Lifelong Sensing of Health and Welfare

and

Big Data and the Internet of Things

# PROCEEDINGS

of the

# FOURTH DAIRYCARE CONFERENCE 2016

Lisbon, October 13th and 14th 2016

COST FA1308

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DairyCare

Proceedings of the Fourth DairyCare Conference 2016

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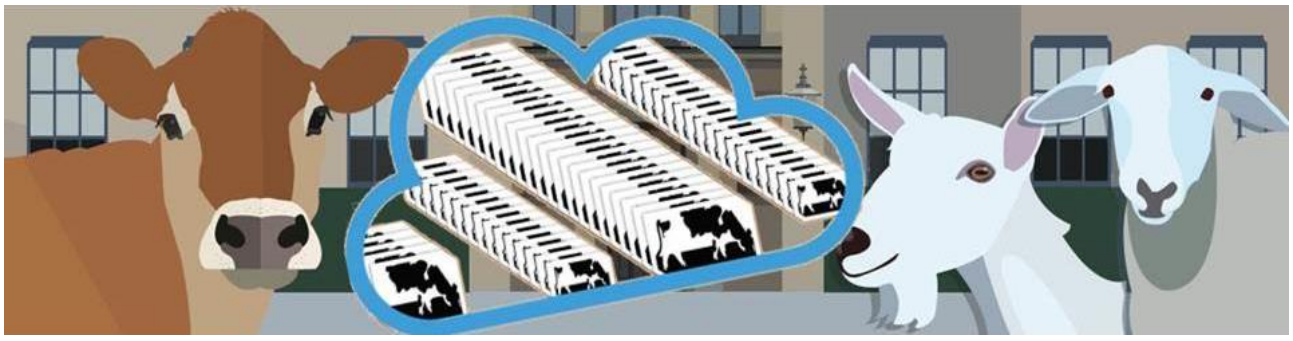
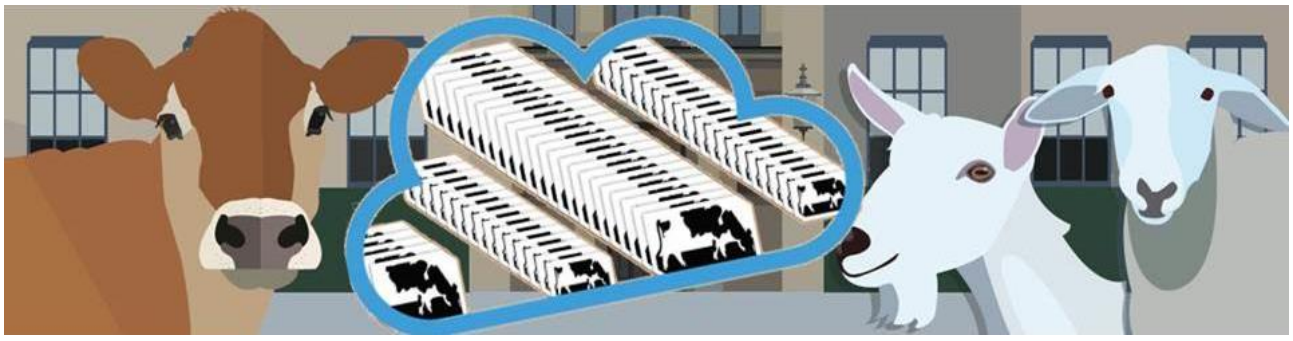




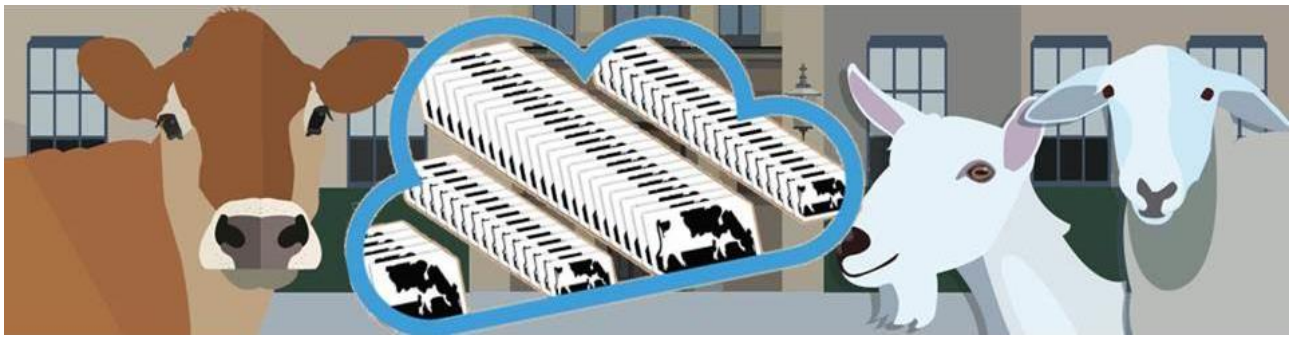
# Proceedings

of the

# Fourth DairyCare Conference 2016

Contents






## WELCOME TO DairyCare!

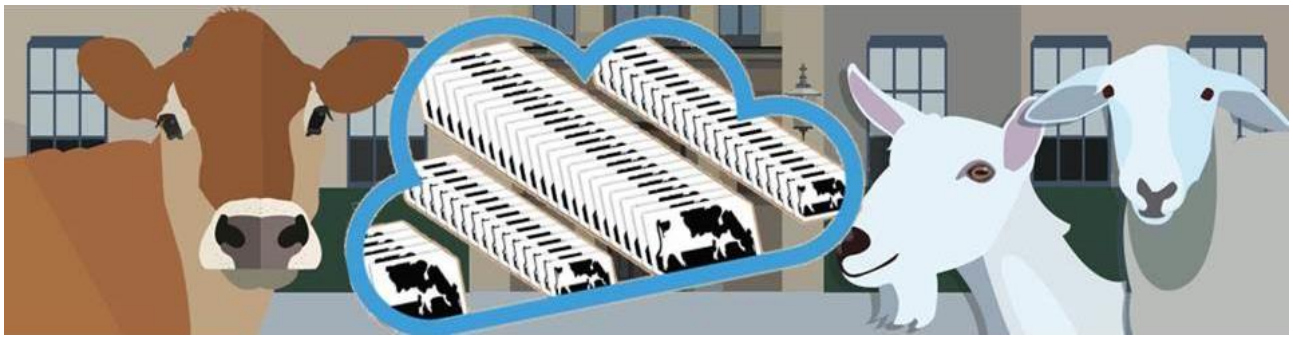
Animal wellbeing is at the start of a chain that links to farmer profitability, product quality, consumer satisfaction and environmental sustainability.

DairyCare is enjoying its third year, and now has more than 680 members representing 32 different COST countries. We have previously published three Conference Proceedings, all available on our website, and a well-received eighteen month Progress Report. Our Working Groups have organized a number of successful focused scientific Workshops, on topics that include cortisol and other stress biomarkers, detection and management of sub-acute ruminal acidosis, lameness detection methodologies and immune function during the peri-parturient period. We have a strong focus on Early Career Investigators and their career development, reinforced at this Fourth DairyCare Conference by a session dedicated to bringing together younger researchers with hosts wishing to organise Short Term Scientific Missions. As we move towards our fourth and final year the focus will shift towards dissemination to stakeholders and end-users, and we have identified a number of priority areas for development at this Fourth DairyCare Conference:

- Achieving greater scientific integration across different disciplines
- Achieving dissemination engagement across the whole of the value chain, linked to application
- Achieving improved value from STSM programme, targeting the next generation
- Achieving sustainability for DairyCare beyond 2018

Please, enjoy Dairycare, enjoy your visit to Lisbon either physically or through the pages of these Proceedings and help us to achieve our objective of improving the health and well-being of dairy animals.

Visit our website www.dairycareaction.org



## WELCOME TO LISBON!

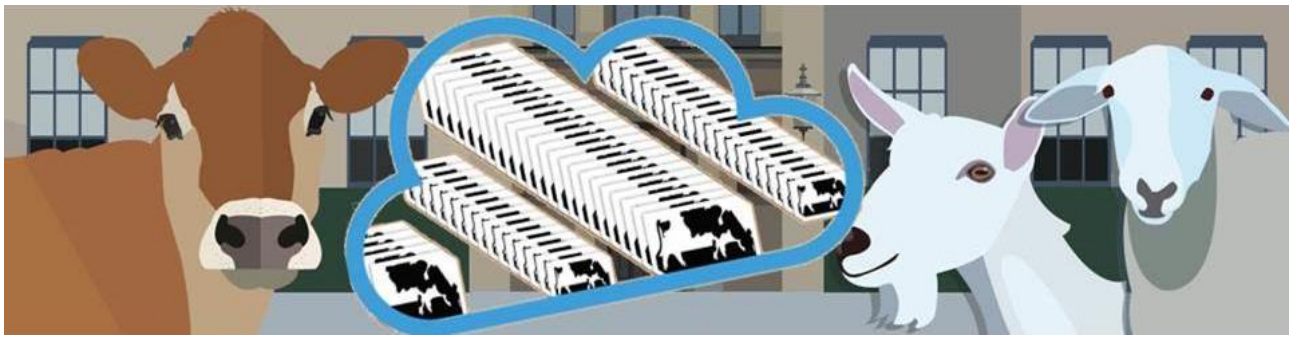
Our Fourth DairyCare Conference is in the magical Portuguese capital of Lisbon, the most westerly of continental Europe's capitals, and the only one located on the Atlantic coast. Lisbon is one of the oldest cities in the world, and the oldest in Western Europe, predating other modern European capitals such as London, Paris and Rome by centuries. Celtic and Phoenician origins gave way to Roman occupation of what was by then Olissipo, and after the fall of the Roman Empire the renamed Ulishbona suffered a succession of barbarian invasions before being taken in 711 by Muslim forces. The Muslim influence is still visibly present in the Alfama district (from the Arabic 'al-hamma'), an old quarter of Lisbon that survived the 1755 earthquake. Lisbon became the capital city of the new Portuguese territory in 1255, and the first Portuguese university was founded in Lisbon in 1290. However, from the 16$^{th}$ Century through until the early 20th century Lisbon lacked a University, and our host for this Conference, Universidade de Lisboa, is a young Institution, having been formed just over 3 years ago in July 2013. The Veterinary Faculty, on the other hand, can trace its origins to 1830, so there is certainly no lack of experience or expertise. Located in the Alto da Ajuda area, the Faculty is a 20 minute bus ride from Marques de Pombal in central Lisbon.

The Conference has been organised by the DairyCare Action Steering Group:

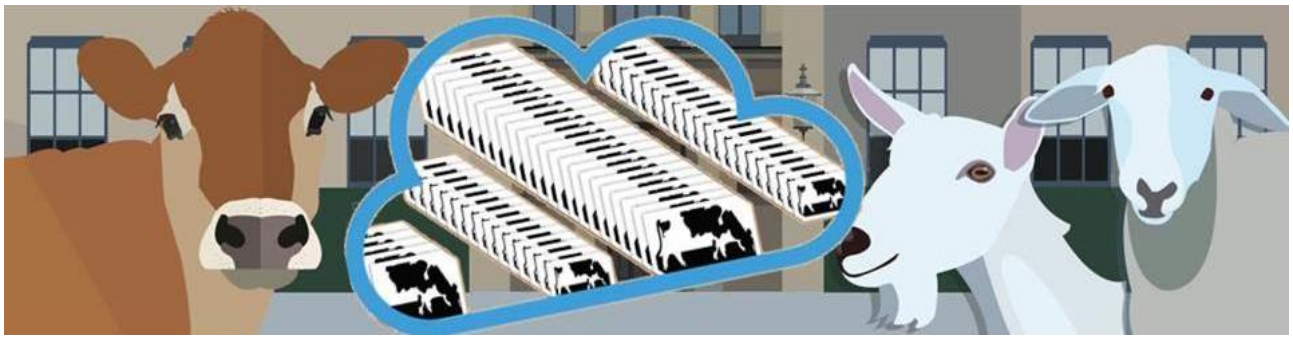
Chris Knight, UK
Lena Lidfors, Sweden
Marcela Speranda, Croatia
Lene Munksgaard, Denmark
Ivan Andonovic, UK
Sigrid Agenäs, Sweden
Gerardo Caja, Spain
Gianfranco Gabai, Italy
Vivi Thorup, Denmark
Jon Moorby, UK
Rupert Bruckmaier, Switzerland
Marta Brscic, Italy
Annelies Van Nuffel, Belgium

Local organiser: George Stilwell, Portugal
DairyCare Project co-ordinator: Sheena Knight, UK

We are grateful to the Universidade de Lisboa for generous support, and to COST for funding.



| Programme for the Fourth DairyCare Conference, Lisbon | | |
|---|---|---|
| **Thursday 13th October** | | |
| 08:00 | **Registration** | |
| 08:50 | **Welcome**<br>*George Stilwell, University of Lisbon and Chris Knight, University of Copenhagen* | |
| 09:10 | **WG1 Report: Rome Workshop**<br>*Marcela Speranda, University of Osijek* | |
| 09:25 | **ECI and STSM Partners Speed Dating Session**<br>**Chair: Sigrid Agenäs** | |
| 10:30 | **Coffee and put up Posters** | |
| 11:00 | **Themed Session: Lifelong Health and Welfare Sensing**<br>**Chair: Lena Lidfors** | |
| 11:10 | **Invited Plenary: Margit Bak Jensen** *Arhus University, Denmark*<br>The calving environment, early social contact and milk feeding management | |
| 11:50 | 1.01 | **Using accelerometers to monitor calf behaviour**<br>Emma CL Bleach, Carrie Gauld & Richard E Drake<br>*Harper Adams University, TF10 8NB UK* |
| 12:00 | 1.02 | **Does the cow-calf develop bond in the absence of nursing?**<br>Julie Føske Johnsen, Anne Marie de Passille, Cecilie Marie Mejdell, Knut Egil Bøe, Ann Margaret Grøndahl, Annabelle Beaver, Jeffrey Rushen & Daniel M. Weary *Norwegian Veterinary Institute, 0106 Oslo, Norway* |
| 12:10 | 1.03 | **Feeding behaviour in dairy goats, a repeatable trait which can be measured automatically**<br>Sylvie Giger-Reverdin, Christine Duvaux-Ponter & Nicolas C Friggens *UMR, INRA AgroParisTech, 75005 Paris, France* |
| 12:20 | 1.04 | **Social Network Analysis and management of calves and dairy cows**<br>Paul Koene<br>*Animal Welfare, Wageningen Livestock Research, Lelystad, The Netherlands* |
| 12:30 | **Lunch and Posters** | |



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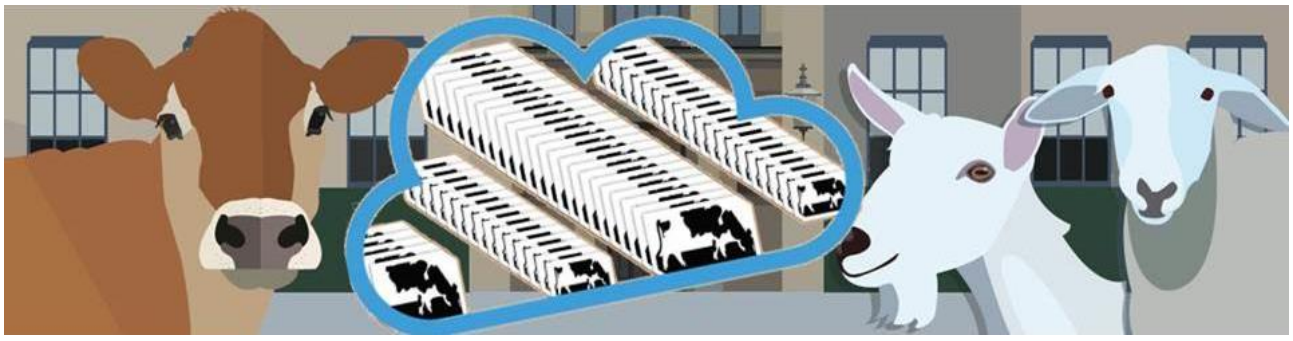
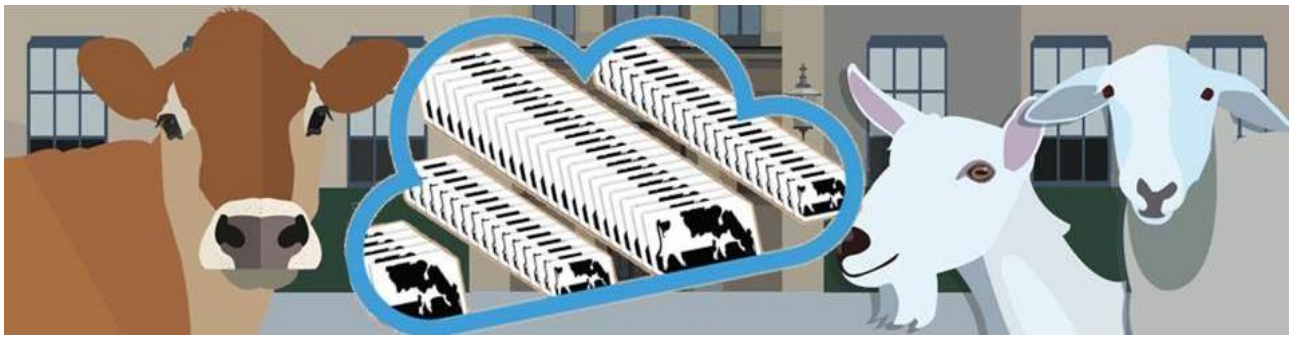
|---|---|---|
| **Thursday 13th October** | | |
| 13:30 | **Invited Plenary: Nina von Keyserlingk** *University of British Columbia, Canada*<br>Effects of calf rearing on cognitive and biological functioning: Recent results and future challenges | |
| 14:10 | 1.05 | **Effects of omission of the dry period on behaviour of dairy cows**<br>A Kok, R J Van Hoeij, B J Tolkamp, M J Haskell, A T M Van Knegsel, I J M De Boer & E A M Bokkers<br>*Wageningen University, 6700AH Wageningen, the Netherlands* |
| 14:20 | 1.06 | **Development of a rumen bolus platform for data acquisition in dairy small ruminants**<br>Joan Oliver, Carles Ferrer, Marta Prim, Lu Wang, Ahmed A. K. Salama & Gerardo Caja<br>*Universitat Autònoma de Barcelona, Bellaterra, Spain* |
| 14:30 | 1.07 | **Locomotor play in dairy calves: a high energy activity correlated with good welfare.**<br>Jeffrey Rushe<br>*University of British Columbia, Agassiz, BC V0M 1A0, Canada* |
| 14:40 | 1.08 | **Towards life-long sensing of dairy cow behaviour using accelerometers**<br>Vivi Thorup, Gemma Charlton, Carrie Gauld, Emma Bleach & Mark Rutter<br>*IceRobotics, Edinburgh EH30 9TF, UK* |
| 14:40 | **Invited Plenary: Ulf Emanuelson** *SLU, Sweden*<br>Dairy cow longevity - early and late predictors | |
| 15:30 | **Coffee and Posters** | |
| 16:00 | **Reports**<br>**Chair: Lene Munksgaard** | |
| 16:00 | **WG2 Report: ILVO Training School and Leeuwarden Workshop**<br>*Vivi Thorup, Ice Robotics, UK* | |
| 16:20 | **WG3 Report: Glasgow Workshop**<br>*Jon Moorby, University of Aberystwyth, UK* | |
| 17:00 | **Management Committee Meeting**<br>**Chair: Chris Knight** | |
| 20:30 | **Conference Dinner** | |



