTOCIN CHANGES IN SALIVA OF SOWS KEPT IN DIFFERENT FARROWING SYSTEMS	10:15-10:30	USE OF A MONITORING SYSTEM FOR HEAT STRESS TO CHECK AND OPTIMIZE COOLING STRATEGIES
12:30-12:45	EFFECT OF LAMBING ON SUBCUTANEOUS TEMPERATURE IN EWES	18:00-18:15	DOES POOR STUNNING AFFECT THE ASSESSMENT OF ANIMAL-BASED MEASURES CONSCIOUSNESS IN LAMBS AT SLAUGHTER?	10:30-10:45	D-AWARE PROJECT: DIGITAL TECHNOLOGIES TO SUPPORT POULTRY FARMERS IN THE ASSESSMENTS OF HEALTH AND WELFARE
12:45-13:00	DEVELOPMENT OF A 3D ACCELEROMETER TO PREDICT DAIRY GOAT BEHAVIOUR	18:15-18:30	BEHAVIORAL VALUATION OF WELFARE IN THE MILKING PARLOR FOR DAIRY COWS	10:45-11:00	A SYSTEMATIC REVIEW OF INDICATORS TO ASSESS PIG WELFARE AND THE SENSOR TECHNOLOGIES TO MONITOR THEM
13:00-13:15	ANIMAL WELFARE IN SPORT HORSES IN THE EQUESTRIAN DISCIPLINE OF ENDURANCE BY ADAPTING THE AWIN PROTOCOL	18:30-18:45	MIGHT COWS HAVE ACCENTS? – ACOUSTIC CHARACTERIZATION OF CALVES VOCALIZATIONS FROM TWO DIFFERENT GEOGRAPHICAL LOCATIONS	11:00-11:30	FISH BEHAVIOURAL STUDIES TO ASSURE BETTER FARMED FISH WELFARE
13:15-13:30	RELATION BETWEEN HAIR CORTISOL CONCENTRATION AND MEAT QUALITY			11:30-11:45	ANIMAL WELFARE: THE VISITOR EFFECT ON THE BEHAVIOR OF FIVE <i>GORILLA GORILLA</i> INDIVIDUALS
13:30-13:45	CREATION THROUGH THE GOOGLE CLASSROOM PLATFORM OF ACTIVITIES ON ANIMAL WELFARE AIMED AT EARLY CHILDHOOD EDUCATION				
13:45-14:00	OVERLAPPING ATTRIBUTES OF ANIMAL WELFARE AND SUSTAINABILITY: POTENTIAL INFLUENCE ON CONSUMER BEHAVIOUR				

Plenary Sessions and Workshop

WHAT DOMESTICATION HAS NOT CHANGED: HOW CAN WE GUARANTEE THE WELFARE OF FARM ANIMALS IN INTENSIVE PRODUCTION SYSTEMS?

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The welfare of an animal depends on its health and on the extent to what its biological needs are met. Biological needs can be roughly divided into two main groups: (1) those related to nutrition and physical and thermal comfort, and (2) those related to mental health and behaviour, including a varied and stimulus-rich environment, a perception of control and agency, and the possibility to engage in highly motivated behaviours. This paper will deal with the importance of this last need for the welfare of farm animals. The term “behavioural need” was defined a few decades ago based on motivational theory. The two main traits that define a behaviour as a “behavioural need” are that (1) its onset depends mainly or solely on internal factors, such as changes in hormone levels, and (2) its motivation only disappears when the animal has performed the behaviour and therefore it is relatively independent of its functional consequences. Several early studies on behavioural needs used the nesting behaviour of sows as an example. As behavioural needs are controlled by internal factors - as opposed to external stimuli-, their motivation is independent of the environment where the animal is kept. Furthermore, animals must perform the behaviour, as otherwise its motivation will remain high. More recently, the concept of “behavioural needs” has been criticized on the grounds that many behaviours that do not fit its definition are still important for welfare, as they contribute to the physical or mental health of animals. In this paper, the term “behavioural need” will be used in a wide sense to refer to all behaviours that, independently of their precise motivation, are important for welfare. To identify which behaviours must be considered “needs”, we must first describe the natural behaviour of the species. This can be challenging for domestic animals, as their behaviour can be severely constrained by the human-made environment in which they live and finding out what is “natural” can be very difficult. One approach to overcome this difficulty is to study the behaviour of free-ranging populations of domestic animals. Several studies have followed this approach with cattle, pigs, and chickens, among other species. Their general conclusion is that the domestication process has modified the frequency and intensity of several behaviours but has not changed the ethogram of the species – e.g., its behavioural repertoire- nor the motivation of each behaviour. Therefore, the natural behaviour of domestic animals is not substantially different from that of their wild ancestors. Once the species’ natural behaviour has been described, the following step is to identify which behaviours -among all those that make up the ethogram- are important for welfare. One way of doing this is finding out whether the impossibility to perform a given behaviour has negative consequences such as an increase in abnormal behaviours, a stress response, or an alteration in the cognitive development of the animals. Also, cognitive bias tests, preference tests or tests that measure the elasticity of demand can be used to assess the relevance of a particular behaviour. These and other, complementary approaches have yielded the conclusion that positive social interactions and foraging behaviour must be considered behavioural needs for most if not all species. Additionally, other behaviours such as nesting, perching, and dustbathing are behavioural needs for some species (nesting is a behavioural need for sows and hens, whereas perching and dustbathing

are behavioural needs for chickens). The importance of positive social interactions -including the mother-offspring bond- has been studied in dairy calves and pigs. In natural conditions, calves interact with their peers from a very early age, whereas on many dairy farms they are housed individually until 8 weeks of age. Several studies have shown that group-housing of calves has many positive effects on the development of cognitive skills, among other benefits. In pigs, weaning at 3-4 weeks disrupts the mother-offspring bond -as natural weaning would occur at a much later age- and has negative consequences for the physical and mental health of piglets. The importance of foraging behaviour has been studied in pigs, chickens, and ruminants. In pigs and laying hens, inability to perform normal foraging behaviour (rooting in pigs and pecking and scratching in hens) is one of the main risk factors of tail biting and feather pecking respectively. It is noteworthy that the appetitive phase of foraging behaviour -e.g., the exploration and manipulation of food prior its intake- appears to be particularly relevant and turns out to be important by itself and not only to acquire food. In ruminants, the importance of foraging behaviour has been assessed in dairy cows by looking at cows' motivation to graze. To a lesser extent, it has also been studied in sheep kept indoors, and it has been suggested that grazing restriction contributes to wool-pulling. In this paper, a review of the experimental evidence about the importance of natural behaviour will be given, and some practical approaches to improve welfare of farm animals in intensive production systems by providing for their behavioural needs will be discussed.

SHOULD WE USE NATURAL BEHAVIOUR TO ASSESS ZOO ANIMAL WELFARE?

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Natural behaviours are defined as behaviours typically seen in the wild, evolved by natural selection and allow an individual to survive more easily in its environment. These include behaviours such as resting, sleeping, foraging, feeding and mating. Any modern zoo encourages the performance of natural behaviours from the animals with naturalistic enclosures and suitable housing and husbandry practices including environmental enrichment programs. However, it is not always safe, ethical or feasible to maintain all natural behaviours in a captive environment. Zoo legislation in the UK for example, discourages the feeding of live vertebrate prey to carnivorous animals. In the wild, the majority carnivores spend a high proportion of their day foraging and hunting – does this mean the zoo carnivores are not provided with positive welfare opportunities related to feeding? The performance of natural behaviours in zoo animals have always been regarded as indicative of positive welfare, with behavioural diversity indices being used as a method to assess this - but do these really work in zoos? The need for and frequency of animal welfare assessments in zoos is on the rise but with the majority of these being resource-based and not focused on the animals behaviour or psychological needs are they really assessing welfare? As you see, the current evidence for using natural behaviours as a means to assess zoo animal welfare is mixed. However, identifying behaviours that are driven by the psychological need of the species as well as focusing on behaviours that are indicative of positive welfare might just enable welfare researchers to assess zoo animal welfare holistically.

DIGITAL TOOLS FOR THE MANAGEMENT OF GRAZING AREAS: PERSPECTIVES FROM THE POINT OF VIEW OF ANIMAL WELFARE

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Grazing areas are complex ecosystem in where both, abiotic (slope, distance to water points, etc) and biotic (herbivore-predator interactions, competence and complementarity of the flocks, etc) factors are involved. Traditionally, the study of these ecosystems has been carried out by direct observation methodologies (i.e. scan-sampling for livestock monitoring or transects for vegetal monitoring), which supposes a high temporal and personal effort. Recent years, new technologies as GPS or virtual fencing devices, drones, etc. have been adapted as tools for the management of extensive grazing systems. These digital tools allow the collection of a large amount of data for both herd and land management. In addition, the growing development of sensors that can be adapted to these devices opens a wide range of possibilities for monitoring and modelling. As example, under the project LIFE Oreka Mendian (<http://www.lifeorekamendian.eu/>) the spatial use of livestock was monitored, taking into account landscape's characteristics. With the aim to find adequate management guidelines for these grazing areas, different practices were evaluated (mechanic as mowing, abiotic as the slope and biotic as the silvopastoralism activity). Spatial use was monitored by Global Positioning System (GPS) devices located on the leader animal of each herd. Collected data were used to study livestock preference and rejection towards different types of vegetation and slope-ranges, estimated by Jacobs index and GPS registers or density. In addition, spatial and temporal analysis of the silvopastoral activity was calculated at different buffer-ranges. Results showed that livestock positively selected mowed zones (mainly at low slope-ranges). Regarding silvopastoralism, Pyrenean oak forest was the most preferred habitat, followed by black and Scots pine forests. At the same time, a gradient from a higher GPS register density to a lower density was observed while distance from the open-pasture habitat increased, on which the type of forest also had influence. According to these results, the optimal zones for mowing would be those at low slope to assure livestock presence. Besides, it is highlighted the need to design silvopastoral activity depending on the grazing-area's potentiality and the animal species. As summary, automatically collected data for land management purposes by these digital tools, show a great opportunity for other disciplines such as animal behaviour, welfare or health. We consider very enriching to hold interdisciplinary approaches to identify possible collaborations and get all the potential to these data.

Oral session 1

INVESTIGATION OF CORRELATIONS BETWEEN SKIN LESION COUNT AND CONCENTRATIONS OF SALIVARY BIOMARKERS IN PIGS FROM SUCKLING TO FATTENING

Ko, Heng-Lun¹; Escribano, Damián²; López-Arjona, Marina¹; Botia, María²; Ortín-Bustillo, Alba²; Tecles, Fernando²; Fuentes Pardo, Pablo³; Cerón, José²; Manteca, Xavier¹; Llonch, Pol¹

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ClearFarm project intends to develop a platform to monitor animal welfare continuously throughout the value chain of pigs and dairy cattle using sensor technology. This platform relies on algorithms (for each species), built up with relevant welfare indicators measured by PLF (Precision Livestock Farming) technology. Before constructing the algorithm, a selection of indicators is required and should be cross-checked with gold standards (i.e., methods conducted by human observers). In this case, skin lesions and salivary biomarkers were investigated as potential references for validation. The aim of the study was to assess the changes in skin and tail lesions, and salivary biomarkers of pigs from suckling to the fattening stage, and the correlation between lesions and salivary biomarkers. Forty-nine pigs (25 males and 24 females) were sampled five times: T1 (suckling stage) – 24 days of age; T2 and T3 – beginning and end of the nursery stage; T4 and T5 – beginning and end of the growing and fattening stage. Cortisol, haptoglobin (Hp), and adenosine deaminase (ADA) were analyzed from saliva as the biomarkers of stress, inflammatory, and immune function, respectively. Generalized linear models and correlation tests were applied. Results showed that skin lesions increased over time ($P < 0.01$): T1: 0, T2: 0.06 ± 0.24 , and T5: 6.5 ± 1.57 , whereas we hardly found tail lesions during the study. Opposite to skin lesions, cortisol, Hp, and ADA, all gradually decreased (all $P < 0.01$). Cortisol (ng/mL) T1: 153.2 ± 115.99 and T5: 70.5 ± 57.09 ; Hp ($\mu\text{g/mL}$) T1: 3477.4 ± 1878.09 and T5: 931.8 ± 957.13 ; ADA (IU/L) T1: 4609.6 ± 2826.8 and T5: 2397.2 ± 1505.10 . Correlation tests between skin lesions and salivary biomarkers of each pig were conducted. Skin lesions were negatively and moderately correlated with all the biomarkers: cortisol, Hp, and ADA ($r = -0.35, -0.48, \text{ and } -0.31, P < 0.01$). Our study concludes that skin lesions and concentrations of salivary biomarkers change over time (either increase or decrease) when pigs grow older. The negative correlations between skin lesions and salivary biomarkers are at variance with our expectations but may be due to other factors such as individual variability, in which each pig has its own coping mechanism towards the environment. Moreover, the number of skin lesions in our study was low in general. Using PLF data may assist us to understand the underlying cause. Last but not least, caution is needed when interpreting or contrasting with PLF data as the former (skin lesions and salivary biomarkers) is individual-level data, whereas the latter (PLF sensors) is often pen-level data.

SCRUBBER SYSTEMS TO IMPROVE AIR QUALITY AND ANIMAL WELFARE IN INTENSIVE PIG FARMS

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Air quality is a key factor impacting pig welfare, especially in indoor-intensive production. Inside the barns, high levels of ammonia (NH₃), methane (CH₄), and suspended particulate matter (PM) can negatively affect animal health, welfare, productivity and environment. The objective of the European LIFE-MEGA Project is to test new technologies (wet (WS) and dry scrubber (DS)) to reduce the levels of NH₃, CH₄, and PM inside and outside pig barns. The scrubbers were installed in two different rooms, and a third room was used as control (all measuring 125 m² (11.30m x 11.07 m), divided in 6 pens (0.26m²/piglet)). Nine batches were evaluated at the beginning and end in two intensive weaning farms. The air quality parameters assessed inside and outside the barn were: NH₃, CH₄, CO₂, H₂S, N₂O, PM_{2,5} and PM₁₀. Animal welfare measures were assessed at individual level (weight, body condition score, skin condition, tail and ear lesions, manure on the body in 810 pigs, and saliva cortisol in 270 pigs) and pen level (thermal comfort, respiratory and digestive measures, and behavioural observations). Behavioural observations were conducted by scan sampling (6 scans/day/pen to record positive and negative social interactions, interaction with pen, interaction with enrichment, resting) and continuous focal sampling (15 min/day/pen, recording ear and tail biting, positive and negative social interactions). In each batch, 30 pigs per treatment were individually identified, and 10 of these used for saliva cortisol analysis. Data were analysed through the difference in the indicators between the last and first visit using different ordered logistic regression and multivariate linear models. The results of this study regarding air quality showed that the DS in fewer PM₁₀ compared to the control (mean±SD: 1.13±0.02 µg/L control; 0.97±0.02 µg/L DS; 1.07 ±0.08 µg/L WS, p<0.05). Despite NH₃ concentration inside the barn was not reduced, the WS retained a mean of 52.09±28.68 g/day of nitrogen. Regarding animal welfare, the DS presented reduced diarrhoea at pen level (median percentage: -5% control; -22% DS; -11% WS; p<0.001) and fewer social negative interactions (median percentage: +39% control; -25% DS; +38% WS; p<0.001). In conclusion, although the technologies did not have a significant impact in all parameters, DS reduced PM and improved some animal welfare indicators, while WS reduced NH₃ emission outdoor. These results are promising, and further studies should be conducted to validate the technologies as a tool to improve animal welfare whilst reducing the environmental impact of pig production.

EFFECT OF LAMBING ON SUBCUTANEOUS TEMPERATURE IN EWES

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The temperature of animals changes during the day according to a circadian pattern and is altered by diseases or stressful moments that the animal goes through. The study took place in September with an average temperature of 18.5°C (25.6-11.3°C). Three Assaf ewes with a live weight of 65.52±5.25 kg, which were diagnosed as pregnant by ultrasound, were implanted with a bio-logger device (DST milli-HRT ACT, Star Oddi, Gardabaer, Iceland) that recorded subcutaneous temperature every five minutes during the pre-lambing, lambing and post-lambing period for 28 days, the procedure was approved by the bioethics committee of the University of Salamanca with the n° 904.. After downloading the data (n = 5,801 records) were downloaded, the days were divided into three groups: PRE-LAMBING (n = 1,829 records): 11 days before lambing, LAMBING (n = 271 records): the day of lambing, and POST-LAMBING (n = 4,060 records): 15 days after lambing. Differences between day groups were analyzed by multivariate analysis of variance and post-hoc Tukey's test, with day group and time as fixed factors. Significant statistical differences (p<0.001) were found between the recorded temperatures of the three groups studied. The mean temperature increased to 39.03±0.33°C on the post-lambing days vs 38.55±0.45°C on the pre-lambing days. During all the days studied, the highest temperature recorded was concentrated at 16:00 h. (39.40°C) and the lowest at 8:00 h. (38.25°C). At 16:00 h. the group with the highest recorded temperature was the POST-LAMBING group (39.22±0.18°C) and the group with the lowest recorded temperature was the PRE-LAMBING group (38.69±0.49°C). Similar differences were found at 8:00 h, where the POST-LAMBING group had the highest recorded temperature (38.87±0.34°C) vs the PRE-LAMBING group had the lowest (38.16±0.46°C). The circadianity of the recorded temperatures changed at the three times studied. Lambing shifted the time of the highest acrophase from 19.53 h. in pre-lambing to 15.07 h. on the day of lambing. In conclusion, lambing produces a change in temperature records, which increase to febrile limits in the days following lambing. The circadianity of temperature is radically altered on the day of lambing, which gives us an idea of the physiological changes that the ewe must undergo at the time of lambing. It is possible to detect the onset of labour period with increasing temperature and on the other hand to reduce postpartum fever, as practical implications of labour.