## Programme for the Fourth DairyCare Conference, Lisbon

### Friday 14th October

| | | |
|---|---|---|
| 09:00 | **Free Submission Session**<br>**Chair: George Stilwell** | |
| 09:00 | 2.01 | **The effect of controllability and predictability on anticipatory behaviours in lambs**<br>Claes Anderson, Lena Lidfors, J Yngvesson & A Boissy<br>SLU, 750 07 Uppsala, Sweden. |
| 09:10 | 2.02 | **Introduction onto a metabonomic study of peri-parturient dairy goats**<br>Ana Elena Cismileanu & Celine Domange<br>*IBNA, Balotesti, Romania* |
| 09:20 | 2.03 | **Effect of cow factors and daily walking distance on commonly used lameness indicators**<br>Lilli Frondelius, Heli Lindeberg, Stephanie Van Weyenberg, Annelies Van Nuffel & Matti Pastell *Natural Resources Institute Finland (Luke) 71750 Maaninka, Finland* |
| 09:30 | 2.04. | **A questionnaire survey on availability and management of hospital pens for Danish dairy cows**<br>Katrine K. Fogsgaard, Peter T. Thomsen, Anne J. Andersen & Anne B. Kudahl<br>*Aarhus University, Department of Animal Science, Denmark* |
| 09:40 | 2.05 | **Fatty acids profile of mammary gland and milk of Palmera and Majorera goat breeds subjected to weight loss**<br>Mariana Palma, Susana P. Alves, Lorenzo Hernandez-Castellano, Juan Capote, Noemí Castro, Anastasio Argüello, Manolis Matzapetakis, Rui J. B. Bessa & André M. de Almeida *Universidade Nova de Lisboa. Oeiras, Portugal.* |
| 09:50 | 2.06 | **Effect of a total dry ration on the feeding behavior and animal welfare of dairy cows**<br>Naceur M'hamdi, Abdelkrim Bessadok, Cyrine Darej, Hajer M'hamdi, Manel Benlarbi & Khaoula Marzougui<br>*Institut National Agronomique de Tunisie. Tunis, Tunisie* |
| 10:00 | 2.07 | **Lying time of dairy cows does not increase linearly throughout lactation**<br>Jarissa Maselyne, Matti Pastell, Peter T. Thomsen, Vivi M. Thorup, Laura Hänninen, Jürgen Vangeyte, Annelies Van Nuffel & Lene Munksgaard<br>*ILVO, Merelbeke, Belgium* |
| 10:10 | 2.08 | **HOMA, QUICKI and RQUICKI in healthy Holstein-Friesian cows during early lactation**<br>Jože Starič, Marko Cincović, Branislava Belić & Jožica Ježek<br>*Veterinary faculty, University of Ljubljana, Slovenia* |
| 10:20 | **Coffee and Posters** | |



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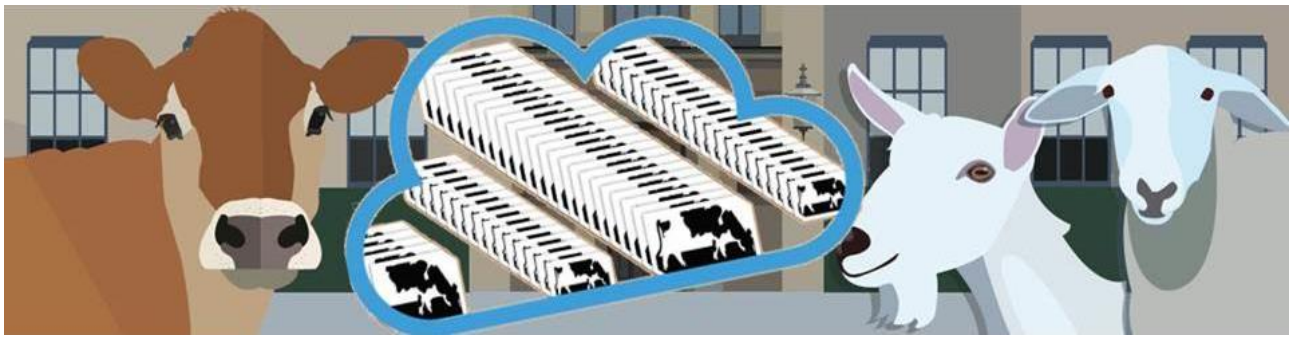
|---|---|---|
| **Friday 14th October** | | |
| 10:50 | **Themed Session: Big Data and the IoT<br>Chair: Jon Moorby** | |
| 10:50 | **Invited Plenary: Craig Michie** *Strathclyde University, UK*<br>What is the IoT and Big Data, and what might it offer the future Dairy Production Industry | |
| 11:30 | 3.01 | **The necessity of milk and microclimate recordings on dairy cattle farms on Balkan region in the light of climate change**<br>Vesna Gantner, Krešimir Kuterovac & Muhamed Brka<br>*Faculty of Agriculture, J. J. Strossmayer University of Osijek, 31000 Osijek, Croatia.* |
| 11:40 | 3.02 | **BIG DATA may be useful to dairy herd managers – after washing and drying**<br>Peter Løvendahl<br>*Aarhus University, AU-Foulum, Denmark* |
| 11:50 | **Invited Plenary: Kees Lokhorst** *Wageningen University, The Netherlands* | |
| **12:30** | **Lunch and posters** | |
| 13:20 | **Invited Plenary: Sikko Pier van Gosliga** *Connecterra, The Netherlands*<br>Improving Dairy Farm Productivity through IoT and Machine Learning Technologies | |
| 14:00 | 3.03 | **Analysis of relationship between claw disorders, metabolic status and milk yield.**<br>Radovan Kasarda & Michal Vlček<br>*Slovak University of Agriculture, 949 76 Nitra, Slovakia* |
| 14:10 | 3.04 | **Data integration to improve the prediction of individual dry matter intake of dairy cows**<br>Francisco Maroto-Molina, Paolo Berzaghi, Ana Garrido-Varo, José Emilio Guerrero-Ginel & Dolores C. Pérez-Marín<br>*University of Cordoba, 14071 Cordoba, Spain* |
| 14:20 | **Invited Plenary: Shlomi Goldshtein** *Volcani Institute, Israel*<br>Big Data mining through partnership: From feed supplier to barn to retailer | |
| 15:00 | **Coffee** | |
| 15:10 | **Small Workshop Incubator Grants<br>Break out rooms available** | |
| 16:10 | **DairyCare Dissemination Strategy: Gerardo Caja** *UAB, Spain* | |
| 16:30 | **Closing Remarks: Chris Knight** *University of Copenhagen, Denmark* | |



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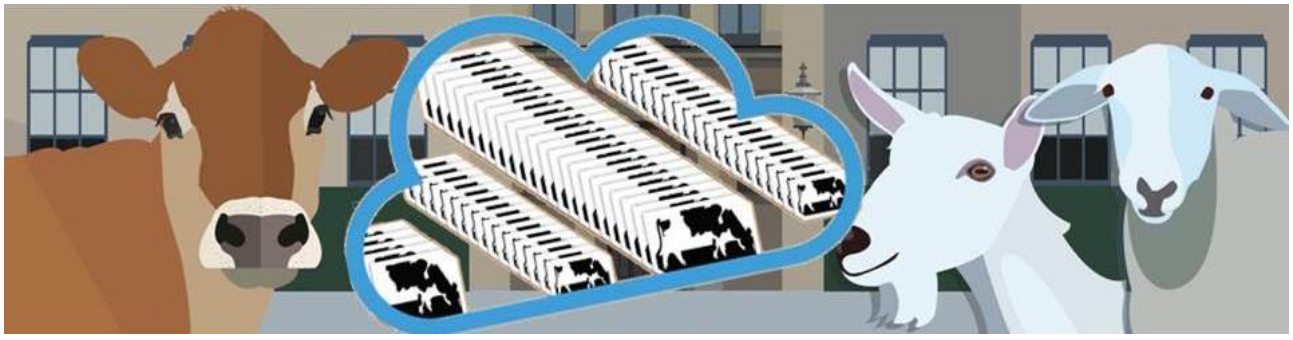
|---|---|
| **Themed Posters: Lifelong Sensing of Health and Welfare** | |
| P.01 | **Effects of intensive milk feeding and butyrate on growth performance and the Insulin-like Growth Factor (IGF)-I system in blood of German Holstein calves**<br>Dörte Frieten, Caroline Gerbert, Christian Koch, Georg Dusel, Birgit Mielenz & Harald M. Hammon<br>*Leibniz Institute for Farm Animal Biology, Dummerstorf, Germany* |
| P.02 | **The effect of shading on individually kept calves**<br>Viktor Jurkovich, Luca F. Kézér, Martina Gánti, Rebeka Gombos, Mikolt Bakony & Levente Kovács<br>*University of Veterinary Medicine, H-1078 Budapest, Hungary* |
| P.03 | **Analysis of d-ROMs and BAP tests in dairy cow and goat plasma and milk**<br>Lada Radin, Jasna Aladrović, Blanka Beer Ljubić, Renata Laškaj, Marija Mamić, Antun Kostelić, Goran Bačić, Iva Bačić, Nino Mačešić &Jelena Šuran<br>*Faculty of Veterinary Medicine Zagreb, 10000 Zagreb, Croatia* |
| **Free Posters** | |
| P.04 | **Implementation of zootechnical and zooprophilactic measures in adaptation and acclimatization of Assaf dairy sheep with multimodal approach**<br>Irena Celeska, Danijela Kirovski, Igor Ulchar, Nikolov Dejan, Miroslav Radeski, Vlatko Ilieski<br>*Faculty of Veterinary Medicine - Skopje, 1000 Skopje, Macedonia* |
| P.05 | **Changes induced by age in the glucose metabolism of suckling camel calves before weaning**<br>Elena Díaz-Medina, Gerardo Caja, Maristela Rovai, Ahmed A. K. Salama, Soraya Cabrera, Moez Ayadi, Riyadh S. Aljumaah & Mohammed A. Alsheikh<br>*Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain* |
| P.06 | **Dairy ewes are not chronically stressed by shearing during lactation and their milk yield may increase depending on the breed**<br>Abdelaali Elhadi, Gerardo Caja, Ahmed A. K. Salama, Xavier Such, Elena Albanell<br>*Group of Research in Ruminants (G2R), Department of Animal and Food Sciences, Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain* |
| P.07 | **Physiological responses and lactational performances of dairy goats under cold stress conditions**<br>Wellington Coloma, Nabil Mehaba, Ahmed A. K. Salama & Gerardo Caja<br>*Group of Research in Ruminants (G2R), Department of Animal and Food Sciences, Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain* |



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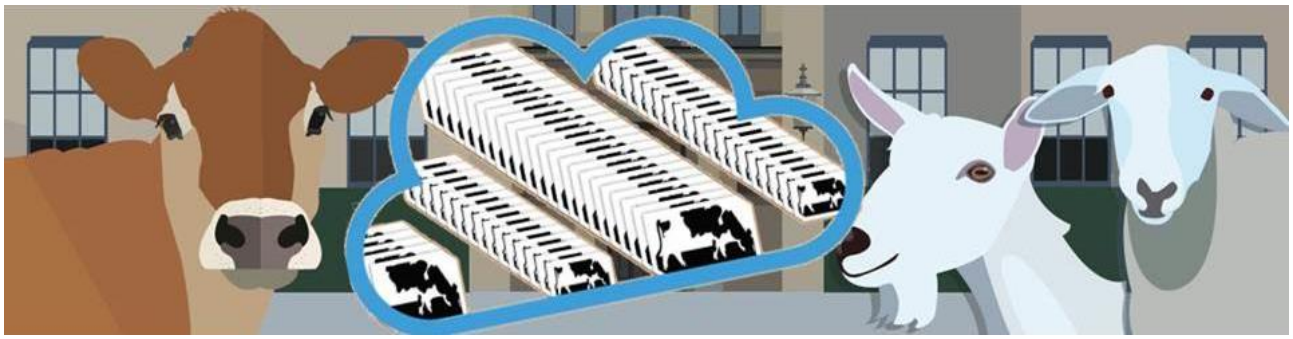
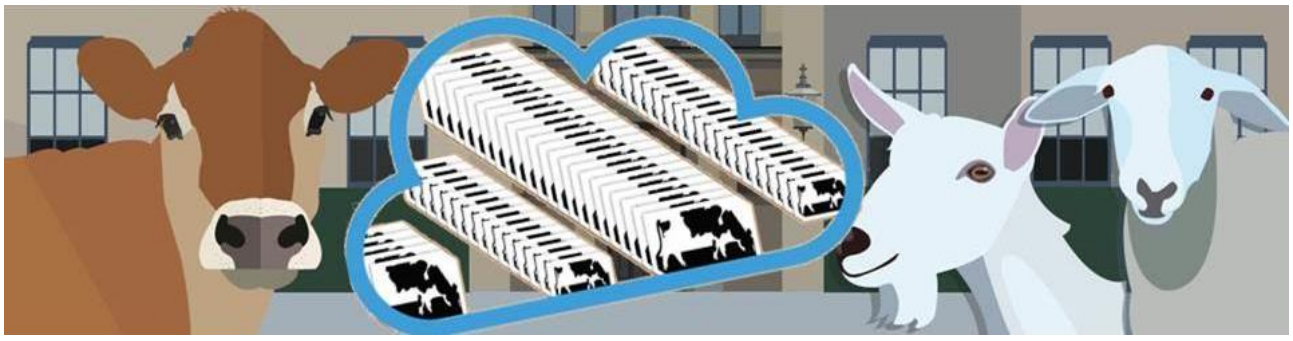
| P.08 | **Effects of horns on production and reproduction efficiency in extensively reared goats**<br>Dinu Gavojdian, Szilvia Kusza, Irina Patras & Maria Sauer<br>*Research and Development Station for Sheep and Goats Caransebes, Academy for Agricultural and Forestry Sciences, 325400, Caransebes, Romania* |
| P.09 | **Behavioural reactivity implications in production and reproduction efficiency of Fleckvieh cows**<br>Daniela-Elena Ilie, Ludovic Toma Cziszter & Dinu Gavojdian<br>*Research and Development Station for Bovine Arad, Academy for Agricultural and Forestry Sciences, Arad, 310059, Romania* |
| P.10 | **Colostrum composition from dairy cows exposed to heat stress during late gestation**<br>Danijela Kirovski, Vojislav Trkulja, Željko Lakić, Vojin Svetko, Julijana Trifković, Snežana Stevanović Đorđević & Željko Sladojević<br>*Faculty of Veterinary Medicine University of Belgrade, Belgrade, Serbia* |
| P.11 | **Comparative study on fitness traits in sheep reared under highland and lowland conditions**<br>Szilvia Kusza, Dinu Gavojdian & Maria Sauer<br>*Academy for Agricultural and Forestry Sciences, 325400 Caransebes, Romania* |
| P.12 | **Salivary HSP70 as a putative biomarker of heat stress in high yielding dairy cows**<br>Elsa Lamy, Viktor Jurkovich, Lénia Rodrigues, Ana Geraldo, Liliana Cachucho, Flávio Silva, Catarina Matos, Fernando Capela e Silva, Cristina Pinheiro, Mikolt Bakony &Alfredo Pereira<br>*University of Évora, Portugal* |
| P.13 | **The Importance of Dry Cow Welfare for a Healthier Dairy Herd**<br>Valentina Lorenzi, Francesca Fusi, Alessandra Angelucci, Rosa Maria Strano, Giorgia Riuzzi, *Jessica Ginestreti & Luigi Bertocchi*<br>*Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Rogmana, Brescia, Italy* |
| P.14 | **Ruminal degradation and response of dairy goats under heat stress conditions to dietary L-carnitine supplementation**<br>Nabil Mehaba, Ahmed Salama, Gerardo Caja & Xavier Such<br>*Universitat Autonoma de Barcelona, Bellaterra, Spain* |
| P.15 | **Accuracy of BHB concentration in dairy cows' blood measured by two methods**<br>Jože Starič, Mislav Đidara, Jožica Ježek, Marija Nemec & Marcela Šperanda<br>*University of Ljubljana, Veterinary Faculty, Slovenia* |
| P.16 | **Changes in dairy cow body weight and milk yield due to diet change**<br>Vivi M. Thorup, Mizeck G. G. Chagunda, Nicolaj I. Nielsen, Anne Mette Kjeldsen &Nicolas C. Friggens<br>*INRA AgroParisTech, 75005 Paris, France* |
| P.17 | **Adipose tissue activity regulates metabolic responses to heat stress in periparturient dairy cows**<br>Romana Turk, Nikola Rošić, Silvijo Vince, Zlata Flegar –Meštrić, Ljubo Barbić, Maja Belić, Mirna Robić & Marko Samardžija<br>*Faculty of Veterinary Medicine, University of Zagreb, Croatia* |