DEVELOPMENT OF A 3D ACCELEROMETER TO PREDICT DAIRY GOAT BEHAVIOUR

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This study focuses on the application of new technologies in the livestock sector, particularly those aiming at improving individual animal management through data collection and analysis of animal behavior. The goal is to use this data as livestock health and well-being indicators. The study incorporates a commercial triaxial accelerometer called Digitanimal® into goat farms to provide information about individual animal behavior. The study was conducted at an experimental farm for small ruminants, using a herd of 14 Murciano-Granadina goats in a non-productive state. The accelerometers were integrated into collars worn by the goats, recording position values of the X, Y, and Z axes at a frequency of 10 Hz. Behaviors such as lying down, standing, rumination, fighting, movement, and inactivity were observed and recorded during 4 hours per day, always in the morning. Behaviours were recorded through an app provided by Digitanimal®, specially designed for the validation of the devices. The collected data were synchronized with the recorded behaviors, and the predictive capacity of the accelerometer was evaluated using the Random Forest machine learning algorithm. The results showed that the Random Forest algorithm had a moderate to high prediction capability for behaviors such as inactive and lying down, with 46% and 100% accuracy, respectively. The algorithm also performed well in identifying movement behavior, with an accuracy of 82%. However, rumination and fighting behaviors could not be evaluated due to the limited amount of data collected.

The study demonstrates that this sensor could predict behaviors such as active, inactive, movement, and lying down in goats. However, more data and observation hours are needed to improve the accuracy of predicting rumination and fighting behaviors. The accuracy of human observers in labeling behaviors is also an important factor that influences data synchronization, training, and validation. In conclusion, this study highlights the potential of using these specific accelerometers and machine learning algorithms to monitor and assess livestock behavior, providing valuable and promising insights into animal health and well-being.

ASSESSMENT OF ANIMAL WELFARE IN SPORT HORSES IN THE EQUESTRIAN DISCIPLINE OF ENDURANCE BY ADAPTING THE AWIN PROTOCOL

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The World Health Organisation (WHO) considers an animal to be in a satisfactory state of welfare when it is healthy, comfortable and well nourished, can express its innate behaviour and is not in pain, fear or stress. Animals need to have a foundation of good nutrition, adequate health, proper management, all of which contribute to the maintenance of their welfare. Animal welfare is based on the following 5 freedoms: Freedom from hunger and thirst; Freedom from discomfort; Freedom from pain, injury, and illness; Freedom to express normal behavior; Freedom from fear and distress;

For the objective assessment of animal welfare in sport horses, we propose an adaptation of the Animal Welfare Indicators Project (AWIN) protocol for breeding horses, based on its four principles, to which we add zootechnical, physiological and behavioural criteria, related to the equestrian discipline they perform, in this case for equestrian endurance. This is where we will propose the modification of protocols based on pre-, intra- and post-competition clinical checks.

The most important sport-related zootechnical parameters are age, weight, sex, reproductive cycle, environmental parameters (temperature, humidity, ventilation), handling parameters (interaction between grooms, trainer, rider, equipment) and feeding according to the energy requirements of the sport. In terms of physiological parameters measurable in competition, heart rate and rhythm, respiratory rate, temperature, mucous membrane condition, skin fold, capillary refill time, intestinal borborigms, muscle tone, regularity of trot and hoof condition (including appropriate shoeing). Behavioural aspects: absence of stereotypes and lack of dressage or defensive behaviour.

By properly observing the proposed parameters and establishing average ranges, the degree of animal welfare of the sport horse between and during equestrian competitions can be assessed and the standards of the veterinary regulations of the national equestrian federations and the Fédération Equestre Internationale can be used.

Animal welfare is a valuable but difficult area of research in which strong emotional and popular beliefs may outweigh scientific evidence. However, regular monitoring of the horse's health can optimize its welfare and reduce situations that can negatively impact it.

RELATION BETWEEN HAIR CORTISOL CONCENTRATION AND MEAT QUALITY

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Currently, consumers' concerns about their own health and animal welfare are in crescendo. For this reason, it is necessary to direct the cattle fattening period towards systems that seek the highest level of animal welfare and the highest quality of meat possible. This work aims to evaluate the relationship between the cortisol in hair (used as a welfare indicator) and the fatty acid content (used as an indicator for meat quality) depending on the forage provided during the fattening period. The study animals consisted of ten *Bos Taurus* cattle aged 7 months, during the 4 months of the fattening phase, five of them were fed with straw and concentrate, and the other five received hay and concentrate. Animals fed ad libitum. Both diets were isoproteic and isoenergetic. The racial phenotype (meat breeds of French origin) and weaning age (7 months) of the two groups were identical. In addition, the weights at the entrance (mean 249.25 ± 6.71 kg) and the exit (mean 379.4 ± 45.22 kg) of the feedlot were similar, with no significant differences. Two hair samples were taken from the scapular region of each animal (beginning and final of the fattening), with the aim of quantifying the variation in hair cortisol concentration during the feedlot period. After slaughter, samples of *longissimus thoracis* were collected to carry out a meat quality analysis, where fatty acids (conjugated linoleic acid (CLA), ratio omega 6/omega 3 ($\omega 6/\omega 3$)), fat, moisture, and protein were determined. We used R Studio for the statistical analysis. A decrease in cortisol levels was observed during the fattening period in both groups, but was slightly higher ($p = 0.798$) in the animals fed with straw and concentrate (mean 0.12 ± 0.25), specifically 0.03 pg/mg more than in the hay group (mean 0.24 ± 0.16). In the meat analysis, the proportion of protein, moisture, and fat, were similar in both feedlots. Conjugated linoleic acid (CLA) concentration in the samples from the straw group was (0.54 ± 0.093 %), compared to the (0.43 ± 0.072 %) found in the meat corresponding to the hay group ($p = 0.559$). In addition, the ratio omega 6 / omega 3 ($\omega 6/\omega 3$) of the straw and hay lots stood at (5.93 ± 0.63) and (7.77 ± 1.41), respectively ($p = 0.461$). Results of the present study suggest a positive relationship between the animal welfare indicator hair cortisol and meat quality parameters. However, more research work is necessary to develop nutritional handling strategies aimed at maximizing meat quality while ensuring animal welfare.

CREATION THROUGH THE GOOGLE CLASSROOM PLATFORM OF ACTIVITIES ON ANIMAL WELFARE AIMED AT EARLY CHILDHOOD EDUCATION

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Google Classroom is an educational platform developed by Google, specifically designed to facilitate the organization of virtual classes which allows for collaborative classroom management through the Internet. Currently, it is widely used because it enables users to organize content, interact with students in a way which they can receive information, respond to quizzes, and submit their work within the same platform, among other possibilities. The objective of this work is to facilitate the understanding of animal welfare in early childhood education, providing resources and activities adapted to the needs of students in this educational stage. The Lesson Planning which has been developed includes personalized learning itineraries for children. It incorporates various resources related to animal welfare from Open Educational Resources (OER), previous content curation, as well as suitable topic and age-specific resources. Likewise, questions have been included throughout the proposed learning itineraries, integrated into various activities to be evaluated later. Blank kid questionnaire was created, configured with a series of simple questions and a collaborative task which were adapted to the early childhood stage. A total of 7 boys and 7 girls aged between 5 and 6 years participated in the activity. Students were allowed to check their grades quickly after submitting their answers. The statistical analysis of the questionnaires and the collaborative activity was carried out through graphs generated by the Google classroom tool itself. An own rubric was also created which was used for the evaluation of the activities. The results show that the students obtained acceptable scores, correcting most of the questions asked. Therefore, the digital educational platform Google Classroom is presented as an appropriate tool to develop teaching aimed at training in animal welfare at this educational stage.