# THEMED SESSION:

# LIFELONG SENSING OF HEALTH AND WELFARE

## ORAL ABSTRACTS



**1.01**
**Using accelerometers to monitor calf behavior**
Emma CL Bleach, Carrie Gauld & Richard E Drake
*Harper Adams University, TF10 8NB UK*
ebleach@harper-adams.ac.uk

Accelerometers have been validated for measuring dairy cow activity. These devices generate activity data that indicate oestrus and are currently being assessed for monitoring health in adult animals. Young calves spend the majority of their time lying down. Previous intermittent studies of calf behaviour show that the amount of time spent lying decreases with ages. The aim of the present study was to use accelerometers to continuously monitor lying times and activity in calves during the milk-fed phase of rearing. Dairy heifer calves (n=18) were recruited on the day of birth (day 0). IceQubes (Ice Robotics Ltd, Edinburgh, UK) were attached to their left foreleg to measure the amount of time spent lying down and the number of steps taken. The calves were removed from their dams as soon as they were dry and housed in an individual straw-bedded hutch. Twice a day (6:00 - 7:00 and 15:00 – 16:00) they were fed 2.8 litres milk replacer (Advance Superstart; 23% crude protein, 20% oil; 150 g/litre) from teated bottle. Concentrates and fresh water were available ad libitum throughout. Manual observations of the activity of 5 calves were conducted across 2 days to validate the IceQubes. There was a positive correlation between the two measures of time spent lying down ($r^2$=0.89, p<0.001). The amount of time spent lying down depended on the age of the calves. During their first day (day 1) calves spent 20.5±0.40h lying down. This had fallen to 18.9±0.37h/d (p=0.006) by day 4 and 17.6±0.35h/d (p<0.001) by day 10. From day 14 to 35 lying times were similar (17.0h/d). Lying time and steps showed a diurnal pattern with the greatest amount of time spent lying down from 1:00 to 6:00 and 19:00 to 24:00 and the least amount of time spent lying down from 7:00 to 8:00 and 15:00 to 16:00. Steps increased co-incident with the reduction in lying time. The extent of the change in diurnal pattern was greatest in older calves. Activity monitors show changes in calf activity with age. Further studies are necessary to show whether they can be used to assess health status of calves.

**1.02**
**Does the cow-calf develop bond in the absence of nursing?**
Julie Føske Johnsen[1], Anne Marie de Passille[2], Cecilie Marie Mejdell[1], Knut Egil Bøe[3], Ann Margaret Grøndahl[1], Annabelle Beaver[2], Jeffrey Rushen[2], Daniel M. Weary[2]
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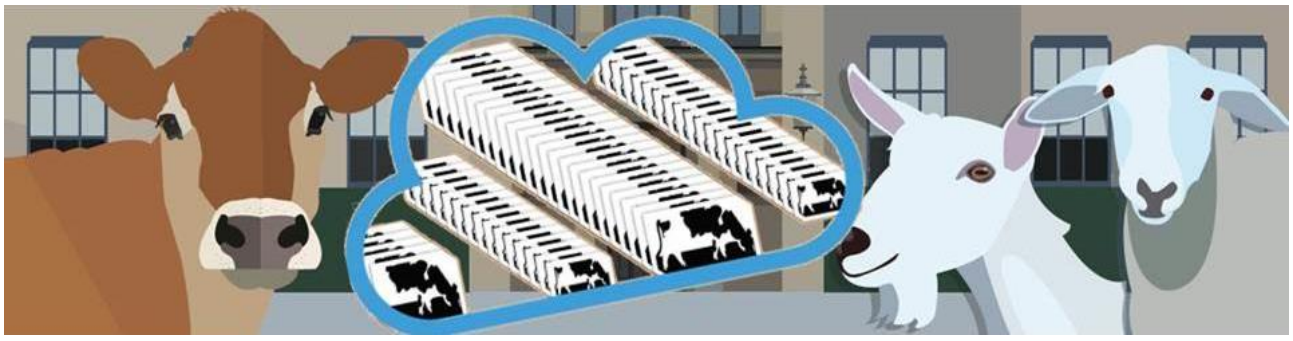
In dairy production, rearing the calf by suckling has received increasing attention due to potential welfare benefits. This study evaluated if nursing is important for the establishment of the cow-calf bond after birth. We compared affiliative behaviours between the dam and her calf using 30 Holstein cow-calf pairs that were randomly allocated to three treatments differing only in nutritional dependency on the dam: *milk feeder*, *combined* or *nursing*. For *milk feeder* calves, suckling was prevented by an uddernet and calves were fed milk from an automated feeder. *Combined* calves suckled, but had additional access to a milk feeder whereas *suckling* calves suckled the dam and had no access to an additional milk feeder. All cow-calf pairs were housed in a partial suckling system which implied that cows and calves were kept together during the night and were housed adjacent to each other during the day. Direct live observations were performed 2 h following the opening of the gate that allowed calves to mix with cows at night. All pairs spent more time (% of observations) allogrooming each other (i.e. own cow/calf) than they did grooming other cows and calves within the same group (10 ± 0.8 % vs. 0.4 ± 0.7%, $t_{29}$ = 168.8, P<0.001). The time cow-calf pairs spent allogrooming did not vary with treatment; 10.0 ± 0.8 %, $F_{2, 27}$ =0.4, P=0.696). Similarly, time spent in close proximity without nursing did not differ among treatments; 31 ± 2.6% $F_{2, 27}$ =0.6, P=0.543). Latency to reunite (among pairs that did so within 180 seconds) was highest for the *combined* pairs and tended to be lower for *milk feeder* and *nursing* calves; 52.5 ± 16.0, 23.3 s ± 8.3 and 12.9 ± 5.8; F 2, 24 = 3.1, P=0.062). These results indicate that the cow-calf bond can be established independent of nursing thus including elements of caretaking and emotions. The study was published in Applied Animal Behaviour Science 163(0): 50-57: Johnsen, J. F., A. M. de Passille, C. M. Mejdell, K. E. Bøe, A. M. Grøndahl, A. Beaver, J. Rushen and D. M. Weary (2015). "The effect of nursing on the cow–calf bond."



**1.03**

**Feeding behaviour in dairy goats, a repeatable trait which can be measured automatically**

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Feeding behaviour influences dry matter intake, but is highly variable between animals. It is a key factor to explain the inter-individual variation in the evolution of rumen pH, and therefore of occurrence of acidosis which differs from one animal to another, even when fed the same diet. Phenotyping feeding behaviour is thus of interest for quantifying some of the variation in digestive efficiency, and therefore in feed efficiency, especially in intensive systems with a high proportion of acidogenic ingredients in the diet.

The aim of this work was to look for repeatable and pertinent criteria to evaluate this trait. Feeding behaviour was assessed at three different periods (1st lactation, 2nd gestation + lactation, 2nd lactation) on thirty-five goats born at the same time. They were housed in individual crates with automatic measurement of the quantity of feed eaten every 2 min, and fed ad libitum a complete ration adapted to requirements. One third of the feed was delivered after the morning milking and two thirds after the afternoon milking according to the intervals between milkings. The evolution of feed intake during 15 hours after the afternoon allowance was measured on 3 or 4 days in each period. Two phenotypes were automatically measured and analysed: Q90 (quantity of diet consumed by 90 min post afternoon feed allowance), P90 (Q90/Total quantity of feed consumed after the afternoon feed allowance). In earlier work, these two parameters were highly linked with the occurrence of acidosis.

Intra-period individual repeatabilities were very high. The value for one period was highly correlated with that of a preceding one for the P90 criteria, but only tended to be correlated for the Q90 criteria. Given this repeatability, it is possible to characterise the feeding behaviour of a goat during its first lactation and, for example, to adjust the feeding of the animals with the lowest P90 or Q90 in the following lactations, in order to decrease the occurrence of acidosis in the herd.

These results on the variability of intake rate show that simple criteria could be found to phenotype goats on intake rate in precision livestock farming systems.

**1.04**

**Social Network Analysis and management of calves and dairy cows**

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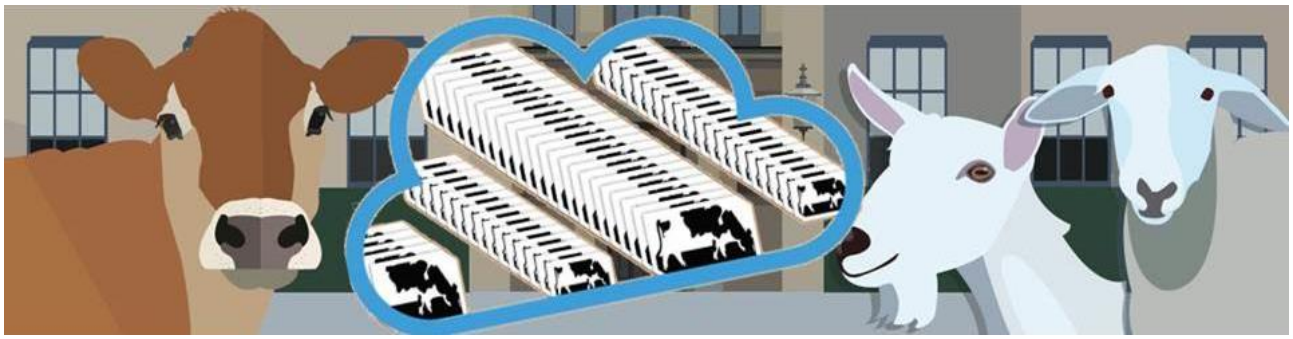
Social networks in animal species may indicate social stress and social support that are important for welfare. A recent finding shows that “Calves seem to form preferential relationships before 3.5 months of age. Keeping cattle together from an early age seems beneficial for them”. We tried to confirm this statement using a Social Network approach and a group of 10 Holstein-Friesian calves (6 males/4 females) aged 3 to 4 months. Individual automated location registration (X-Y position) was used to calculate the nearest neighbour of each calf in the pen (4 x 11 meters). Based on the nearest neighbour matrix positive and negative associations were calculated using standardized residuals (MatMan). The residuals are used as input for social network analysis (SNA) of the positive and negative associations of the calves using UciNet. Data were analysed per day excluding the dark period (21-06 hrs.), when calf activity was low. To challenge the calves and their relationships the feeding regime was changed from dried alfalfa (day 1-6) to wet silage (day 7-12). Comparison of day 6 and day 7 shows that the challenge changed daily habits and increased for instance daily walking from 298 to 418 meter per day (paired T-test, P0.05), indicating instability of the social network. We conclude that social networks might be important for the welfare management of calves and that automatic recording and follow-up management actions are feasible in the near future. More importantly, suggestions are made to use Social Network information in adult dairy cow management.



**1.05**

**Effects of omission of the dry period on behaviour of dairy cows**

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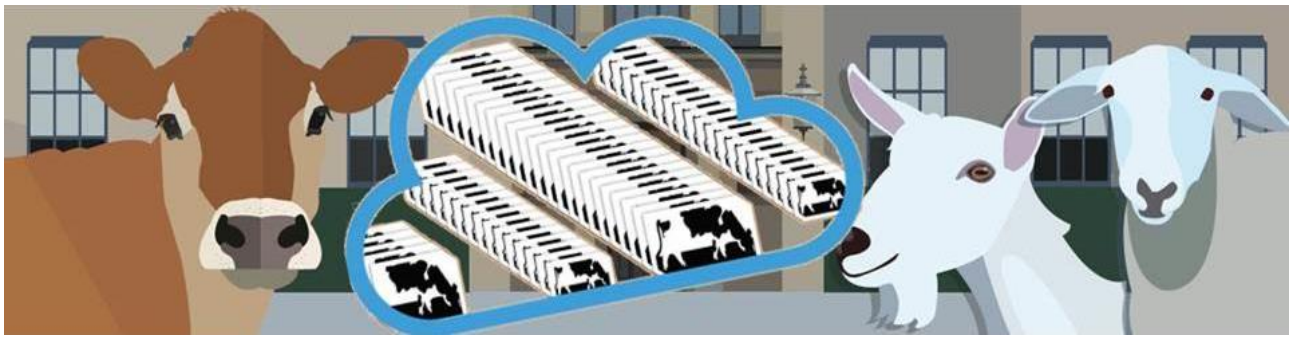
Reducing the changes in management in the period around calving could facilitate adaptation to lactation and might thereby increase the longevity of dairy cows. More constant management for dairy cows can be achieved by omitting the dry period. This would not require drying off, group changes and ration changes in late gestation, as opposed to conventional dry period management. In addition, cows with no dry period have a lower milk yield and improved energy balance after calving. It is unknown, however, how behaviour of dairy cows in late gestation and early lactation is affected by omitting the dry period. We studied the effects of a dry period (of 30 days; n=28 cows) and no dry period (n=53 cows) on feeding, lying, and walking of dairy cows in late gestation and early lactation. This data was collected using computerized feeders and accelerometers. All cows were housed in a free stall with slatted floor and cubicles. Effects of dry period and timing (before vs. after calving) on behaviours were analysed with mixed models; associations between energy balance and behaviours were analysed with Pearson correlations. Before calving, cows with no dry period had a higher feed intake, but a shorter daily feeding time than cows with a dry period. Cows with no dry period spent less time lying than cows with a short dry period (12.6 vs. 13.7 h/d, $P < 0.05$), and they walked more (1134 vs. 661 steps/d; $P < 0.05$). After calving, cows with no dry period spent more time lying than cows with a dry period (11.6 vs. 10.7 h/d, $P < 0.05$). Cows with no dry period also had a higher feed intake after calving than cows with a dry period ($P < 0.05$); feeding duration and walking did not differ. Daily lying time was positively correlated with energy balance (r: 0.28, $P < 0.05$) at 4 weeks in milk, but not correlated with daily feeding time. No dry period, as compared with a dry period, resulted in smaller changes in behaviour between late gestation and early lactation, which could facilitate adaptation to the next lactation.



**1.06**

**Development of a rumen bolus platform for data acquisition in dairy small ruminants**

Joan Oliver[1], Carles Ferrer[1], Marta Prim[1], Lu Wang[1], Ahmed A. K. Salama[2] & Gerardo Caja[2]
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Currently available rumen bolus equipped with sensors (e.g., temperature, pH, movement) were developed for cattle monitoring and are unsuitable for small ruminants. This is due to the large size capsules (external diameter, 27 to 35 mm; length, 115 to 145 mm; weight, 70 to 240 g) which makes necessary their implantation by surgery or throughout rumen cannulas. With the aim of solving this limitation, we developed a small rumen bolus (BIOSENS; external diameter, 22 mm; length, 80 mm; weight, 40 g), designed to monitor the rumen temperatures and movements of sheep and goats using an electronic sensing platform. The platform contained an internal sensing device connected to an external receiver by high radiofrequency (programmable and ranging from 433 to 473 MHz). Three main phases were followed for the development of the platform:

- Analysis, design and construction of the internal circuitry, configuring the sensors and optimization of the energy consumption
- Miniaturization of the bolus and control of the power of transmission
- Design and construction of the receiver for a permanent listening of the internal device
- Manufacture of bolus prototypes and tests of encapsulation
- Performance tests of prototypes in a cannulated dairy cow
- Oral administration and performance tests of prototypes in 4 adult dairy sheep

The core of the bolus was based in an ATMEL microprocessor configured for low power operation and powered with by a small cylindrical Li battery (3.3 V, 2.1 Ah, 0.67 A) which proved to be operative for more than 10 mo when logged to a temperature sensor collecting data every 2 min (sampling frequency can be 1/10 s). The radiofrequency signal was able to be transmitted from inside the rumen to a transceiver located at more than 5 m. The platform is open to incorporate other types of internal of external data acquisition devices (e.g., pedometers, subcutaneous sensors) and currently it has been extended to log data from a tri-axial accelerometer to monitor rumen movements of dairy sheep. A total of 100 prototypes are currently being produced to be administered to a flock of dairy sheep during lactation.

Acknowledgement: Ministerio Economía y Competitividad, Spain, Project BIOSENS (Reference: AGL2013-44061-R).

**1.07**

**Locomotor play in dairy calves: a high energy activity correlated with good welfare.**

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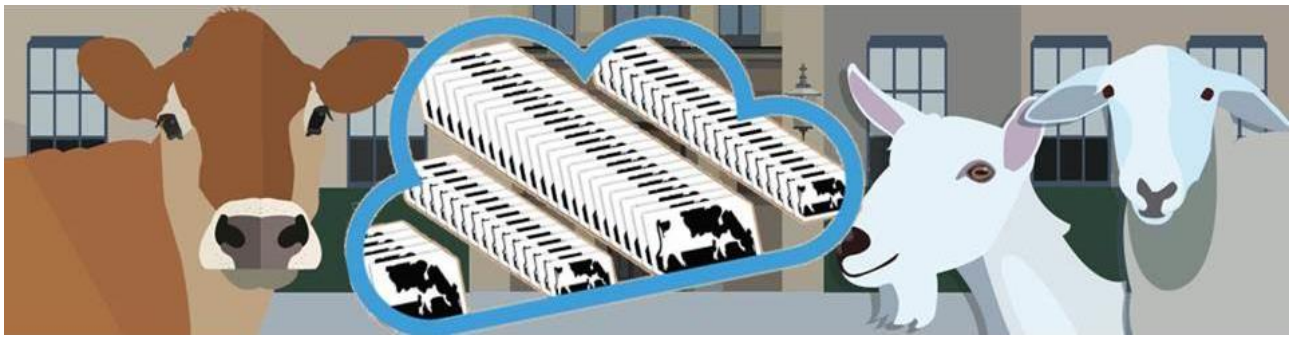
Within any type of housing system, there are differences between individual dairy calves in their health and welfare. Locomotor play is a high energy activity that is a sign of good health and welfare. In a series of experiments, we examined locomotor play in group housed un-weaned dairy calves (1 – 8 weeks of age) to determine the extent that individual differences in locomotor play were related to individual differences in growth rates and in calves' fearfulness or curiosity in response to novelty. The frequency of jumping and the duration of running were observed both in the calves' home pens and during a 10 min exposure to a novel arena. In both situations, there were large differences between individual calves, and calves which ran most in the home pens ran most in the arena (r = 0.65; n=20; P = 3g) was highly correlated with the frequency of jumping (r = 0.86; n=30; P 0.10), suggesting that they are specific to high energy activity. There are relatively stable individual differences in the extent that calves show locomotor play and these differences reflect phenotypic differences in growth rates and emotional responses to novelty. Automated measures of locomotor play have potential to be a novel method of automatically phenotyping calves in terms of their potential for good or poor welfare.



**1.08**

**Towards life-long sensing of dairy cow behaviour using accelerometers**

Vivi Thorup[1], Gemma Charlton[2], Carrie Gauld[2], Emma Bleach[2] & Mark Rutter[2]

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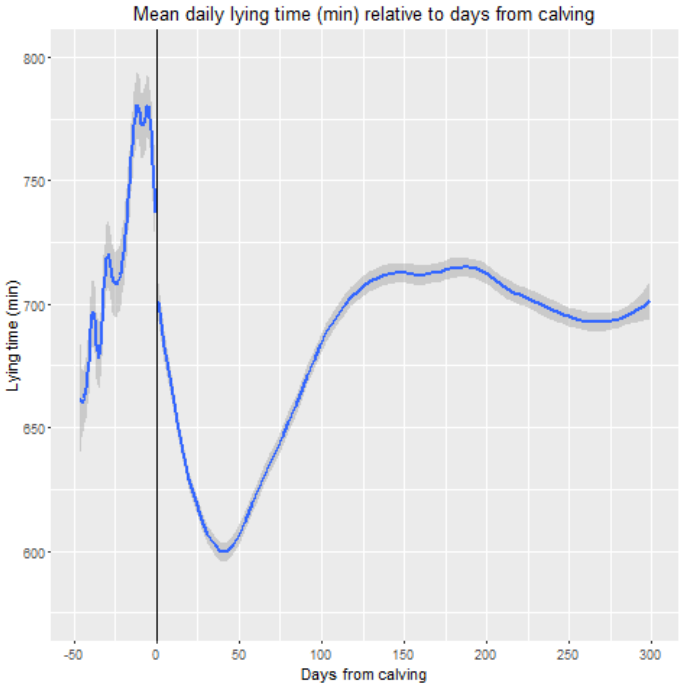
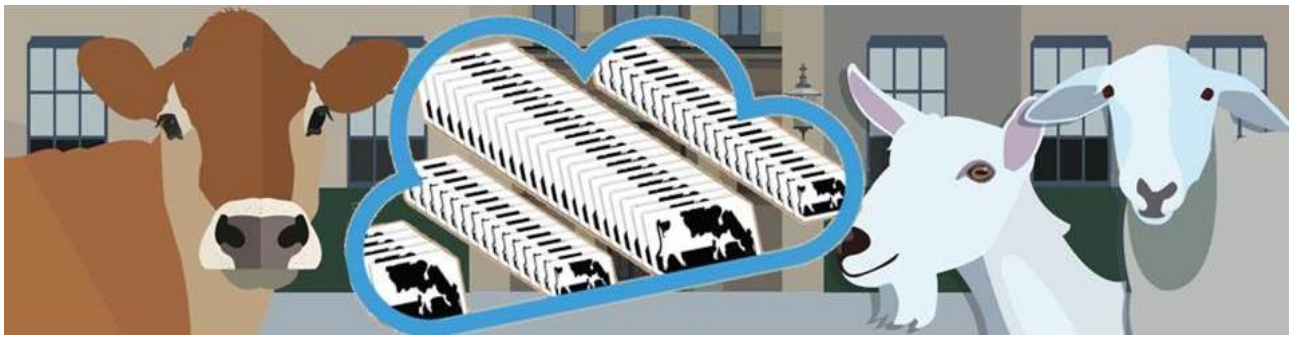
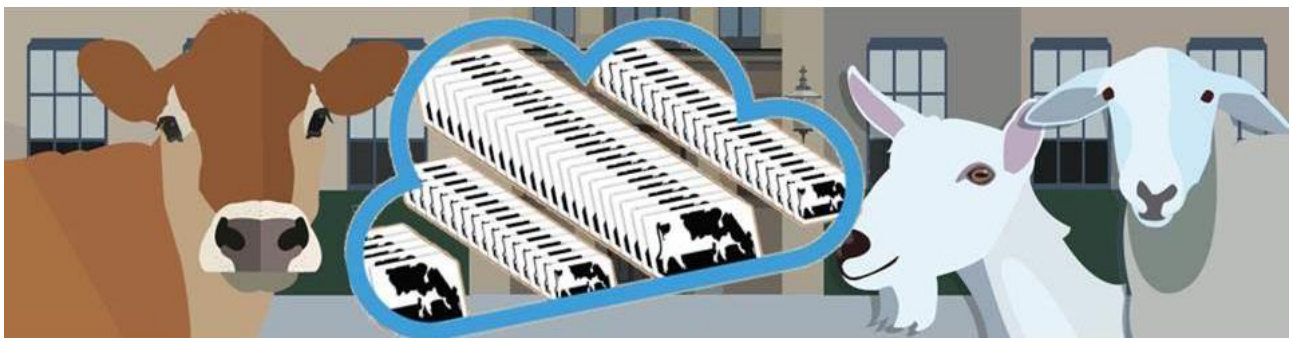
During the last decade, the use of accelerometers for heat detection and measurement of other types of dairy cow behaviour has increased considerably, not just for research purposes, but also for management purposes on commercial farms. Leg-mounted IceQube® accelerometers (IceRobotics Ltd, Edinburgh, UK) measure lying time (LT), number of lying bouts (LB), number of steps (Steps) and Motion Index (MI, an expression of overall leg activity) of cattle automatically. So far, automated data collection has typically focused on the lactation period, because of easy data download at each milking. Thus, automated sensor data from the dry period is lacking or at best scarce. As part of the Dairy Animal Sensor Integrated Engineering (DASIE) project funded by Innovate UK, around 100 Holstein Friesian dairy cows at Harper Adams University have worn IceQube® accelerometers for a varying period between August 2014 and present day, primarily collecting data from the lactation period. Additionally, dry period data were collected for some cows via an antenna in the dry barn. This study aimed to describe cow behaviour during the lactation as well as the dry period. Using data collected from the right hind leg starting late August 2014 to late July 2016, mean daily LT, LB, Steps, and MI was calculated for days of more than 10 observations. For plotting, data were smoothed using the loess function in R-package ggplot2. The figure shows the development of mean lying time across lactation and dry period, revealing distinct periods of very different levels of lying time, such as the peak prior to calving and the nadir about 4 weeks after calving. If the sensor is attached at first calving, the current battery life of five years allows for continuous data collection throughout five consecutive lactations. In conclusion, given that data collection infrastructure is also present in the dry barn, IceQube® accelerometers enable life-long real-time sensing of dairy cow behaviour, including the dry periods.



## FREE SESSION

## ORAL ABSTRACTS



**2.01**

**The effect of controllability and predictability on anticipatory behaviours in lambs**

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The aim of this study was to investigate the effect of predictability and controllability on the behavioural and heart rate responses when lambs were anticipating a reward. 36 female lambs of the breed Romane were allocated into three treatment groups where the Operant Conditioned Lambs (OCL) were trained to perform an operant task for a food reward (US), Pavlovian Conditioned Lambs (PCL) were trained to associate a red light (CS) with US and Control Lambs (CL) were presented with CS and US without a temporal connection between the two. Following training, lambs were tested when the duration between CS and US was five seconds (according to the training routine) and one when the CS-US interval was delayed to 30 seconds. Treatment had an effect on locomotor activity ($\chi^2(2)= 6.23$, $p=0.044$) where CL showed most locomotor activity. Additionally, PCL spent more time where the anticipated US would be delivered compared to CL ($z=2.83$, $p=0.013$) and OCL ($z=-2.77$, $p=0.016$), while OCL spent more time near where the operant task could be performed, more than CL ($z=2.79$, $p=0.059$) and PCL ($z=3.82$, $p=0.002$). OCL also repeated the operant task when the interval between CS and US was delayed (on an average of 1.67 times per lamb). There was no effect of treatment on heart rate. In conclusion, predictability and controllability affect the behavioural responses in different ways, while PCL focused more on the expected reward, OCL attempted to repeat the task that would result in the reward.

**2.02**

**Introduction to a metabonomic study of peri-parturient dairy goats**

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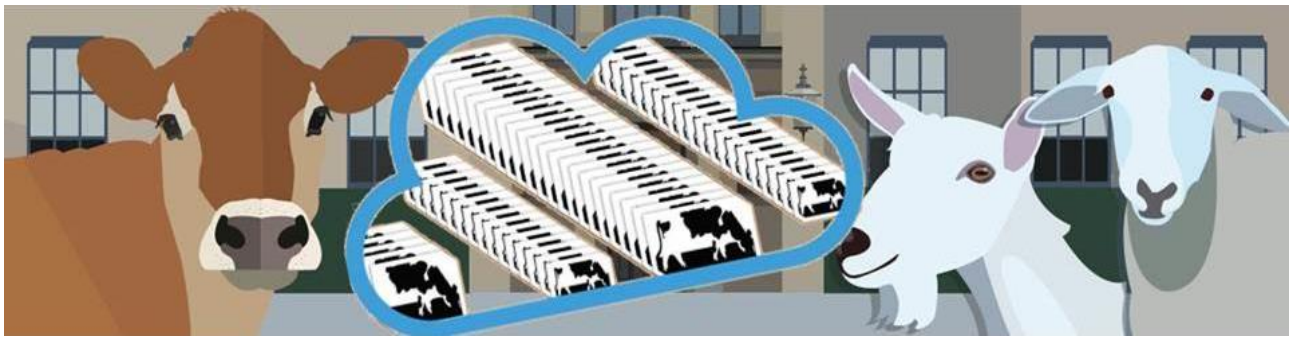
Peri-parturition is a critical period for dairy ruminants because of increased energy needs and not enough intakes. In some serious cases, it can lead to pathological state (ketosis/pregnancy toxemia). Up to now, some chemical additives were used to treat this period of metabolic imbalance (for example, propylene glycol). So, we wanted to test saponin-based feed additive during 2 periods (middle of lactating and peripartum periods) on dairy goats. Different parameters have been collected (classical biochemical data, metabolomic data using 1H-NMR spectroscopy, zootechnical parameters) in order to study the effect of this additive on these 2 periods, the individual responses of animals and to find some putative and earlier biomarkers of risk of ketosis (other than the classical but delayed beta-hydroxybutyrate or BHB).

The first experiment was provided on 20 lactating goats and the second one on 24 peri-parturient goats with 4 weeks of plant additive distribution. Weekly sampling of blood, rumen liquors and milk have been done. No significant differences on plasmatic glucose, urea, BHB and non-esterified fatty acids concentrations were found between additive/control groups or between sampling times. For rumen liquors, the pH normally decreased, the ammonia also normally decreased and the protozoa number had no variation. There was no statistical difference of the molar proportion concentrations of the most important volatile fatty acids between the experimental/control groups or between times at each sampling moment.

The metabonomic approach enable us, (by using 1H-NMR spectroscopy and the BATMAN R software package) to list main metabolites found in the different biofluids and to differentiate metabolic fingerprints of lactating and peri-parturient goats. Profiling analysis will led to the identification of the most abundant metabolites. The multidimensional statistical analyse will be performed on data in order to reveal the main metabolites and metabolic pathways involved in the peri-partum period of dairy goats and in their individual response to saponin-based additive.



**2.03**

**Effect of cow factors and daily walking distance on commonly used lameness indicators**

Lilli Frondelius, Heli Lindeberg, Stephanie Van Weyenberg, Annelies Van Nuffel & Matti Pastell
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There has been debate that common lameness scoring methods are unreliable, partly because factors unrelated to lameness can affect locomotion. We investigated the effect of cow factors (CF: parity, breed, lactation stage, milk production) and daily walking distance (DWD) on frequently used lameness indicators (LI).
Seventy-two cows (parity 1-6; 42 Holstein-Friesian (HF), 30 Nordic Red (NR)) were locomotion scored (LS; 1-12 times/cow, in total n = 402)) every two weeks in a 7 month study. LI could be non-present (0), present (1) or obviously present (2). The overall LS was based on the sum of the LI scores (0=0; 1=1; 2=2-4; 3= >4). The cows were housed in a freestall barn with slatted floors, and their position was recorded continuously (0.5 – 7 months/cow) with 1.2Hz sample rate. DWD was calculated from filtered positioning data. The effect of CFs and DWD on LIs was analyzed with backwards stepwise regression using linear mixed model with cow as a random effect. Six and a half percent of the cows were scored as 0 (4 % of NR; 8 % of HF), 23 % as 1 (26 %; 20.8 %), 53 % as 2 (56 %; 50.4 %) and 18 % as 3 (14 %; 20.8 %).
Cows with higher parity had higher scores ($p<0.002$) in tender placement of the hooves, back arch, reduced speed, irregularity in step timing, irregularity in step placement, abduction and head movement. Aging itself may affect the locomotion, but it is also possible that older cows have more claw disorders. HF cows had more abduction ($p<0.0001$) and irregularity in step placement ($p=0.008$), while NR cows reduced tracking up ($p<0.0001$). Overall LS spread quite evenly across the breeds and it is possible that some of LI differences are due to anatomical differences in two breeds. In early lactation tracking up was lower ($p<0.0001$), while the lactation progressed back arching increased ($p=0.06$). Larger udder in early lactation may hinder the hind leg movement. The DWD was lower when back arch ($p=0.002$) and reduced speed ($p=0.0003$) scored higher. In this study the cause of lameness was not investigated, and thus here the LI may be affected both by lameness and cow factors.