OVERLAPPING ATTRIBUTES OF ANIMAL WELFARE AND SUSTAINABILITY: POTENTIAL INFLUENCE ON CONSUMER BEHAVIOUR

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This study belongs to the first stage of a project aiming to analyze how overlapping attributes might affect purchase decisions for animal products. The main goal is to understand the intersection between two attributes impacting consumer behaviour: sustainability and welfare. Consumers tend to understand sustainability as a one-dimensional problem (environment) and prioritize it in their purchase decision-making processes. Welfare is a multidimensional concept influenced by culture and context and prone to perceptual discordance. Therefore, the possibility of consumers viewing welfare and sustainability as conflicting choices could compromise its marketability and, hence, the animals' wellbeing. We first performed a bibliometric study to analyze the available literature, clarify tendencies and identify research gaps. We searched for scientific publications in English, published between 2000 and 2022, considering the following keywords as inclusion criteria: Farm animal, Welfare, Sustainability and Consumer. We found 747 documents and reduced the scope by revising suitability of inclusion criteria within the abstracts. A full review of the resulting 138 papers to ensure adequacy led to the final 46 papers included in the analyses. Papers were classified according to year of publication, animal species, journal and area of publication, and authors' origin and expertise. We then performed automated content analysis (quanteda, tidyverse and topicmodel R packages) to generate text corpus statistics (number, relative weight and frequency of unique words and keywords) and visualize lexical dispersion plots and similarity graphs amongst documents. We also attempted Latent Dirichlet Allocation topic modelling on our textual data. Finally, we performed and agreed on a qualitative thematic analysis, using the inductively developed category system. Most frequent unique words were product_, consum_, food_, anim_, sustain_, meat_ and welfar_, while density of information per paper followed a positive linear correlation. Three main groups of papers were detected, two were closely related and homogeneous and the third one was distant and heterogeneous. None of the LDA models explored included our three main areas of interest together and tended to present topics in isolation or grouping welfare-sustainability or sustainability-consumer. Our thematic analysis centered around categories related to food labelling information and preferences (regarding either welfare or sustainability, but often both attributes are mixed unclearly) and its links to willingness to pay. The conflict between sustainability and welfare from a consumer perspective was hardly considered, but we found references to lack of interest on social aspects of sustainability, preference for sustainability over welfare labels and confusing information regarding sustainable intensification.

Oral session 2

PROLACTIN IN SALIVA OF PIGS AS A POSSIBLE BIOMARKER OF STRESS: ANALYTICAL VALIDATION OF AN IMMUNOASSAY AND CHANGES AT SLAUGHTERHOUSE

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Prolactin (PRL) is considered a biomarker of stress response, both acute and chronic, in several species. Although the scientific literature reports divergent results, some studies suggest that prolactin secretion during stress acts to maintain homeostasis within the immune system. Several studies have investigated the possibility of measuring PRL in saliva in different species such as rats, domestic ruminants, donkeys, dogs, cattle, and sheep for diagnosis or research purposes. Results obtained in animal models have indicated that the secretion of this hormone is dependent on the type and intensity of the stress. However, to our knowledge, PRL has not been measured in the saliva of pigs, species in which is especially appropriate due to its non-invasive collection. The objective of this study was to validate a commercial immunoassay for measuring PRL in porcine saliva and, to evaluate how prolactin can change in saliva after a model of stress based on transport, approximately 30 min, to the slaughterhouse. Saliva samples were collected using saliva collection tubes (Salivette®) and synthetic sponges of pigs from a commercial farm in Totana, Murcia, Spain. An analytical validation was made of pig PRL enzyme immunoassay (Cusabio®). In addition, salivary PRL was measured in ten pigs (5 male and 5 female) at different times: before the transport (BT), at the time of arrival (T0) immediately after unloading at the slaughterhouse, and 4h after arrival to the slaughterhouse (T4). PRL assay showed an average of intra- and inter-assay coefficient of variation < 12%. Linearity under dilution presented a linear regression equation with r^2 close to 1 and recovery percentage ranged from 90%. The limit of detection was 0.23 pg/mL. Salivary PRL was lower ($P<0.05$) at T0 (median 0.79 (0.58^{25th}-1.12^{75th}) pg/mL) and at T4 ($P<0.001$) (median 0.37 (0.32^{25th}-0.40^{75th}) pg/mL) as compared with BT (median 1.26 (1.05^{25th}-1.70^{75th}) pg/mL). In conclusion, PRL can be measured in saliva of pigs with the immunoassay used in this study that presented adequate precision and accuracy. In addition, although more studies are needed because of the low number of animals used, PRL showed a decrease after transportation and remains low during 4 hours at slaughter, indicating that it could be a biomarker of stress.

OXYTOCIN CHANGES IN SALIVA OF SOWS KEPT IN DIFFERENT FARROWING SYSTEMS

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Farrowing systems can influence the behaviour of sows during lactation -including their interaction with piglets and ability to move around-, hence improving their welfare. Oxytocin has been associated with positive emotions, and consequently to welfare improvement. The purpose of this study was to compare the welfare of sows through salivary oxytocin concentrations in three different farrowing systems during lactation and shortly after weaning. They were: farrowing crate (FC) and two different farrowing pens with temporary crating: SWAP and JLF15. SWAP and JLF15 had a crating period from 1-day pre-expected farrowing date to 3 days after farrowing, whereas FC had a larger crating period from entry to weaning. The main difference between SWAP and JLF15 was the pen size (3 x 2 m in SWAP and 2.40 x 2.40 m in JLF15) and, additionally, SWAP is designed in a way where the sows can have different spaces (resting, dunging, and feeding areas). Sows nursed their own piglets. Saliva samples from each sow (n=17; 6 housed in SWAP, 6 in JLF15, and 5 in FC) were collected at six different points during lactation and after weaning, relative to the time of farrowing: day 2 (1-day before opening the crates in SWAP and JLF15; FC sows remained crated), day 4 (1-day after opening the crate in SWAP and JLF15, FC sows remained crated), day 12 (mid-lactation), day 23 (end lactation), day 25 (1 day post-weaning), and day 26 (2 days post-weaning). Salivary oxytocin concentrations were measured using an AlphaLISA method validated in pig saliva. The results showed that SWAP sows had higher oxytocin values than FC sows on day 2 (SWAP: 1134 pg/mL; FC: 482.8 pg/mL; P=0.02). When oxytocin values were compared at different time points in each system, in the SWAP, oxytocin concentrations were higher on D2 (1134 pg/mL) and D4 (860 pg/mL) than D26 (320.2 pg/mL) (P=0.01 and P=0.05, respectively), and were higher on D2 than D25 (672.8 pg/ml) (P=0.02). In the JLF15, oxytocin concentrations were higher on D2 (455.2 pg/mL) than D23 (313.2 pg/mL) (P=0.04). Finally, in the FC, oxytocin concentrations on D4 (575 pg/mL) were higher than D23 (224 pg/mL) (P=0.02). In conclusion, the increased oxytocin values in the SWAP compared to the FC, as well as the higher values at the beginning of lactation in temporary crating systems might suggest an improvement in the welfare of sows in temporary crating systems compared to the conventional system.

DOES POOR STUNNING AFFECT THE ASSESSMENT OF ANIMAL-BASED MEASURES CONSCIOUSNESS IN LAMBS AT SLAUGHTER?