**2.04**

**A questionnaire survey on availability and management of hospital pens for Danish dairy cows**

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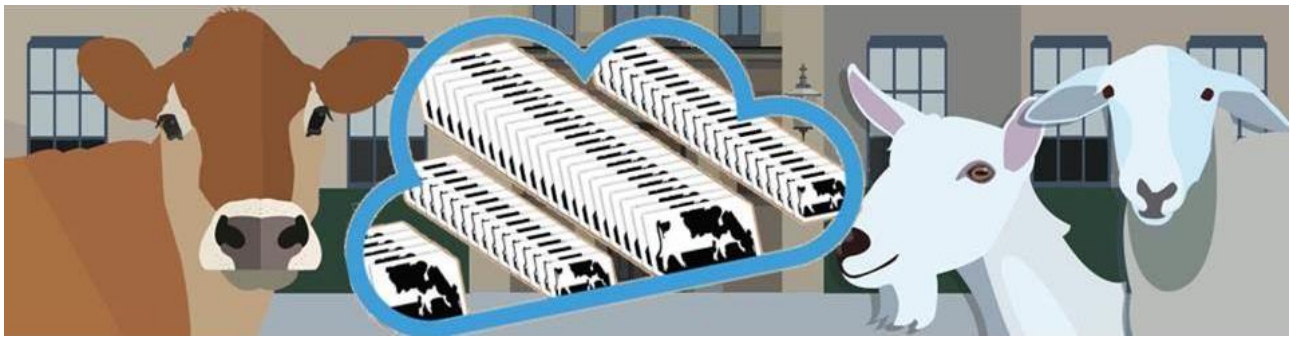
Sick dairy cows may have different needs compared to healthy cows and may therefore benefit from a stay in a hospital pen. However, although the presence of hospital pens on Danish dairy farms is mandatory, little information about the availability and management of these hospital pens is available. The purpose of this study was, by use of a questionnaire-based survey, to provide descriptive information about availability and management of hospital pens on Danish dairy farms.
The survey was emailed to 1296 dairy producers with an overall response rate of 24% including both conventional (88%) and organic (12%) farms with a median herd size of 150 cows (range 25 -1200). Almost all respondents (98%) had the possibility to move a sick or injured cow away from the milking herd. For 40% of the respondents the hospital area consisted of one or more single pens (for one cow), while 30% had group pen(s) and 30% had both. Among group pens 45% were designated hospital pens (as opposed to pens also used for e.g. calving). The most frequently cited conditions that would always result in moving the cow to a hospital pen were hip displacement (80%), milk fever (77%), displaced abomasum (65%) and severe cases of lameness (65%). However, large variation among which conditions would lead to the use of hospital pens was found between respondents. In 86% of the farms information regarding sick cows was passed on between employees in a systematic way (orally or written).

There is a lack of specified scientific substantiated recommendations for farmers about the facilities and management of hospital pens. Therefore, respondents were asked to evaluate if they believed that number of hospital pens and the facilities in the hospital pens matched the needs of the sick and injured cows on their farm. Surprisingly, 20% stated that their farm had too few pens and 36% found the facilities inadequate to fully match the needs of sick cows. This warrants for more scientific knowledge on the needs of sick cow in order to create evidence based guidelines for facilities and management of hospital pens.



**2.05**

**Fatty acids profile of mammary gland and milk of Palmera and Majorera goat breeds subjected to weight loss**

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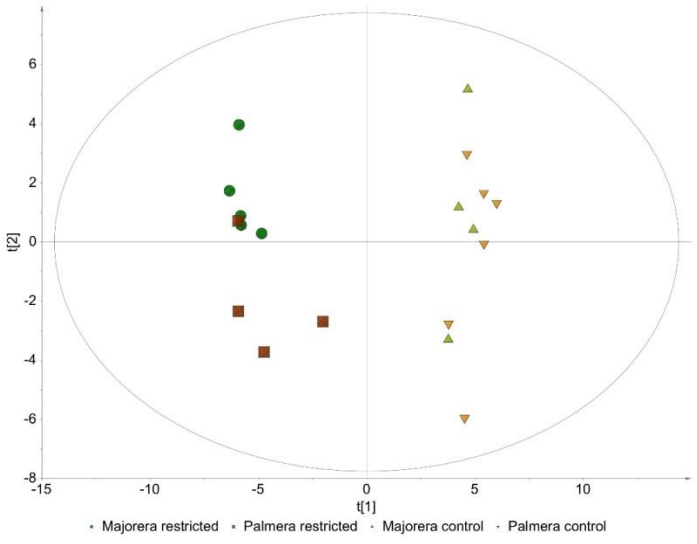
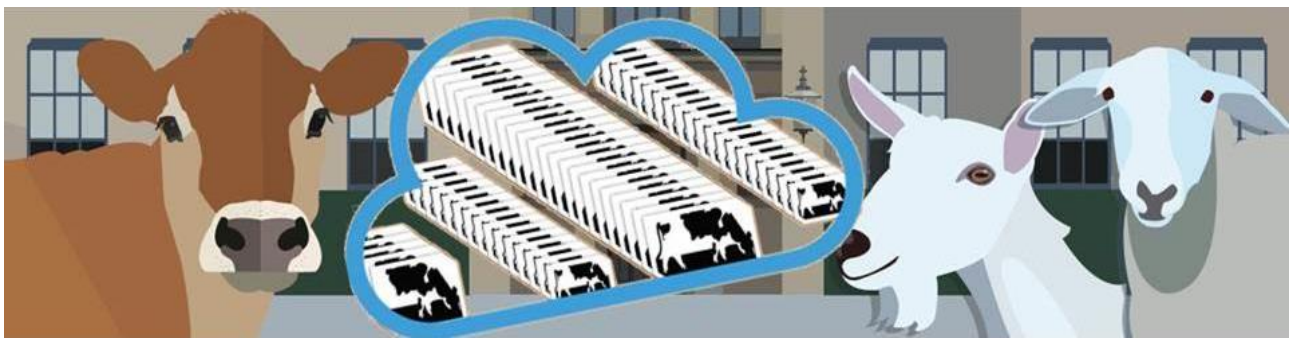
Goat dairy products are an important source of animal protein in the Mediterranean and the tropics. During the long dry seasons, pastures scarcity lead animals to lose up to 40% of their body weight, a condition known as Seasonal Weight Loss (SWL), that is one of the major limitations in ruminant production. Some breeds show higher tolerance to SWL and have therefore relevance to understand the physiological aspects of SWL. In the Canary Islands there are two dairy goat breeds differently adapted to SWL: the Palmera, evolved in a rainy climate and susceptible to SWL; and the Majorera, well adapted to arid environments showing tolerance to SWL. Fat is the milk component most affected by environmental and physiological conditions, and with major influence in its organoleptic qualities. Herein, we aimed to study the influence of feed-restriction in the fatty acid profile of the mammary gland and milk of the Palmera and Majorera goat breeds. Goats in mid-lactation from each breed were divided in a control group and a restricted-fed group. Milk and mammary gland biopsies were collected at the end of the experimental period (23 days) and the fatty acid profiles were established. The most representative fatty acids in mammary gland were oleic acid, palmitic acid and stearic acid. Most of the differences observed in this tissue were due to the treatment-effect and no differences were observed due to breed-effect. In milk, the four more abundant fatty acids were palmitic acid, oleic acid, capric acid and myristic acid. However, considering the total fatty acid composition, saturated fatty acids were the most representative. Most of the differences found in both breeds were caused by the treatment-effect. The treatment-effect on the fatty acid profiles was more marked in the milk samples than in the mammary gland biopsies. However, most of the fatty acids affected by the treatment-effect were observed in both samples (milk and mammary gland). Milk seems to be more susceptible to external changes, such as SWL. These results demonstrate the effects of feed-restriction in the milk fatty acids profile of the studied breeds and consequently its nutritional properties.



**2.06**

**Effect of a total dry ration on the feeding behavior and animal welfare of dairy cows**

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Welfare is a multidimensional concept. And its assessment is based on a set of indicators. In this context, an investigation was carried out in 10 dairy farms that have undergone a diet based on the total mixed ration to evaluate its effect on the welfare quality of dairy cows through some indicators such as body condition, lameness, milk production, flight distance, the appearance of the dung of cows and eating behavior such as the ingestion time, rumination and number of chewing. The results showed that the total mixed diet has an effect on some indicators. Indeed, a significant effect ($P < 0.05$) was observed in the increase of milk production, clean feet (score = 1.07 ± 0.06), the appearance of dung (score=1.37 ± 0.05) and flight distance ($p = 0.0004$). moreover, we recorded during observation of eating behavior of the cow an increase in the period of rumination ($p < 0.0001$), increased number of mastications by bolus (58.28±0.51) and increase in the amount of feed ingested and decreased ingestion time (26.58 ± 0.55 min) during a meal. On the other hand, no difference was recorded in the scoring of lameness and body condition.

**2.07**

**Lying time of dairy cows does not increase linearly throughout lactation**

Jarissa Maselyne[1], Matti Pastell [2], Peter T. Thomsen [3], Vivi M. Thorup [4], Laura Hänninen [5], Jürgen Vangeyte [1], Annelies Van Nuffel [1], Lene Munksgaard [3]

*[1]ILVO, Merelbeke, Belgium; [2]Luke, Helsinki, Finland; [3]Aarhus University, Tjele, Denmark; [4]IceRobotics Ltd., Edinburgh, UK; [5]University of Helsinki, Helsinki, Finland*

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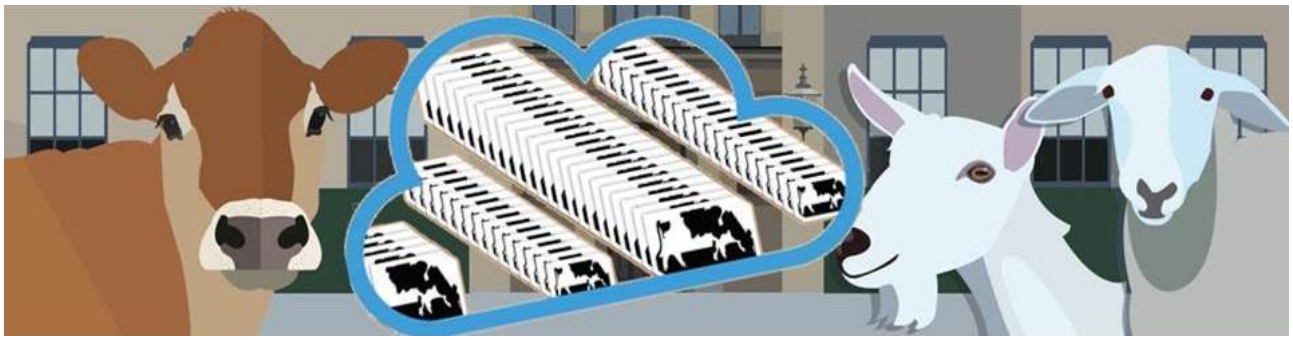
Lying time of dairy cows changes with lactation stage, and most authors report an increase in lying time from early to mid and mid to late lactation. Detailed measurements throughout lactation are often lacking however, which could mean that we are missing part of the picture. Data from 366 cows during 466 lactations were therefore used to derive a curve of lying time relative to days in milk. The cows were part of four large commercial Danish Holstein herds that were equipped with IceTags from 2008 to 2009. In total 53,653 days of data were collected between 0 and 305 days in milk. Lying time decreased dramatically during early lactation to reach a minimum around four weeks after calving. Only after this initial decrease, lying time increased steadily and stabilized towards the end of lactation. Wilmink's function for lactation curves was adapted to fit a model on to this data. Lying time was traded in exchange for standing time and not for walking time. Whether this was mainly standing while feeding (so a trade-off with feeding time) or idle standing (which could indicate discomfort during lying or long time waiting to be milked) or a combination is not known. The similarity of the lying time curve with a reversed lactation curve is striking, but more data is needed to verify whether or not there is a strong relationship between the curves (and between the minimum in lying time and the peak in milk yield) in a group of cows. Besides milk yield, a curve of feeding time would add to the understanding of the lying time. Similar curves were derived for motion index per minute walking and step frequency during walking [steps/min] and these showed a similar pattern related to stage of lactation. To conclude, this topic requires extra attention in future research on dairy cow welfare to pin-point what makes dairy cows change their lying time and step frequency throughout lactation (time budget, udder pain, pregnancy stage, etc.), and what effects this change in lying behavior could have on cow performance and welfare.



**2.08**

**HOMA, QUICKI and RQUICKI in healthy Holstein-Friesian cows during early lactation**

Jože Starič[1], Marko Cincović[2], Branislava Belić[2], Jožica Ježek[1]

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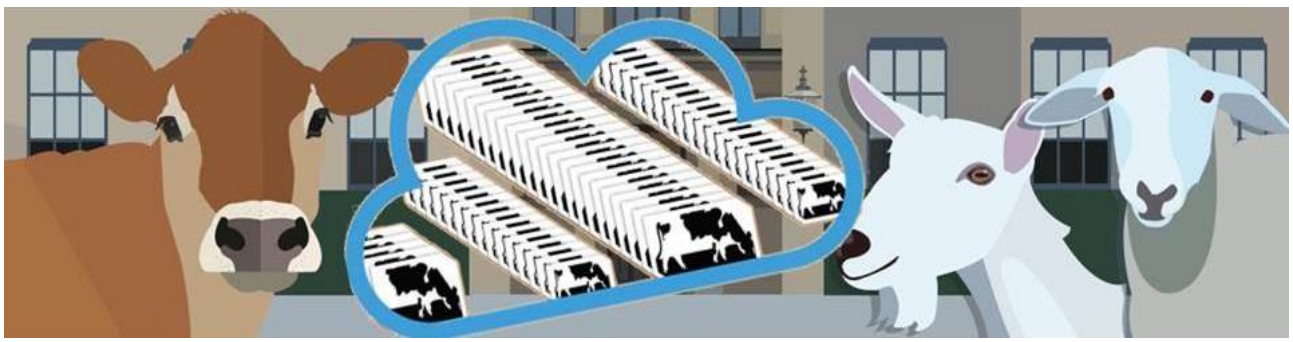
HOMA, QUICKI and RQUICKI are indexes of insulin sensitivity that are founded on measurement of blood concentration of insulin and glucose. Insulin resistance is phenomenon, where biological effect of insulin is lower than normally. Subsequently production of insulin could be compensatory higher or the biological effect could be lower due to inadequate production of insulin in response to glucose stimulation. Insulin resistance mechanism potentially enables sufficient glucose to mammary gland, which utilises glucose independently of insulin.

Forty Holstein-Friesian cows, second or higher parity, with milk yield of 7000 kg in previous lactation and without any health issues in previous lactation were enrolled in the study. They were kept at a commercial dairy farm and fed TMR according to NRC 2001 recommendations. At the time of blood sampling their body condition score was 3 to 3.5 and they did not show any signs of disease. Blood samples were obtained from v. jugularis 3 to 7 days after calving. Insulin, glucose and beta hydroxy butyrate were measured in blood serum and HOMA, QUICKI and RQUICKI calculated. Mean, standard deviation and reference intervals of indexes of insulin sensitivity were calculated.
Mean, standard deviation and reference interval of HOMA was 18.5±4.1 (10.172-26.978), QUICKI 0.36±0.06 (0.235-0.479) and RQUICKI 0.51±0.1 (0.296-0.722). Our results are to some degree comparable to results of other researchers, however there is some evidence that cows in different phases of lactation, with different energy balance and sick cows have different reference intervals of indexes of insulin sensitivity. Further studies clarifying these issues are necessary.

Table: Reference intervals for value of HOMA, QUICKI and RQUICKI in cows during early lactation

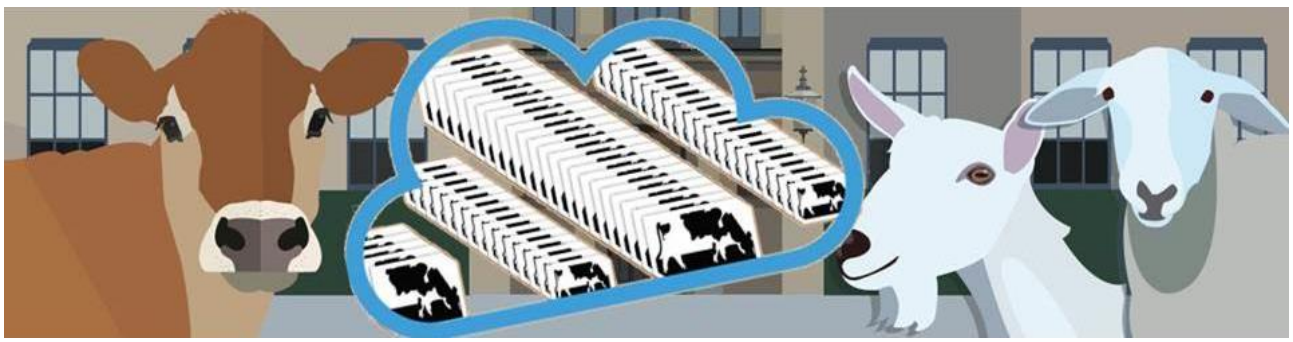
| | Quantile | | Limit | 90% CI |
|---|---|---|---|---|
| HOMA | Lower | 2.5% | 10.172 | 8.348 to 11.996 |
| | Upper | 97.5% | 26.978 | 25.154 to 28.802 |
| QUICKI | Lower | 2.5% | 0.235 | 0.209 to 0.261 |
| | Upper | 97.5% | 0.479 | 0.453 to 0.505 |
| RQUICKI | Lower | 2.5% | 0.296 | 0.250 to 0.342 |
| | Upper | 97.5% | 0.722 | 0.676 to 0.768 |



## THEMED SESSION:

## BIG DATA AND THE IoT

## ORAL ABSTRACTS



**3.01**

**The necessity of milk and microclimate recordings on dairy cattle farms on Balkan region in the light of climate change**

Vesna Gantner, Krešimir Kuterovac & Muhamed Brka

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Having in mind indisputable climate change worldwide that significantly affect dairy cattle farming, the necessity of implementation of breeding values for heat resistance in breeding strategies, aiming the financial losses reduction and enabling the sustainable farming, have become indisputable. The basic precondition of genetic evaluation are accurate data measured on population under control. Also, determination of THI threshold value, is the basis for setting up the genetic evaluation model. In most of the studies of the heat stress, climate parameters (temperature and relative humidity) were taken from meteorological stations resulting in possibly biased evaluation. In this research, ambient temperature and relative humidity were measured in the barns during the milk recording of dairy cattle population in Croatia in the period from January 2005 to December 2012. Daily temperature-humidity index was calculated accordingly to the Kibler's (1964) equation:

$THI = 1.8 \times Ta - (1 - RH) \times (Ta - 14.3) + 32$ (Ta is average temperature in degrees of Celsius and RH is relative humidity as a fraction of the unit). After logical control performed in SAS/STAT (SAS Institute Inc., 2000), data provided by the Croatian Agricultural Agency, consisted of 1,070,554 test-day records from 70,135 Holsteins reared on 5,679 farms and 1,300,683 test-day records from 86,013 Simmentals reared on 8,827 farms in Croatia. Determination of THI threshold value for daily milk traits of Holsteins and dairy Simmentals in Croatian farm showed high variability in determined value due to parity, production level and breed. Also, results showed higher resistance to the heat stress of dairy Simmentals than Holsteins. Following researches need to answer are Simmentals genetically more appropriate for the dairy farming in the climatic condition on the Balkan region? With that purpose, accurate milk and microclimate parameters recording need to be introduced in all countries in this region on regular basis.