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According to EU legislation on the killing of animals (EC n. 1099/2009), to ensure that animals do not regain consciousness before slaughter, the efficiency of stunning method must be evaluated through animal-based measures (ABMs). In 2021 EFSA has indicated a list of ABMs commonly applied in the slaughterhouses to assess proper stunning in sheep. The aim of this study was to evaluate, in a commercial abattoir, whether the poor quality of the head-only electrical stunning (incorrect position of the electrodes, duration) influences the presence of signs of consciousness (ABMs) in lambs. Data were collected during normal slaughter routine, on 50 lambs (LW 6.0-8.0 kg) in one Italian slaughterhouse. Lambs were manually restrained and stunned with a head-only fixed on the wall, and hoisted on the rail by one operator. A second operator bled each lamb by the perforation of jugular veins. Two fixed video cameras (GoPro 7 HERO) were used: one recorded the stunning and hoisting phases, while the second recorded the bleeding during post-cutting period up to 54.59 ± 15.29 s. Videos were analyzed using BORIS (8.17.1). The quality of the stun, the stun-to-stick interval, and the ABMs related to a poor stun (absence of tonic seizure, righting reflex, movements of the ears, the head, the nostrils, and the eyes) were evaluated by a trained observer. In 20 lambs the stun was correct, while in 28 lambs the electrodes were placed in the wrong position on the head of the animals, and in two lambs the duration of stun was less than 2s. When the stun was correct, the lambs showed: ears movements (18%), movements of the eyes (4%), movements of the head (16%), movements of nostrils (24%), righting reflex (14%), and absence of tonic seizures (4%). When the stun was poor the lambs exhibited: ear movements (24%), movements of the eyes (2%), movements of the head (14%), movements of nostrils (24%), righting reflex (26%), and absence of tonic seizures (12%). Moreover, a Mann-Whitney U test showed a significantly higher probability of absence of tonic seizures correlated with longer stun-to-stick interval (23.3 ± 1.81 s vs 21.19 ± 5.81 s). These preliminary results highlighted the critical presence of sign of consciousness in both correct and poor stunned lambs. Further analysis is needed to investigate the correlation between each ABM and other parameters. Furthermore, it would be useful to identify possible automation solutions, which may inform the operator of the incorrect placement of the electrodes.

BEHAVIORAL VALUATION OF WELFARE IN THE MILKING PARLOR FOR DAIRY COWS

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Milking cows is one of the most important tasks on dairy farms. Poorly performed milking can lead to animal welfare problems manifested by increased aversive behaviour. Kicking is defined as the cow's behaviour as she shifts her weight from one leg to the other (Rousing et al., 2006). Several factors are associated with stepping behaviour during milking, such as the quality of the human-animal relationship, lameness, teat injuries, milk production, and number of parturitions, among others. This study aimed to correlate step frequency with animal-related factors. The study included 32 farms with a total of 1799 cows. At each milking, the number of steps taken by each animal was recorded. The lactations of the animals studied were divided into three classes: first class: cows with 1-lactation cows; second class: cows with 2 and 3 lactations and third class: cows with four or more lactations. The lactation phases were defined according to the milk contrast: 1st phase: ≤ 60 days; 2nd phase: 61 to 120 days; 3rd phase: 121 to 180 days and 4th phase: > 180 days. The degree of lameness was also assessed according to the method of Sprecher et al. (1997). Statistical treatment of the data was carried out using the SPSS program. Animals with four or more lactations had a significantly higher number of steps ($P < 0.001$) compared to cows with fewer lactations, with an average of 6.43 ± 5.99 steps for primiparous cows and 8.02 ± 7.69 steps for cows with four or more lactations. No differences ($P > 0.05$) were observed in the number of steps taken at different stages of lactation, although cows in the third stage of lactation showed a greater number of significant steps (7.61). In the lameness score, differences ($P < 0.001$) were found in the frequency of steps, with animals scoring 5 having three times more steps than cows with little or no lameness (scores 1 and 2). It has been observed that lame cows were very agitated during milking, probably related to the pain felt in the limb affected by this pathology. Therefore, observing the steps and related behaviour during milking can help to detect lame cows or other problems.

MIGHT COWS HAVE ACCENTS? – ACOUSTIC CHARACTERIZATION OF CALVES VOCALIZATIONS FROM TWO DIFFERENT GEOGRAPHICAL LOCATIONS

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The development of artificial intelligence algorithms and monitoring technologies has led to the increased use of sensors in animal production. Animal production stakeholders have emphasized the importance of non-invasive methods that provide accurate information without compromising the physical integrity of the animals. Animal vocalizations offer an opportunity to capture data of biological relevance without animal manipulation. However, the development of machine learning (ML) algorithms, based on certain assumptions, may impact the accuracy of the measurements and the interpretation of the information obtained from sensors. Vocalizations from individuals of the same species are assumed to have similar acoustic features. However, communication is strongly influenced by the environment, and there might be differences in acoustic features among individuals of the same species and age in different geographical locations. Therefore, to test this hypothesis, two categories of calves' (Holstein, around 5 months old) vocalizations were tested, i.e., "high vocalization" (short duration and with an ascendant fundamental frequency (f_0) with repetitions) and "low vocalization" (longer and with a lower f_0), along with coughing (shorter duration and high f_0) in two dairy cattle farms in Spain (in the province of Girona and Valencia), during 4 consecutive days in a temporal transit corral at each farm. The recorded vocalizations and cough were analyzed for f_0 , repetitions, duration, and other spectral parameters by the Audacity® software. In total 3,921 vocalizations and 2,351 coughing events were detected. Statistical analyses were performed with a Npar1way model. Differences were observed between the two farms on the vocalization spectral parameters (bandwidth, centroid, and roll-off, $P < 0.05$), duration (Mean \pm SD; *high*: 1.73 \pm 0.003 vs. 1.43 \pm 0.013 sec; *low*: 1.70 \pm 0.004 vs. 1.38 \pm 0.002 sec.; $P < 0.05$) and f_0 (*high*: 239.27 \pm 0.757 vs. 287.61 \pm 2.712 Hz.; *low*: 157.59 \pm 1.219 vs. 265.64 \pm 0.672 Hz.; respectively $P < 0.05$). Likewise, coughing spectral parameters (bandwidth, centroid, flatness, and roll-off, $P < 0.05$), duration (0.58 \pm 0.001 vs. 0.55 \pm 0.001 sec., $P < 0.05$), and f_0 (133.49 \pm 2.155 vs. 300.46 \pm 2.754 Hz., respectively; $P < 0.05$) were also different between farms. Recorded campaigns were conducted in different facilities and environmental conditions, which may affect the detection of sounds. This study reveals that designing ML algorithms for monitoring animal sounds should account for differences in the acoustic variability of farms/geographical locations to increase measurement accuracy.

Oral session 3

COWS VOCALIZATION AND BEHAVIORAL CHARACTERIZATION DURING EUTOCIC AND DYSTOCIC CALVINGS

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Calving is a painful and stressful event for dairy cows. Continuous monitoring can provide quick and accurate assistance to the cow, reducing stress, pain, and preventing calving difficulties (dystocia). Vocalizations can provide information on cow welfare problems, such as pain. The aims of the current study were: (1) to characterize cows' vocalizations before and during calving and (2) to determine the relationship between cow vocalizations and pain-related behavior in eutocic and dystocic calvings. Ten Holstein cows (five primiparous and five multiparous) were individually housed in a pen and video and audio recorded before and during their calving on a dairy farm in Spain. The recording took 1.5 hours/cow. Four calvings required traction assistance due to abnormal calf presentation and/or a prolonged calving, which were categorized as dystocic. Videos were observed to detect pain-related behaviors, including cow's posture, abdominal contractions, and vocalizations. Vocalizations were categorized on the basis on their acoustic features: duration, fundamental frequency (f₀) and spectral properties (bandwidth, centroid, flatness, and roll-off) using the Audacity® software. Vocalizations were classified into three types: “*high*” (416 vocalizations), short and an ascendent f₀ with repetitions; “*low*” (7 vocalizations), long and a lower f₀; and “*calving*” (122 vocalizations), shorter duration than “*high*” and an ascendent f₀. There were differences (P<0.0001) between “*high*”, “*low*” and “*calving*” vocalizations based on their acoustic features. Linear mixed models and correlations between behavioral and vocalization data were performed using the SPSS® statistical software. Cows with dystocic calving vocalized more than eutocic calving (31.35 ± 5.79 vs. 5.88 ± 4.64, respectively; P=0.0003). The incidence of “*high*” and “*calving*” vocalizations was higher in primiparous cows (27.31 ± 5.41) than in multiparous cows (9.92 ± 4.95) (P = 0.03). During the 1.5 hours before and during calving, there were positive correlations between vocalizations and abdominal contractions ($r_s = +0.55$; P = 0.001), and between vocalizations and the time that cows spent lying in lateral position ($r_s = +0.56$; P = 0.001). The vocalizations recorded in this study were associated with pain at calving and dystocia. These results highlight the potential of vocalizations as a useful tool for farmers to detect pain and prevent problems at calving.

USE OF A MONITORING SYSTEM FOR HEAT STRESS TO CHECK AND OPTIMIZE COOLING STRATEGIES

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Heat stress in dairy cows can have detrimental effects on milk production and reproduction. Traditional indicators like the temperature-humidity index (THI) provide an estimate of potential stress but fail to measure the actual impact on the animals. To address this, the study utilized the SenseHub® monitoring system, which records panting, a direct indicator of heat stress, along with intake and rumination data. The objectives of this work were to evaluate the impact of heat stress on cows in different production phases and assess the effectiveness of cooling strategies such as showers. The study monitored 77 cows from various production cycles, including lactating, dry, and postpartum cows, using the SenseHub® collar. Information on panting, intake, and rumination was collected over 24 hours, as well as daily and monthly averages from June 2022 to September 2022 in a commercial farm located in Bétera (Valencia, Spain). THI values were recorded during the whole experimental period. For prepartum cows, two cooling strategies were compared: 2 hours per day in three showers vs. 4 hours per day in six showers. Dry and postpartum cows received 4 hours of cooling per day in six showers. The results showed that lactating cows experienced the highest impact of heat stress, while dry cows were less affected. The monitoring revealed a significant difference between day and night impacts, with the highest panting percentage occurring during the day for lactating cows. In addition, the number of showers did not affect to dry cows as expected. Panting duration correlated inversely with intake and rumination activity, indicating the severity of heat stress. Descriptive analysis as well as T-test with paired data was performed with SAS System®. The beneficial effect of cooling on heat stress was clear during the day, but some doubts appear during the night. The average percentage of panting animals varied depending on whether they were in the cooling period or not. Comparing the two cooling strategies for lactating cows, no significant biological differences were observed. Despite the positive impact of cooling, heat stress remained high, with THI values above 72 resulting in reduced production and conception rates. In conclusion, the monitoring system used in this work proved to be a valuable tool for evaluating heat stress impacts and optimizing cooling strategies. However, under conditions of high ambient humidity, further evaluation of alternative cooling strategies is necessary to effectively mitigate the negative impacts of heat stress while optimizing available resources.

D-AWARE PROJECT: DIGITAL TECHNOLOGIES TO SUPPORT POULTRY FARMERS IN THE ASSESSMENTS OF HEALTH AND WELFARE

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Currently, animal welfare is a well-established dimension of the sustainable animal production. Farmers already perceive animal welfare as a management aspect, acknowledging the interconnections between welfare, health, and performance. In this scenario, the Welfare Quality (WQ) and AWIN® projects developed protocols to assess and control risks associated to animal welfare for different poultry species. The Techwel project combined these protocols and developed the Broiler App, a tool to carry out broiler welfare assessments. However, the implementation of such combined protocol requires training and time to collect data, and therefore, while useful for scientific purposes, it is not practical for farmers. The objective of the D-AWARE project is to develop a simplified digital tool to support meat poultry farmers during regular welfare self-assessments. This tool (the D-AWARE app) will be based on sub-sets of key on-farm and at slaughter indicators, specific for turkeys and broilers, with a high predictive capacity of the on-farm welfare status of flocks. To develop the D-AWARE app, complete sets of on-farm and slaughterhouse welfare indicators will be obtained for broilers and turkeys. With the data, AI tools will be applied to explore and identify key welfare indicators with the best predictive potential. Based on these indicators, the D-AWARE app prototype tool will be developed, and then tested by different end-users. A market transference and valorisation strategy will be developed in parallel. At the end of this project, it is expected that the D-AWARE app will be ready to be transferred to the market, and to be adopted and used by meat poultry farmers and companies both from a national and international scale. Adoption of the D-AWARE tool during meat poultry daily management routines will allow having first-hand, quantitative information about flock health, welfare, and performance with little economic and time investment. Farmers will not need to have a high technological competence to be able to use the app and to obtain practical information based on solid scientific grounds. This pocket tool will facilitate early detection of welfare problems, being the animals the most direct beneficiaries as their health and welfare will be easily monitored, and corrective measures will be taken in case deficiencies are detected. This will also maximize the possibilities of successfully passing welfare inspections, as well as improving productivity by assuring maximum flock welfare and performance at slaughter, thus having a positive impact on the economic outcomes of the meat poultry industry.

A SYSTEMATIC REVIEW OF INDICATORS TO ASSESS PIG WELFARE AND THE SENSOR TECHNOLOGIES TO MONITOR THEM

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Pig production is considered one of the largest and most intensified production systems and raises major concerns regarding animal welfare. Animal welfare must be assessed using valid welfare indicators, which can be (a) animal-based, directly measuring the response of the animal (physical and mental) to the environment, and (b) resource-based, measuring the environment of the animal and estimating the risk for animal welfare. The aim of this systematic review is to elaborate a list of welfare indicators covering the five domains of pig welfare at all stages of the production cycle, from the farm to the slaughterhouse. A literature search was performed following the PRISMA systematic review guidelines to identify studies using valid indicators. The search was conducted using PubMed, Web of Science and Scopus databases including peer-review papers written in English and published from January 2000 to December 2022. From 1583 papers found, only 119 have been selected. In total 76 validated indicators were extracted: 27 indicators were measured on the farm, 10 in transport, and 39 at the slaughterhouse. Regarding the indicators assessed on farm, all five domains are covered: good feeding ($n=3$), good housing ($n=5$), good health ($n=9$), appropriate behaviour ($n=3$), and mental domain ($n=7$). The indicators more studied in this phase are the feeding and drinking behaviour, postural changes and movements, vocalisations, and lameness. In transport, only indicators of good housing ($n=4$), good health ($n=1$), and mental domains ($n=5$) were found, being environmental parameters, body temperature, and biomarkers the most frequently used. At the slaughterhouse, indicators related to good housing ($n=6$), good health ($n=23$), and mental domain ($n=10$) were identified, with skin lesions (including ear and tail lesions), and fear and stress behaviours as the most popular indicators. These indicators can be assessed either by a human observer or by precision livestock farming (PLF) sensors. The most frequent PLF sensors to monitor animal welfare indicators were, computer vision solutions, thermal cameras, infrared sensors, microphones, accelerometers, radio frequency identification (RFID), and environmental sensors, which can be used mainly on farms and, to a lesser extent, in transport. It is important to remark that there is a lack of validated technologies, mainly at the slaughterhouse, capable of assessing indicators related to the health domain such as lesions, signs of disease and the state of consciousness after stunning.

FISH BEHAVIOURAL STUDIES TO ASSURE BETTER FARMED FISH WELFARE

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On-farm conditions directly influence fish behaviour. When assessing aquatic animals' welfare standards, behaviour is one of the critical aspects to consider. This presentation will briefly describe a general view of Spanish aquaculture, some of the farmed fish's most frequent behaviours (e.g., aggressiveness, appetite, distribution, gill ventilation frequency, swimming activity, etc.), and how scientific studies are needed to cover fish welfare. A literature review was conducted on fish behaviour and farmed fish welfare parameters. Scientific articles, guidelines, reports, and certification standards were analyzed. Also, current collaborations with other animal welfare organizations provided valuable information to learn about various finfish species, rearing systems and conditions in aquaculture in different EU Member States and third countries. In 2019, the estimated global number of farmed finfish destined for consumption was 124.000 M, equivalent to 15.5 times the human population worldwide. According to Mendeley, only 1.25% (173 out of 13,798) of the scientific articles published between 2018-2023 were dedicated to studying their behaviour. However, most resources are usually allocated to salmon and rainbow trout, leaving other frequently farmed species in Spain aside (i.e. seabass, seabream, tuna, and turbot). For instance, farmed seabass (23,924 tonnes), rainbow trout (15,357 tonnes) and seabream (9,632 tonnes) were the top 3 fish produced in 2021. There are scientific knowledge gaps on farmed fish welfare. Therefore, assigning more resources to research projects focused on this topic is essential. In particular, to the species raised in the Mediterranean, such as European seabass (*D. labrax*) and gilthead seabream (*S. aurata*). On the other hand, it is vital to approach welfare positively, identifying behaviours that can be encouraged in existing aquaculture rearing systems, e.g., favoring natural fish behaviours through environmental enrichment.