**3.02**

**BIG DATA may be useful to dairy herd managers – after washing and drying**

Peter Løvendahl

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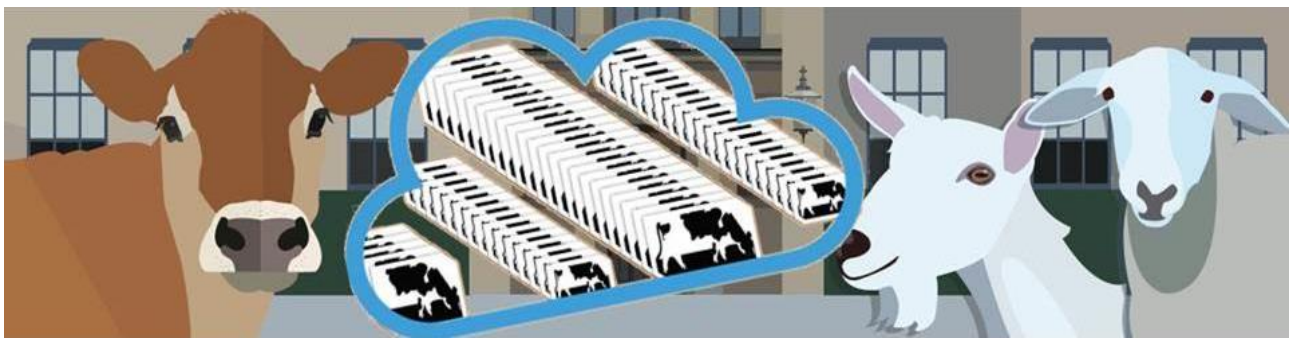
Great promises are often made by providers of newly developed sensor based decision support systems. After getting the device paid, installed, connected and switched on, the decision support is expected to work flawless ever after. But, it will not, unless a number of maintenance and control points are attended to. In some cases, the equipment will run but produce wrong results. General quality parameters like sensitivity and specificity may be available in technical data, but they are insufficient in describing common errors and stability issues. A simple "dashboard style" control panel would be a great help to verify that sensors are working, data is flowing and calibrations are within expected range. Also "oil lamps" and "fuel gauges" offer good help to view when service is needed. Control data from these "lamps and gauges" should be stored automatically in order to verify long-term performance and record service interventions of any kind. It would also be an advantage if equipment of various kinds were tested according to official guidelines provided by an international body such as ICAR. The guidelines should provide a list of control parameters; specify how they are to be measured and calculated; and give latitudes for acceptable function. The test results should be openly available to anyone. Testing for approval to known guidelines has been successful in many industries, including cars, electric hardware, safety equipment, and milk recording devices. During development of new sensor based decision support, with or without internet, BIG data solutions should therefore include routines for quality and performance control, as well as filters to remove faulty data. We have investigated these issues during our work with a mastitis detection and monitoring tool based on frequently recorded somatic cell count obtained from automatically milked cows. Our findings were clear: algorithms will usually work good with good clean data and bad with faulty and biased data. A modular build of software encourages guided sensor maintenance, cleaning or filtering and adjusting data, that was of utmost importance to obtain reliable processed data.



**3.03**

**Analysis of relationship between claw disorders, metabolic status and milk yield.**

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The aim of the study was to evaluate the influence of fat to protein ratio (F/P ratio) as the indicator of metabolic status according to milk yield. 144 Holstein cows from 3 dairy farms between 2012 and 2016 were observed. In total 374 records of month milking were studied between 7 to 100 days in milk. Maximum 4 test-day records before functional claw trimming were observed. The average milk yield was 38.44 ± 9.45 kg/day. Statistical analysis was performed by the SAS. The influence of F/P ratio to claw disorders (IDHE, DD, SU) was analysed with proc gml of SAS. The model included the fixed effect of herd, year of calving, calving season, number of lactation and the random effects of days in milk and F/P ratio. In risk of acidosis were 13.9 % of observations and 13.10 % in risk of ketosis. The effects of herd, parity, year and season of calving, days in milk and fat to protein ratio described the milk yield on 47.41 %. All the selected effects except the F/P ratio and calving season had highly significant influenced (P0.05). According the subsequent functional claw trimming 29 cows were affected by IDHE, 9 cows by DD and 29 cows by SU. Observed cows in average produced 38.44 ± 9.45kg of milk. The average of F/P ratio was 1.24 ± 0.26 and the average of days in milk was 47.98 ± 26.59. The models determined the presence of claw disorders from 10.72 % in case of DD resp. 23.05 % in case of IDHE. The model described the prevalence of by 16.09 %. The F/P ratio influenced significantly (P>0.05) the presence of IDHE by 17.10 % resp. SU by 25.07 %. It is possible to use the F/P ratio as the non-invasive method of prediction of metabolic disorders and to eliminate the negative effect on milk yield and presence of the claw disorders. Individual signals could be observed when analysing whole genome data associated with economically important traits as immunity and adaptation.

**3.04**

**Data integration to improve the prediction of individual dry matter intake of dairy cows**

Francisco Maroto-Molina, Paolo Berzaghi, Ana Garrido-Varo, José Emilio Guerrero-Ginel & Dolores C. Pérez-Marín
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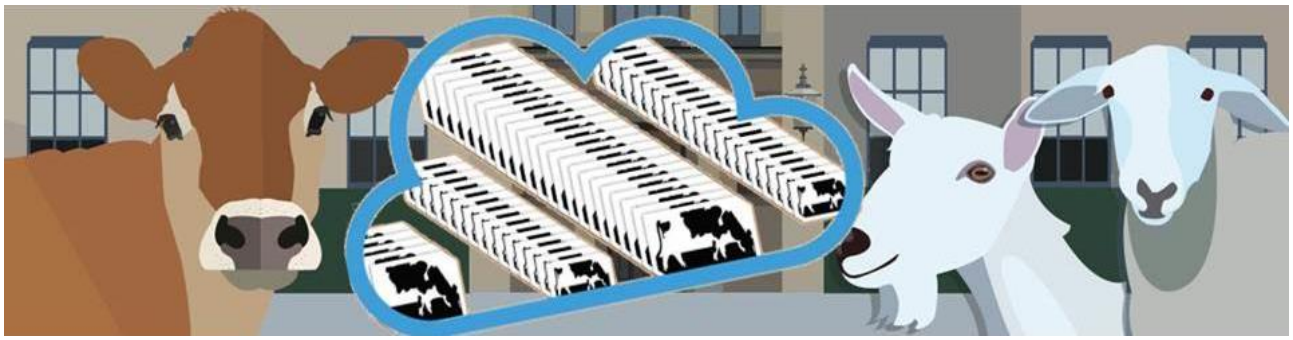
Monitoring individual dry matter intake of dairy cows is important for nutritional management, early detection of disease, etc. Nowadays, we have several precision livestock farming technologies that allow us to automatically measure the time dairy cows spend around the feeding area, i.e. feeding time, and some researchers are developing models to estimate individual intake from that variable. However, there are other variables related to intake that could be automatically monitored and it can be expected that a multivariate approach (multi-sensor) could lead to better predictions. The objective of this study was to explore the potential of data integration in order to improve individual dry matter intake prediction models. We have used a database containing records from two feeding trials carried out in an experimental farm of northern Italy: 12 cows x 12 days and 14 cows x 10 days. We applied a stepwise regression to daily dry matter intake as the dependent variable and daily feeding time, cow body weight, daily change in body weight, week of lactation, energy corrected daily milk production, NDF content in the diet and particle size (percentage below 19 mm and percentage below 8 mm) as independent variables. Using our database, the linear regression between intake and feeding time has a R2 of 0.06 and a standard error of 3.94 kg/day. However, the stepwise regression model procedure includes cow body weight, energy corrected daily milk production, feeding time, particle size expressed as percentage below 8 mm and daily change in body weight and has a R2 of 0.62 and a standard error of 2.51 kg/day. Data integration has enabled an important improvement in the prediction model, but more research is needed in some aspects, e.g. the effect of data granularity (in our database, we have daily and weekly measured data) or the inclusion of new data (rumination time, climate data, etc) into the model.



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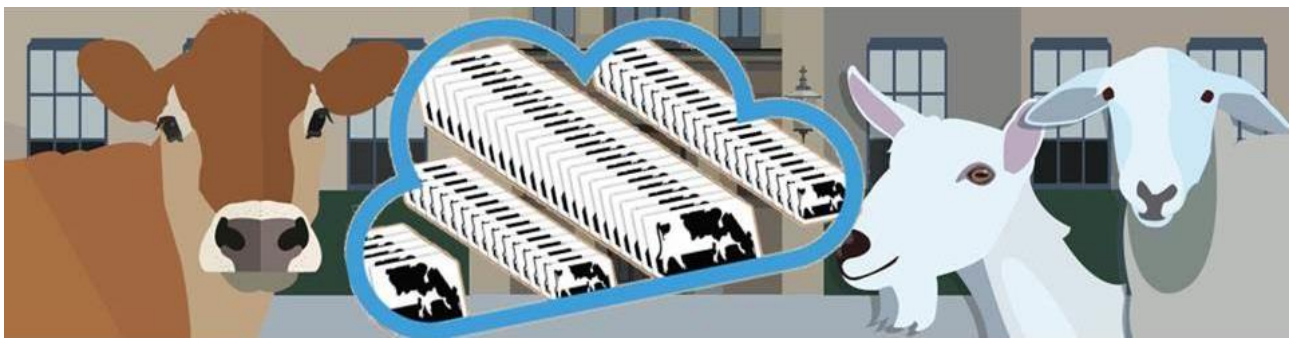

**P.01**

**Effects of intensive milk feeding and butyrate on growth performance and the Insulin-like Growth Factor (IGF)-I system in blood of German Holstein calves**

Dörte Frieten[1], Caroline Gerbert[2], Christian Koch[2], Georg Dusel[1], Birgit Mielenz[3] & Harald M. Hammon[3]
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Combining the strategy of intensive milk feeding and butyrate supplementation, we hypothesised that this combination accelerates postnatal growth performance and affects plasma concentrations of glucose, insulin, IGF-I and IGF binding proteins (IGFBP) in calves. German Holstein calves (32 male and 32 female) were studied from birth until 11 wk of age. All calves received colostrum and milk replacer (MR; 125 g powder/l) in amounts of 6 l/d (Res; n=32) or *ad libitum* (Adlib; n=32) for 8 wk. In both feeding regimes, half of the calves (n=16/group) were fed MR with 0.33% Ca-/Na-butyrate or same MR without butyrate by an automatic feeding system. Milk intake was stepped down to 2 l/d from wk 8 to wk 10, and 2 kg MR were offered until the end of the study. Concentrate, hay and water were freely available. On d 1, 2, 3 and 7, then weekly until wk 11 of life, blood samples were taken to measure plasma concentrations of glucose, insulin, IGF-I and IGFBP-2, -3 and -4. Feed intake was measured daily, and body weight was determined weekly. Data were analysed by the Mixed Model of SAS with feeding regime, butyrate supplementation and time as fixed effects. Birth weight was similar and MR intake was greater ($P < 0.001$), concentrate intake was lower ($P < 0.001$), and body weight increased much more ($P < 0.001$) in Adlib than in Res. Plasma concentrations of glucose, insulin, IGF-I and IGFBP-3 were greater ($P < 0.001$), but the plasma concentration of IGFBP-2 was lower in Adlib than Res up to the end of ad lib milk feeding. Thereafter, glucose, insulin, IGF-I and IGFBP-4 concentrations were partly greater in plasma of Res calves ($P < 0.05$), whereas plasma IGFBP-2 was greater in Adlib. Butyrate supplement partly reduced ($P < 0.05$) plasma concentrations of glucose, insulin and IGF-I. The stimulation of the IGF system in blood indicated an enhanced anabolic metabolism in calves during intensive milk feeding. However, this stimulation disappeared when the intensive milk feeding is stopped. Butyrate did not improve postnatal growth and partly depresses the IGF system in blood.

**P.02**

**The effect of shading on individually kept calves**

Viktor Jurkovich[1], Luca F. Kézér[2,3], Martina Gánti[1], Rebeka Gombos[3], Mikolt Bakony[1] & Levente Kovács[2,3]
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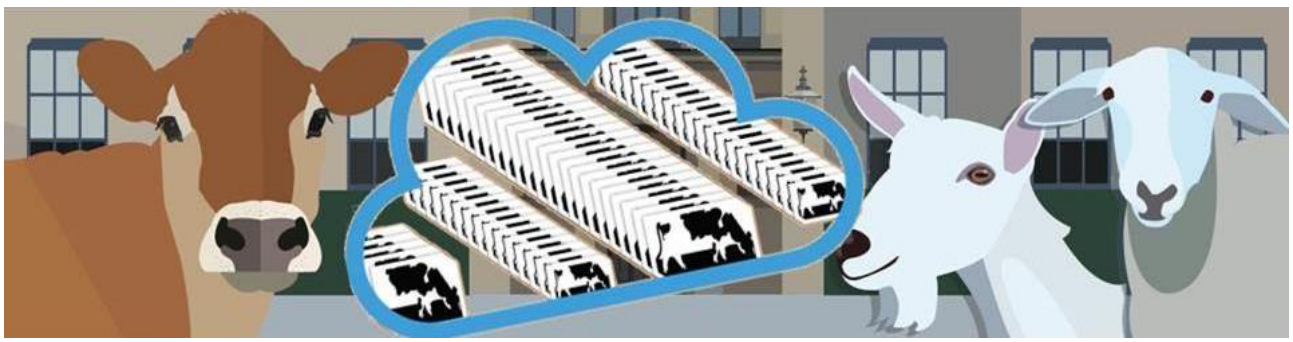
Heat stress entails severe loss in production, reproduction and mortality. The physiology of heat stress and ways of alleviating the adverse effects of high ambient temperature have been the subject of extended research. Solar radiation has a huge impact on the sense of heat and consequently behaviour of animals kept outdoors. The material, color or thermal isolation of individual calf hutches, or merely the presence of good quality shading can help reduce radiant heat load in calves, however, none of these „cooling" methods are widely used in calf rearing. We studied the effects of reducing solar radiation by shading on calves kept outdoors in individual cages on hot summer days. 16 pre-weaned Holstein-Friesian calves were allocated into two groups. 85% shade rate sun shade net was placed 2m above one of the groups in a way that both the hutches and the runs were in shade all through the day. Respiratory rate, rectal temperature and the surface temperature of the shoulder, feet, nose, eyes and ears were registered every 4 hours. Data loggers have recorded temperature and relative humidity data every 10 minutes in shade, sun, shaded and sunny hutches. HOBO Pendant G accelerometers were used to continuously register the posture (standing or lying) of animals. The temperature humidity indices calculated from the recorded data showed a significant difference between the two groups. Respiratory rate was lower, and animals changed posture less frequently in the group with shading. The animals spent less time lying in the periods with the highest temperature. Body surface temperatures showed a similar pattern in both groups and no significant difference was detected, however, in the midday and early afternoon hours great differences could be observed. Average rectal temperatures did not differ between groups. Results confirm that shading can help reduce heat stress in calves kept in individual cages. The research was supported by the János Bolyai Research Scolarship of the Hungarian Academy of Sciences.