ANIMAL WELFARE: THE VISITOR EFFECT ON THE BEHAVIOR OF FIVE GORILLA GORILLA INDIVIDUALS

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Can the presence of visitors influence gorilla behavior? Tourists are an inevitable presence in zoos, so this study aimed to determine their impact on the behavior of the gorillas in the Parque de la Naturaleza de Cabárceno, as an indicator of their welfare. For this purpose, a comparative study of the behavior of 5 individuals was carried out, between the summer period when visitor numbers are high (277,082), and the winter period when there are fewer visitors (71,279). Ethograms specifically designed for this species were adapted, and behavioral data were collected using the "focal sampling" and "zero sampling" methods, with one minute of observation per gorilla, resulting in a total of 74 hours of observation. A total of 776 observations were collected for adult female 1, 789 observations for adult female 2, 813 observations for adult female 3, 697 observations for youth male, and 539 observations for adult male when they were present on-site during sampling. The sampling was conducted from the visitors' space between 10:00 and 18:00, with observations recorded every 15 minutes. Various variables were considered, including the periods mentioned above, the number of visitors present during observations, and the influence of open/closed dormitories. Data collection was facilitated by the free software "Behavioral Observation Research Interactive Software" (BORIS), and subsequent analysis was performed using SAS version 9.1, employing the "CATMOD" and "FREQ" procedures. Overall, the findings of this study showed a significant increase in the frequency of feeding, locomotion, and environmental monitoring behaviors during the peak period, corresponding to the summer season. Visitor vigilance behavior, which is related to anxiety levels, was more prevalent during the off-peak period, and this trend was particularly significant for the male silverback. An increase in visitor numbers correlated with higher levels of vigilance and abnormal behaviors such as trichotillomania, ear cover and coprophagy. The study also found that resting and abnormal behaviors frequency were higher when the dormitories were closed. Statistical analyses confirmed the presence of a visitor effect, which needs to be evaluated individually for each gorilla. Moreover, several significant relationships were found between the variables studied, providing valuable insights for welfare assessment and recommendations for improvement.

Posters Presentations

ASSESSMENT OF THE DEGREE OF ANIMAL WELFARE IN STUD FARMS

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Although being provided with food, water and safety, domesticated horses are confined in spaces that are convenient for humans, preventing them from natural behaviors. In addition to that, communication challenges may also arise since humans often exhibit authoritarian behavior. These factors contribute to increased stress levels, resulting in unwanted behaviors and potential health issues if these conditions persist. Given that the primary cause of declining health in captive horses is anthropogenic, it is crucial to understand how the horse-human relationship affects their welfare and, thus, prevents further deterioration. Various tools and protocols can help identify welfare indicators. However, their applicability in different captive horse environments should be examined.

In this study we test the Animal Welfare Indicators Project (AWIN) protocol for horses on a horse farm. The focus of the AWIN is to tackle the creation, integration, and distribution of indicators related to the welfare of animals, particularly regarding farm animals. The farm had 21 mares that lived in corrals (~62%), and 13 stallions and leisure horses that lived individually in boxes (~38%). Out of 34 individuals in total, seven (~21%) presented poor conditions: 5 mares that lived in corrals and 2 mares that lived in boxes. The proportion of individuals with poor conditions in corrals (23.81%) was higher than those in boxes (15.38%).

Three main stress and pain sources were identified after following the protocol. First, neglected hooves, especially in the mares living in groups. Second, artificial groups without individual choice, leading to a feeling of lack of control and becoming a source of stress-related diseases. Lastly, sport malpractice, which involves overusing the horses' physical capabilities and forcing unnatural postures, making them prone to injuries, high levels of stress, and subsequent pain.

Based on the protocol, the farm did not have a significant number of individuals experiencing a decline in welfare. The individuals exhibiting bad health conditions were likely a result of neglect due to a lack of knowledge and poor management rather than intentional mistreatment. It is important to notice that the protocol acknowledges that it is not effectively fitted for horses living in groups, which can result in misinterpretation of observations in such cases. Additionally, there is a need to modify the protocol to make it accessible to inexperienced horsemen and stable caretakers. This adaptation aims to enhance the horse-human relationship, regardless of whether the horse is owned for breeding, leisure, or sports purposes.

RELATION BETWEEN HAIR CORTISOL CONCENTRATION AND MEAT QUALITY

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Currently, consumers' concerns about their own health and animal welfare are in crescendo. For this reason, it is necessary to direct the cattle fattening period towards systems that seek the highest level of animal welfare and the highest quality of meat possible. This work aims to evaluate the relationship between the cortisol in hair (used as a welfare indicator) and the fatty acid content (used as an indicator for meat quality) depending on the forage provided during the fattening period. The study animals consisted of ten *Bos Taurus* cattle aged 7 months, during the 4 months of the fattening phase, five of them were fed with straw and concentrate, and the other five received hay and concentrate. Animals fed ad libitum. Both diets were isoproteic and isoenergetic. The racial phenotype (meat breeds of French origin) and weaning age (7 months) of the two groups were identical. In addition, the weights at the entrance (mean 249.25 ± 6.71 kg) and the exit (mean 379.4 ± 45.22 kg) of the feedlot were similar, with no significant differences. Two hair samples were taken from the scapular region of each animal (beginning and final of the fattening), with the aim of quantifying the variation in hair cortisol concentration during the feedlot period. After slaughter, samples of *longissimus thoracis* were collected to carry out a meat quality analysis, where fatty acids (conjugated linoleic acid (CLA), ratio omega 6/omega 3 ($\omega 6/\omega 3$)), fat, moisture, and protein were determined. We used R Studio for the statistical analysis. A decrease in cortisol levels was observed during the fattening period in both groups, but was slightly higher ($p = 0.798$) in the animals fed with straw and concentrate (mean 0.12 ± 0.25), specifically 0.03 pg/mg more than in the hay group (mean 0.24 ± 0.16). In the meat analysis, the proportion of protein, moisture, and fat, were similar in both feedlots. Conjugated linoleic acid (CLA) concentration in the samples from the straw group was (0.54 ± 0.093 %), compared to the (0.43 ± 0.072 %) found in the meat corresponding to the hay group ($p = 0.559$). In addition, the ratio omega 6 / omega 3 ($\omega 6/\omega 3$) of the straw and hay lots stood at (5.93 ± 0.63) and (7.77 ± 1.41), respectively ($p = 0.461$). Results of the present study suggest a positive relationship between the animal welfare indicator hair cortisol and meat quality parameters. However, more research work is necessary to develop nutritional handling strategies aimed at maximizing meat quality while ensuring animal welfare.

ANIMAL WELFARE IMPLICATIONS OF WATER TROUGH USED BY HEIFERS REARED UNDER EXTENSIVE CONDITIONS

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Water is an essential element important from the nutrient and animal welfare point of view. In the present scenario of climate change, all the knowledge about extensive cattle behaviour related to water use could help develop appropriate handling strategies to mitigate the impact of water availability on animal welfare. This study aims to evaluate the influence of food supplementation on the social behaviour and circadian use of water troughs by cattle reared under extensive conditions. A total of 1708 videos of 5 seconds each from a period of approximately two months (September and December) were obtained using digital photo-trapping cameras (119935 TRAIL SCOUT BUSHNELL®) with IR movement sensors. Videos were analyzed with Reproductor Windows Media®, and the frequency of drinking, agonistic non-ritualized and ritualized behaviour, grooming, and animals present in the area around the trough of a group of 20 heifers 1.5 to 2 years old were registered. Two rectangular water troughs with 690 and 815 cm of linear access and 50 cm deep were used. Data were processed by dynamic tables with Excel. When supplementation was carried out during September, most of the drinking episodes were registered in the 2 hours after the consumption of concentrated food, both in the morning (from 10 a.m. to 12 p.m.) and in the afternoon (from 16 to 18 p.m.). On the other hand, when this practice was not carried out, the heifers routinely maintained the morning drinking period, despite finding ice water on a high number of occasions, producing the peak of water ingestion around 10:00 a.m. The analysis of the behaviour of the cows in the areas adjacent to the drinking trough revealed a high frequency of agonistic patterns (maximum total frequency of 58 events for no ritualized and 68 events for ritualized patterns) during the peaks of use of the drinking troughs, which indicates that access to water resources implies conflicts between dominant and subordinates' animals. In conclusion, this study observed a circadian pattern of drinking episodes and the presence of animals around the drinkers influenced by feeding management. Considering the limitations in duration and only one farm assessed, more studies should be done to corroborate these results.

SALIVARY OXYTOCIN IN SEPSIS: CHANGES AND COMPARISON WITH OTHER ANALYTES IN PIGS WITH *STREPTOCOCCUS SUIS* INFECTION

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Oxytocin has been associated with positive and stressful situations in animals in previous studies and has an important role in parturition and lactation. However, a few studies have evaluated its relationship with sepsis because of the anti-inflammatory effects in the early stages of sepsis and a possible protective role by limiting organ damage. The objective of this study was to evaluate the possible changes in salivary oxytocin concentrations in pigs diagnosed with meningitis induced by *Streptococcus suis* in comparison to healthy pigs, and the comparison with other salivary analytes such as alpha-amylase (biomarker of stress), haptoglobin (biomarker of inflammation), and S100A8/A9 and S100A12 (biomarkers of an innate response activation). A total of 56 growing male pigs were used in this study. The animals were classified into two different groups: the healthy group (n=28), integrated by clinically healthy pigs, and the meningitis group (n =28). Salivary oxytocin and haptoglobin concentrations were determined by AlphaLISA methods, while alpha-amylase activity was measured by a commercial method (a-Amylase, OSR6182, Beckman Coulter). S100A8/A9 and S100A12 were analysed by BÜHLMANN fCal Turbo® assay using an Olympus AU400 autoanalyzer and SEB080Po Cloud-Clone ELISA kit, respectively. Oxytocin showed higher median values in infected pigs (4108 pg/mL) in comparison to healthy pigs (2256 pg/mL) (P=0.004). In addition, alpha-amylase, haptoglobin, and S100A8/A9 and S100A12 also showed higher median values in infected pigs (alpha-amylase: 7306 U/L; haptoglobin: 3874 µg/mL; S100A8/A9: 0.24 mg/L; S100A12: 0.72 mg/L) than healthy pigs (alpha-amylase: 814.4 U/L; haptoglobin: 2516 µg/mL; S100A8/A9: 0.07 mg/L; S100A12: 0.20 mg/L) (P<0.001; P=0.021; P<0.001 and P<0.001, respectively). Regarding correlation between oxytocin and the other biomarkers, a significant correlation was only found with S100A8/A9 (r=0.449, P=0.015). The increase found in oxytocin could indicate a role of this protein in sepsis and infectious diseases with anti-inflammatory effects and avoiding organ damage as has been described in humans. However, further studies should be performed in the future to clarify the reason of oxytocin increase in *S. suis* infection. In conclusion, there is an increase in salivary oxytocin concentrations in pigs with meningitis due to *S. suis*.

ANIMAL WELFARE IN THE BREEDING OF FIGHTING BULLS: BEHAVIOURAL ASSESSMENT USING THE WELFARE QUALITY® PROTOCOL

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The growing concern for animal welfare led the European Union to develop reference protocols known as the Welfare Quality® Assessment Protocols. These protocols pay little attention to extensive systems due to the perception that in this type of exploitation, animals experience less stress and better welfare conditions by being able to freely express a wide variety of natural behaviours. Bullfighting farms are an excellent example of an extensive environmentally friendly farming system, but they are not exempt from challenges such as hunger, parasitism, and adverse weather conditions. Therefore, it has been considered necessary to evaluate animal welfare in extensive exploitations, specifically, in bullfighting livestock, due to their unique and dangerous handling system because of the selection of these animals based on behavioural factors such as bravery. In this sense, the aim of this study was to evaluate the behaviour of animals in a bullfighting cattle farm, as well as to compare the behaviour between bulls and steers in the herd. A total of 55 animals were examined in the pens, which were located (32 bulls in the first pen and 23 bulls in the second). The information was collected considering only the male bulls and young male bulls of the herd aged 3 and 4 years. For this purpose, the study evaluated 4 criteria collected in the Welfare Quality® Protocol applied to fattening cattle to assess the appropriate behaviour of the animals. The scoring system of this protocol was used to evaluate the “expression of agonistic and cohesive social behaviours”, the “expression of other behaviours”, “good human-animal relationship” and “positive emotional state” in the 2 pens where the 55 animals belonging to the last production phase were located. The farm obtained a final score of 43.05 points for this principle, which is considered “Acceptable”. The zero scores in the “good human-animal relationship” criteria affected the rating negatively. Despite this, the rest of the criteria related to behaviour obtained excellent scores, with the “expression of social behaviours” scoring 85.93 points, the “expression of other behaviours” scoring 100 points, and the evaluation of the “positive emotional state” through qualitative behaviour assessment scoring 80 points. In conclusion, despite the inherent bravery and aggressiveness of these animals, the results indicate that the animals have good welfare in terms of behaviour. Cohesive behaviours were observed more frequently than agonistic behaviours, possibly because the groups remain practically stable from weaning, with the animals staying together since then. The frequency of agonistic behaviours was even lower in younger animals, as sibling bonds decreased with age. However, the final score was negatively affected by the inability to perform the “good human-animal relationship” criteria test for safety reasons.

CALVES´ WELFARE AFTER WEANING CAN BE AFFECTED BY HOW THEY BEHAVE WHEN HOUSED

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One of the most controversial aspects of animal welfare is the role of behaviour attributed to housing. During the transition from weaning to housing, calves after weaning are under stress due to the change in environment and feeding pattern. The aim was to observe the behaviour of the calves after weaning. The study was carried out at the Finca Castillo de La Monclova, Fuentes de Andalucía, Seville. A total of 75 4-month-old male Limousine calves after weaning with an initial weight of 139.19 ± 8.89 kg were used. They were housed in two 20 x 20 m pens and fed a balanced ration of Triticum-based diets for 8 weeks. A behavioural observation study to assess feeding and drinking behaviour, stereotypies, health (coughing) and weight was carried out one day per week for 8 weeks. Data were recorded using a Sony HDR-CX675 video camera and subsequently were analysed by the same person to avoid variations. The duration of recording was from the time of early morning feeding until 4 hours later. Descriptive analysis and the use of non-parametric statistical techniques such as Spearman's correlation and the Mann-Whitney test revealed a strong correlation between weight and the selected behavioural variables (except coughing), with particular emphasis on the appropriate use of the feeder and drinker during the first two weeks, as this led to statistically significant differences in mean weights throughout the study. During the first week of observation, the frequency of visits to the feeder averaged 4.76 ± 0.42 times. However, from the second week this frequency decreased to 1.86 ± 0.72 . As far as the drinker is concerned, the frequency of visits during the first week was 2.510 ± 0.37 times, but from the second week onwards it decreased to an average of 1.18 ± 0.61 times. Spearman's correlation showed a high correlation between weight and stereotypies. To conclude, behavioural changes, such as eating and drinking behaviour or stereotypies, are indicative of the stress caused to the calf by separation from the mother and the change from free-range to housed calves. For the first two weeks, because there was no adult in the pen to look at and reproduce the behaviour, the animals did not identify drinker/feeder as the correct locations for drinking/feeding. This was reflected in a decrease in body weight. However, over the weeks, the animals adapt to their environment and feeding and drinking pattern and acquire a learning process by imitation and experience as the days of housing progress and by their adaptation to the new housing situation, which implies an improvement in their welfare.

EFFECT OF LAMBING ON HEART RATE IN EWES

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An animal's heart rate changes throughout the day according to a circadian pattern and is altered by periods of stress that the animal goes through. It is an immediate response to a stressor and depends on the activity or stress state of the animal. Three Assaf ewes with a live weight of 65.52 ± 5.25 kg, which were diagnosed pregnant by ultrasound, were implanted with a bio-logger device (DST milli-HRT ACT, Star Oddi, Gardabaer, Iceland) which recorded heart rate every five minutes during the pre-lambing, lambing and post-lambing period for 28 days. Once the data (N = 5,801 records) were downloaded, the days were divided into three groups: PRE-LAMBING (n = 1,829 records): 11 days before lambing, LAMBING (N = 271 records): the day of lambing, and POST-LAMBING (n = 4,060 records): 15 days after lambing. Differences between day groups were analyzed by multivariate analysis of variance and post-hoc Tukey's test, with day group and time as fixed factors. There were significant statistical differences ($p < 0.001$) appeared between the recorded heart rates of the three groups studied. The mean heart rate increased to 127.53 ± 18.93 bpm on the lambing day compared to 100.52 ± 11.98 bpm on the post-lambing days. On all the days studied, the highest heart rate recorded was concentrated at 12:00 h. (127.52 bpm) and the lowest at 22:00 h. (95.01 bpm). At 12:00 h. the group with the highest recorded heart rate ($P < 0,001$) was the LAMBING group (132.36 ± 13.78 bpm) and the group with the lowest recorded heart rate was the POST-LAMBING group (98.28 ± 11.16 bpm). Similar differences were found at 22:00 h, where the LAMBING day had the highest recorded heart rate (122.25 ± 10.69 bpm) versus the post-lambing group that had the lowest (105.32 ± 10.58 bpm). The circadianity of the recorded heart rates changed at the three times studied. Lambing shifted the time of maximum acrophase from 18.69 h. - 21.98 h. in pre- and post-lambing, respectively, to 7.06 h. on the day of lambing. In conclusion, lambing produces a change in the heart rate recordings being maximum on the day and at the time of lambing. The circadianity of the heart rate is radically altered on the day of lambing, which gives us an idea of the physiological changes that the ewe must go through at the time of lambing. As the heart rate increases on lambing day, it may be a sign of ewes preparing for lambing and may be a tool to better manage lambing crates.

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