**P.03**

**Analysis of d-ROMs and BAP tests in dairy cow and goat plasma and milk**

Lada Radin[1], Jasna Aladrović[1], Blanka Beer Ljubić[1], Renata Laškaj[2], Marija Mamić[1], Antun Kostelić[3], Goran Bačić[1], Iva Bačić[1], Nino Mačešić[1] & Jelena Šuran[1]

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While not indicative of a single illness, oxidative stress has been linked to a number of various pathologies in ruminants, such as mastitis, retained placenta and various reproductive disorders. The efforts to measure oxidative stress/status have devised a big number of methods, but quantifying it still presents a significant challenge, especially in veterinary medicine. The evaluation of oxidative balance by assessment of Reactive Oxygen Metabolites (d-ROMs test) production and biological antioxidant potential (BAP) has become increasingly popular among the "quantification" methods due to its simplicity and low cost. This study was conducted on 17 dairy cows (Holstein) and 17 dairy goats (Alpine) that were in the first third of their lactation. Milk from each quarter/half was microbiologically tested for common mastitis pathogens and tested negative. BAP, d-ROMs, SOD (superoxid dismutase) and GSH-Px (glutation peroxidase) were measured in both milk and serum samples. The correlation of d-ROMs and BAP tests in dairy ruminants between two biological fluids has been investigated as a possibility to use a non-invasively obtained sample for measuring oxidative status. Furthermore, the relationship between d-ROM, BAP and antioxidant enzymes was investigated. d-ROMs were unmeasurable in goats' defatted milk prepared through a double centrifugal process, while mean d-ROMs values in cows' milk (prepared in the same way) were 60 ± 36,5 U Carr. BAP values were almost double significantly higher in cows and goats milk than in serum. For both antioxidant enzymes, difference in serum and milk activity was significantly different, with GSH-Px activity being higher in serum, while SOD activity was higher in milk. In cows, milk d-ROM were significantly positive correlated to milk SOD and negatively to serum SOD. In goats, milk SOD was positively and significantly correlated with milk BAP, while milk GSH-Px was highly positively correlated to serum BAP. These results represent first measurement of d-ROMs and BAP in ruminants' milk, and call for further evaluation of their usability in measuring oxidative status of dairy ruminants.

**P.04**

**Implementation of zootechnical and zooprophilactic measures in adaptation and acclimatization of Assaf dairy sheep with multimodal approach**

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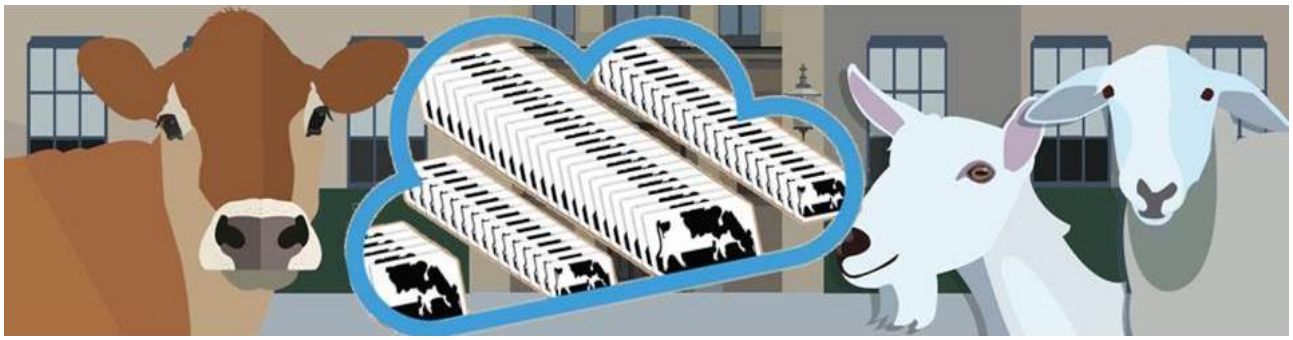
Assaf dairy sheep originated form Israel and is crossbread between Awassi and East Friesian breeds. High productive and reproductive performances are mainly characteristic of Assaf sheep for intensive breeding. Successful adaptation and acclimatization are very important for: maintaining good health, new born lambs and milk production. Average milk production of Assaf dairy sheep is 334 liters milk for 173 days of lactation and 1.34 lamb per sheep for one year. For that purposes, Assaf sheep were imported in our country, kept under appropriate environmental condition and nutrition was suitable for productive stages. Continuous monitoring of hematological and biochemical parameters of the heard during reproductive cycle, have shown successful metabolic adaptation in different stages, without exhibit any production disease, such as ketosis, fatty liver, gravidity toxemia, retain placenta etc. But welfare and wellbeing at the most of the sheep were affected with severe gangrenous mastitis, agalactia, clostridia infectious and pasteurelosis in lambs. Lymphocytes as a predominant population in white blood cell in sheep are response for producing circulating antibodies in blood stream. Immunological response can be favorable factor for successful adaptation and acclimatization ability of Assaf breed, in the intensive farm breeding. Implementing combination of zootechnical and zooprophylactic measures help to diminished clinical and subclinical disease. Improving ambiental condition, lightening, ventilation, more comfortable beddings, daily cleaning, disinfection and dissection, dividing sheep into appropriate groups according age, lactation, lambing, were helpful for easier control of the disease. Cleaning and disinfection of milking system ensure proper milking and udder hygiene. Also including software for evidence milking per sheep and calculate average milk lactation obtains relevant data for milk production. Dehelminitisation and vaccination protocol improve immunological system for faster and easier recognizing infectious agent. Feeding management implemented by nutritionist was helpful for supplying palatable and quality diet for the heard. All undertake measures and records of all necessary data in the program software were very helpful to alleviate losses in the first year of importing Assaf dairy sheep in our country. Continuous monitoring with all necessary parameters improves better condition of welfare and wellbeing of imported sheep.



**P.05**

**Changes induced by age in the glucose metabolism of suckling camel calves before weaning**

Elena Díaz-Medina[1,2], Gerardo Caja[1], Maristela Rovai[3], Ahmed A. K. Salama[1], Soraya Cabrera[2], Moez Ayadi[4], Riyadh S. Aljumaah[4], Mohammed A. Alsheikh[4]

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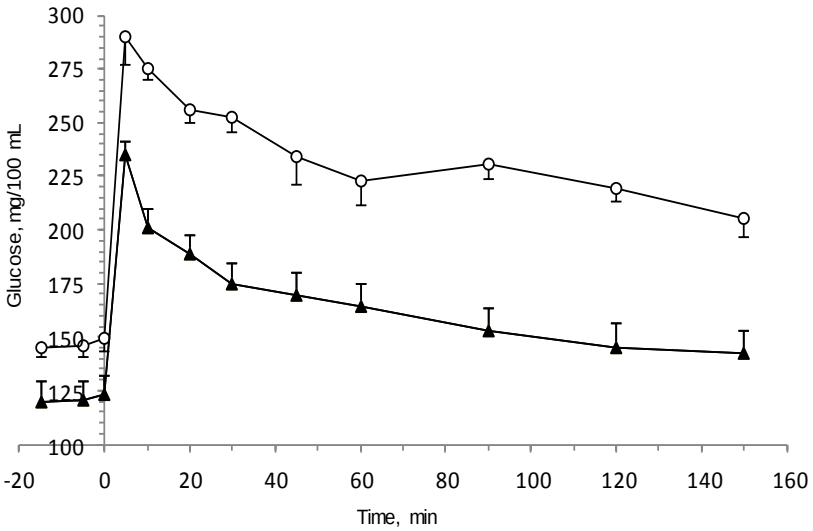
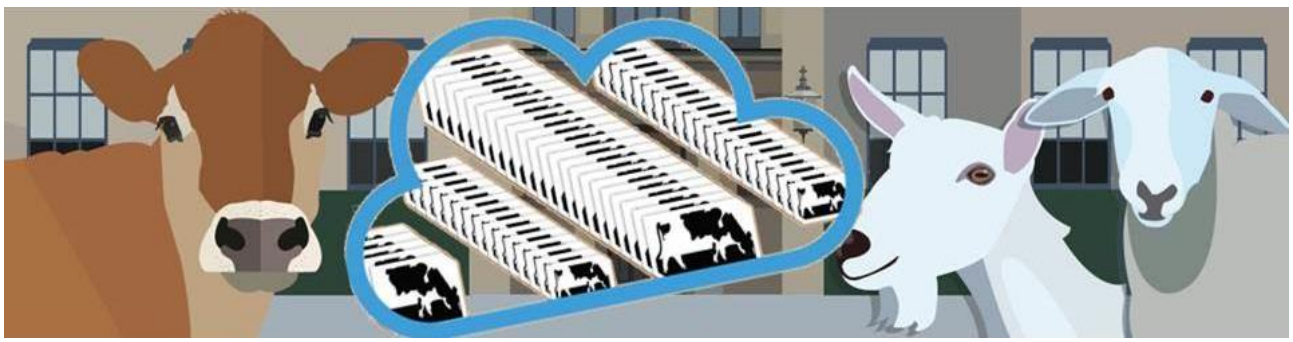
Dromedary camels are pseudo-ruminants adapted to arid conditions. Despite fermenting carbohydrates into VFA like true-ruminants and producing glucose (GLU) by gluconeogenesis, camels have glycemic values like monogastrics and twice than true-ruminants. On the contrary, suckling camels absorb milk sugars mainly as GLU, undergoing dramatic changes in carbohydrate metabolism around weaning. With this in mind, 2 groups of camel calves of different ages: A (15 ± 3 d and 39.7 ± 1.8 kg BW, n = 5) and B (132 ± 19 d and 115.2 ± 5.8 kg BW, n = 5), were catheterized and submitted to GLU tolerance tests (0.25 g GLU/kg BW) and INS challenges (4.6 µg INS/kg BW) for 12 time points (min −15 to 150). Plasma basal values were high in GLU (A vs. B, 121 ± 4 vs. 148 ± 3 mg/dL; $P < 0.01$), increasing by age, and low in INS (0.124 ± 0.027 ng/mL; $P > 0.05$). Both B basal values were similar to adults. Pattern of GLU and INS curves during GLU tolerance tests (Fig. 1) and INS challenges, and their areas under the curves, were lower for A vs. B camels ($P < 0.001$). The GLU-induced INS secretion decreased by age, peaking 5 min after infusion (A vs. B, 1.60 ± 0.63 vs. 0.41 ± 0.07 ng/mL; $P < 0.001$). Nevertheless, B camels were able to use the high GLU values without dramatically increasing INS or mobilizing fat depots (i.e., NEFA). The INS-infusion decreased GLU in both A and B camels, being able to metabolize NEFA into BHB. Moreover, INS sensitivity surrogate indices (A vs. B) were different for QUICKI (0.40 ± 0.01 vs. 0.35 ± 0.01; $P < 0.05$) and HOMA (0.52 ± 0.19 vs. 0.99 ± 0.19; $P < 0.05$), but not for RQUICKI, GLU half-life, and GLU and INS clearance ($P = 0.16$ to 0.35). The GLU half-life values of camels (124 ± 16 min) were twice than reported in true-ruminants. In conclusion, young suckling camels showed high GLU, which increased by age, and low INS values, the GLU being used slowly and likely by insensitive GLU transporters (i.e., GLUT-1).

**Figure 1.** Plasma glucose concentration during glucose tolerance test in camel calves of different ages: A (▲, 15 d and 40 kg BW) and B (○, 132 d and 115 kg BW). Values are means of 5 animals in each group. Bars represent standard errors.



**P.06**

**Dairy ewes are not chronically stressed by shearing during lactation and their milk yield may increase depending on the breed**

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The effect of shearing during mid-lactation under mild winter conditions was investigated in a total of 48 dairy ewes of 2 breeds (Manchega, MN; Lacaune, LC) differing in milk yield and composition, but of similar body weight, body condition score, age and stage of lactation. Ewes were permanently sheltered indoors, fed alfalfa hay ad libitum and concentrate (MN, 0.45 kg/d; LC, 0.65 kg/d; as fed) and allocated in 4 balanced groups by breed to which the experimental treatments were randomly applied in duplicate. Treatments were: US (unshorn: control) and SH (shorn). Temperatures in the shelter were similar before (12.6 ± 0.9°C) and after (13.0 ± 0.3°C) shearing. Fleece weight was greater in shorn MN than LC (1.04 ± 0.10 vs. 0.75 ± 0.09 kg/ewe; $P < 0.05$). As a result of shearing, rectal temperature decreased in the MN-SH ewes, when compared to the MN-US (38.51± 0.11 vs. 38.88 ± 0.12°C, respectively; $P < 0.001$), but did no vary in the LC ewes (38.57 ± 0.08°C). Lactational responses to shearing during milking varied according to breed, the results in LC being most marked than in MN ewes. Feed intake increased in the LC-SH (5%; $P < 0.01$), when compared to LC-US, but did not vary in MN ewes. Moreover, the LC-SH ewes yielded 10% more milk (1.38 ± 0.06 vs. 1.52 ± 0.05 L/d; $P < 0.05$) than LC-US ewes, but no differences were detected in MN ewes (0.74 ± 0.03 L/d; $P = 0.261$). There were no differences in milk composition between treatments in both breeds but LC-SH ewes yielded more milk protein (9%; $P < 0.01$) and lactose (10%; $P < 0.05$) than LC-US ewes. No effects of shearing were detected on metabolic (glucose, NEFA) and hormonal (cortisol, insulin) plasma values, as well as on BW and BCS changes. In conclusion, shearing lactating ewes during winter, under moderate cold conditions, were not chronically stressed and this may a suitable management option for improving feed intake and milk production of high-yielding dairy ewes, without deleterious effects neither on physiological indicators nor milk composition.

**P.07**

**Physiological responses and lactational performances of dairy goats under cold stress conditions**

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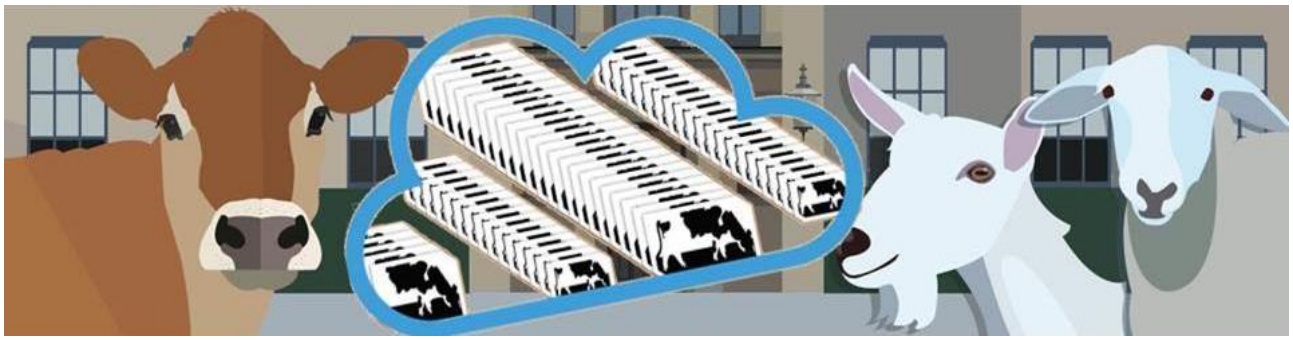
Low winter temperatures in some regions combined with increasingly frequent extreme cold waves have negative impact on animal performance and welfare. The objective of this study was to evaluate the physiological and lactational responses to cold stress of dairy goats. Eight Murciano-Granadina dairy goats in mid-lactation were lodged in metabolic cages and randomly allocated into 2 groups: thermoneutral (TN; 15 to 20°C) and cold stress (CS; -4 to 8°C). The experimental design was a crossover with 2 treatments in 2 periods (21 d each). Goats received a total mixed ration (70% forage and 30% concentrate) and water ad libitum and were machine milked twice daily (0800 and 1700h). Feed intake, water consumption, rectal temperature, and respiration rate were recorded daily. Milk samples for composition were collected weekly. Insulin, glucose, non-esterified fatty acids (NEFA), beta-hydroxybutyrate (BHBA), cholesterol and triglycerides were measured in blood samples taken weekly. Body weight (BW) was recorded at the start and end of each period. Compared to TN goats, CS goats had similar feed intake but lower ($P < 0.05$) water intake (−23%), milk yield (−8%), respiratory rate (−6 breaths/min) and rectal temperature (−0.32°C). Furthermore, milk of CS goats had greater ($P < 0.05$) contents of protein (10%), fat (12%) and lactose (4%). By the end of the experimental period, CS goats lost −0.45 kg of BW (not significant), whereas TN goats gained 2.2 kg ($P < 0.05$). Blood insulin and cholesterol levels were not affected by CS. However, values of blood glucose, NEFA, hematocrit and hemoglobin increased ($P < 0.05$) by CS, whereas BHBA and triglycerides decreased ($P < 0.05$). In conclusion, cold stress reduced milk yield in dairy goats, but milk contained greater fat and protein. Significant changes in metabolism induced by low ambient temperatures included the increment in blood NEFA and glucose levels, despite the no change in insulin values. We hypothesized that NEFA were directly used by the mammary gland (increased milk fat) rather than metabolized in the liver (lower BHBA and triglycerides).



**P.08**

**Effects of horns on production and reproduction efficiency in extensively reared goats**

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Disbudding in ruminants is a recognized and widely accepted welfare concern. Having multiple implications in goats, given that for some European breeds the male infertility and inter-sex condition are linked to the polled phenotype. As a result, selection for hornless animals could not be advised in breeds where this link was documented. Aim of the current research was to evaluate the effects of horns on production and reproduction efficiency in extensively reared Carpatina goats. The study was carried out at the Research and Development Station for Sheep and Goats from Caransebes (45°25'17"N 22°13'19"E) Romania (altitude of site 280 m), where 126 purebred Carpatina does and their resulting kids, managed under extensive low-input production conditions were included in the research flock. Does were either horned (n-69) or naturally polled (n-57), no disbudding was practiced. Body weight at the onset of the reproduction season (mid-September) was of 37.2±0.70kg and 40.7±0.87kg in polled and horned goats, respectively ($p \leq 0.05$). Conception rates were not affected ($p > 0.05$) by the presence of horns in the studied goats, with polled does having conception rates of 95.7±4.13% and the horned animals 97.1±3.12%. Litter size was significantly ($p \leq 0.05$) influenced by the phenotype, with hornless does exhibiting lower prolificacy rates, of 123.6±8.38% compared to 131.8±6.30% the horned animals. Litter weight at kidding was not influenced ($p \geq 0.05$) by the doe's phenotype, being on average 3.78±0.07kg and 3.91±0.06kg in hornless and horned animals, respectively. Milk yield was significantly ($p \leq 0.01$) influenced by the presence of horns, with polled does having and average production of 148.1±1.56kg and the horned ones, on average 155.7±1.40kg. Based on the current preliminary findings, it was concluded that presence of horns in extensively reared goats influences significantly some of the production and reproduction outputs. Further larger scale studies should be implemented, in order to evaluate the economic implications and the genetic basis for selection in Carpatina goats for polledness.

**P.09**

**Behavioural reactivity implications in production and reproduction efficiency of Fleckvieh cows**

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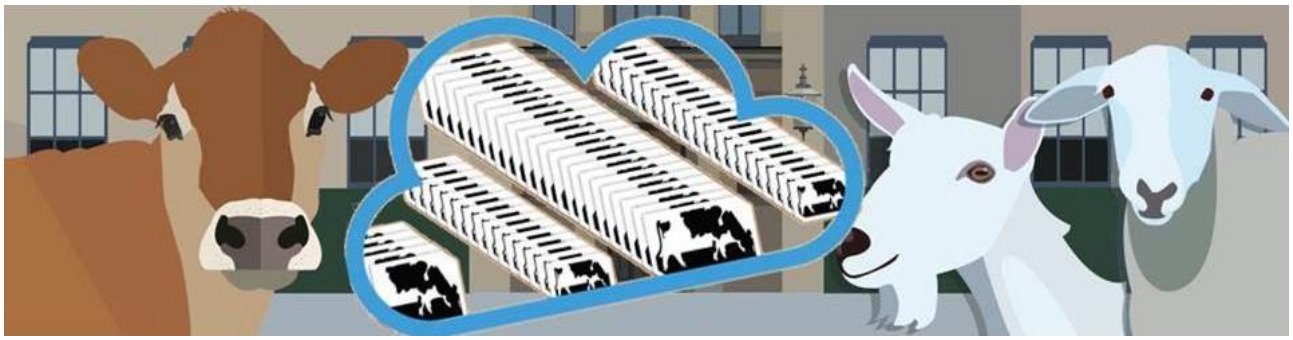
The aim of the current research was to evaluate the effects that behavioural reactivity has on production and reproduction performances in Fleckvieh dual-purpose cattle breed. The study was carried out at the Research and Development Station for Bovine Arad (46°10'36"N 21°18'4"E) Romania (altitude of site 107 m), where 198 purebred Fleckvieh cows, managed under loose system with zero grazing were included in the research herd. Behavior of animals was recorded using a 5-points score scale at weighting, while spending 30 seconds in the weighing crate: 1 calm, no movement; 2 calm with occasional movements; 3 moderately movements; 4 abrupt episodic movements; 5 permanent episodic movements. Comparisons between the three temperament classes (calm, nervous and moderate) for body weight, days open, inseminations per gestation, calving interval, milk yield, fat yield, fat percentage, protein yield, protein percentage, milking speed, somatic cell count and number of steps were carried out using the one way ANOVA protocol, with categorical factor being considered the temperament of cows. Behavioral reactivity of cows significantly influenced ($p \leq 0.05$) the body weight, milk yield, fat yield, protein yield, protein content and the calving interval of the cows included in the study-head, having more substantial effects ($p \leq 0.001$) on the milking speed and the number of steps per day, with calmer cows outperforming the nervous counterparts. However, temperament did not influenced ($p > 0.05$) traits such as days open, number of inseminations per gestation, fat percentage, somatic cell count, body condition score, cleanliness of udder and cleanliness of hindquarter. Significant negative phenotypic correlations were found between temperament and cows body weight (-0.19), milk yield (-0.19), fat yield (-0.14), protein yield (-0.18) and milking speed (-0.18). Current results suggest that selection for calm temperaments will translate into increased milk, fat and protein yields in Fleckvieh cattle, as well as shortening the calving interval and improving the milking speed.



**P.10**

**Colostrum composition from dairy cows exposed to heat stress during late gestation**

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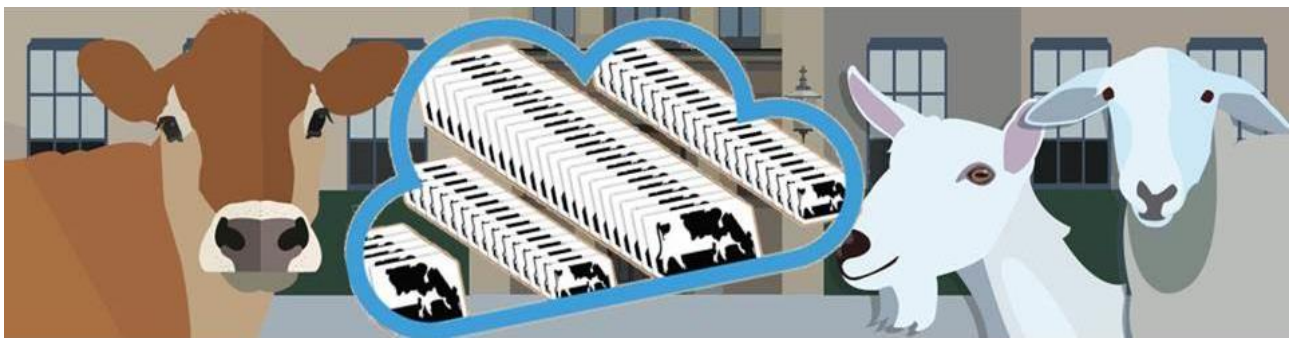
The objective of this study was to assess the effect of heat stress during late gestation on the nutritional value of colostrum from dairy cows. Additionally, concentrations of IgG and IGF-I, as biologically active components of colostrum that are essential for neonatal survival, were examined. The experiment was conducted at the commercial Dairy farm near Belgrade, Serbia, from March to September (thermoneutral period of the year) and from July to September (hot period of the year), year 2015. The Temperature humidity Index (THI) was calculated, daily. Twenty Holstein cows were assigned for this study. The first group (OPT, n=10) included late gestational cows examined during thermoneutral period of the year, and the second group (HS, n=10) included cows examined during hot period. Colostrum samples were Colostrum samples were taken from dams 2, 12 and 24 hours after calving. Results for colostrum composition indicate that colostrum composition is markedly affected by heat stress (table 1). In conclusion, one of the factors that can compromise survival of newborn calves during hot season is poor quality of colostrum from dams exposed to heat stress.

ACKNOWLEDGMENTS:
The study was financed by the Ministry of Science and Tecnology, Republic of Srpska, number 19/6-020/961-59/15.

***Table 1***: Colostrum composition

*Significantly different values ($p < 0.05$) than in OPT cows at the same time period

| Mean ± SE | 1st colostrum | | 2nd colostrum | | 3rd colostrum | | p value | | |
|---|---|---|---|---|---|---|---|---|---|
| | OPT | HS | OPT | HS | OPT | HS | time | TRT | time*TRT |
| **Milk fat, g/L** | 7.65±0.35 | 6.09±0.34* | 6.36 ±0.35 | 5.13 ±0.37* | 4.33 ±0.31 | 3.45 ±0,31 | <0.001 | <0.001 | 0.618 |
| **Lactose, g/L** | 3.45±0.12 | 2.11 ±0.07* | 3.96 ±0.18 | 2.67 ±0.30B | 4.87 ±0.21 | 3.49 ±0.22* | <0.001 | <0.001 | 0.968 |
| **SNF, %** | 29.32±1.29 | 23.17 ±1.37* | 18.49 ±0.95 | 16.87 ±1.21 | 15.33 ±0.31 | 14.73 ±1.44 | <0.001 | 0.004 | 0.047 |
| **Protein, g/L** | 14.38±0.44 | 11.20 ±0.11* | 9.66 ±0.34 | 7.33 ±0.51* | 7.45 ±0.45 | 5.54 ±0.59* | <0.001 | <0.001 | 0.338 |
| **IgG, mg/mL** | 68.95±2.55 | 59.94 ±1.58* | 53.59 ±2.57 | 45.41 ±2.09* | 32.83 ±1.49 | 28.31 ±0.99 | <0.001 | <0.001 | 0.482 |
| **IGF, nmol/L** | 65.42±5.85 | 43.03 ±1.92 | 40.64 ±4.96 | 25.95 ±2.27 | 22.69 ±3.80 | 16.57±1.65 | <0.001 | <0.001 | 0.106 |



**P.11**

**Comparative study on fitness traits in sheep reared under highland and lowland conditions**

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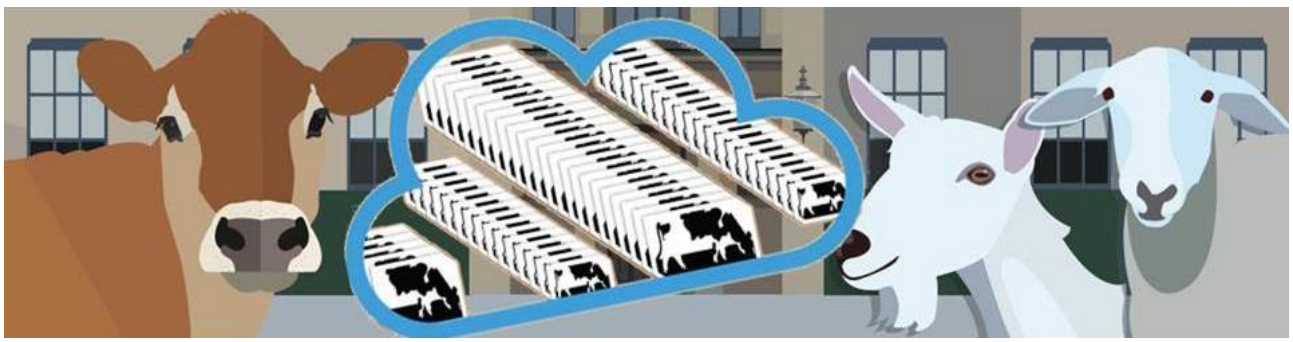
Little information exists up-to-date regarding the altitudes influence on reproduction efficiency and health traits in extensively farmed sheep. Aim of the current comparative study was to evaluate reproductive outputs and fitness indicators in Turcana sheep reared under highland and lowland extensive conditions. Two commercial sheep flocks were monitored for this purpose, the highland farm (45°25'17"N/22°13'19"E, altitude 280 m) managed a number of 438 breeding ewes, while the lowland situated farm (46°05'14"N/20°47'27"E, altitude 85 m) had 225 breeding ewes. Both farms reared the indigenous Turcana breed, belonging to the Zackel Eastern European group, as purebreds and had the animals included in the official performance recording scheme. Conception rates of ewes were on average 95.2±1.23% and 97.7±0.98% under highland and lowland conditions, respectively. Litter size was on average of 1.17±0.02% under highland rearing conditions, and of 1.25±0.04% under lowland farming. Altitude of the site did not influenced significantly ($p>0.05$) the conception rates, while having a significant ($p\leq0.01$) influence on litter size between flocks. Clinical mastitis incidence was of 3.11±1.16% and 4.76±0.84% in the highland and lowland farm, respectively. While the voluntary culling was of 14.2±2.33% under highland production system and of 20.1±1.87% in the lowland situated farm. Site altitude influenced significantly ($p\leq0.05$) mastitis incidence between flocks. Voluntary culling of ewes differed between farms ($p\leq0.01$), however this could not be entirely attributed to the altitude, given the more intense selection pressure found in the lowland flock due to the higher selection practiced. Lambs survival rates from birth to weaning (70±10 days of age) were on average of 93.4±1.22% and 96.9±1.06% in highland and lowland farm, respectively. Altitude influenced significantly ($p\leq0.05$) the lambs' survival rates till the age of weaning. It was concluded that the altitude has an influence on both relevant reproductive outputs and health related traits in extensively reared sheep. And in future breeding plans designed for the Turcana breed, selection traits such as mastitis resistance and lambs survival rates should be included, in order to make the breed more competitive and to aid animal welfare.



**P.12**

**Salivary HSP70 as a putative biomarker of heat stress in high yielding dairy cows**

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Molecular chaperones of the HSP70 family provide protection for cells against environmental stress. HSP70 levels in blood reportedly increase during heat stress in livestock. HSP70 has been reported to be present in saliva of humans but, to our knowledge, it has yet not been described in cattle. The aim of the present study was to determine whether HSP70 was detectable in saliva of dairy cows whether this protein was a good marker of adaptation to hot weather. Eight high-yielding (305 D milk production: 11367 ± 1006 kg) and eight lower-yielding (305 D milk production 8002 ± 643 kg) Holstein Frisian cows (lactation No.: 2.3 ± 0.5 and 2.1 ± 0.4; DIM: 115.8 ± 47.4 and 112.0 ± 46.3, respectively) from a dairy farm in the Alentejo region, Portugal were involved in the study. Saliva samples were collected from the cows in summer, autum and winter (average environmental temperatures in summer and winter: 32.8°C, and 11.5°C, respectively). Salivette cotton rolls (Sarstedt GmbH, Germany) were used, and centrifuged samples were stored at -20ºC until quantification by ELISA (SEA873Mi, Cloud-Clone Corp, USA). Samples were run in duplicate and without dilution. Data were analysed by One-way ANOVA. Post-hoc pooling of the factor's levels was performed by Tukey-Hsu test for P Salivary HSP70 concentrations ranged from 0.524 to 12.174 ng/mL. For high producing cows, salivary HSP70 concentrations were higher in summer than in winter (7.34 ± 2.03 vs 2.54 ± 0.26. respectively; P=0.033). No differences were observed between autumn and winter, and no differences among periods were observed for low producing cows (Table 1).

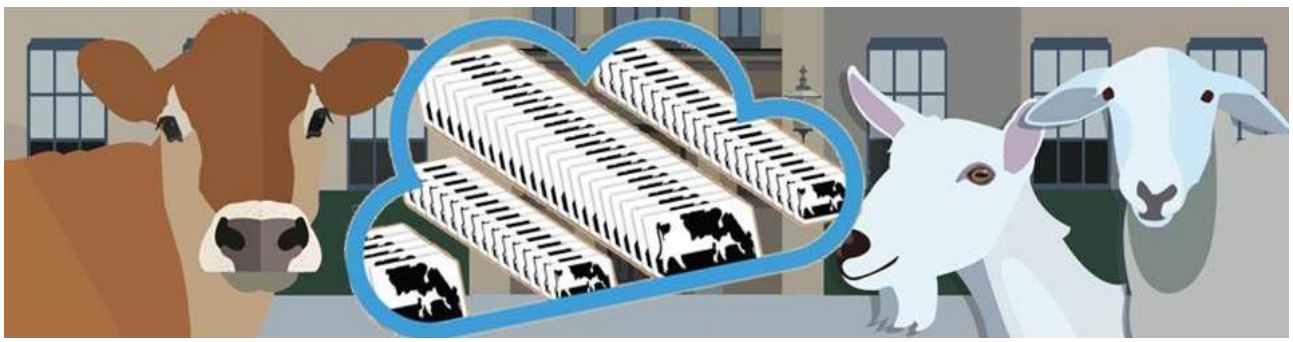
To our knowledge, this is the first time that HSP70 is reported to be present in cattle saliva. This preliminary study highlights that salivary HSP70 as a non-invasive biomarker may be a potential tool in further studies on thermal adaptation in cows.

Acknowledgements: Viktor Jurkovich is grateful for the support of DairyCare COST STSM project and the Bolyai János Research Fellowship of Hungarian Academy of Sciences. This work is funded by National Funds through FCT under the Project UID/AGR/00115/2013. Authors acknowledge also financial support from Elsa Lamy Investigator FCT contract IF/01778/2013.

| | High producing | Low producing |
|---|---|---|
| Summer | $7.34 \pm 2.03^{aA}$ | $2.34 \pm 0.60^{a,B}$ |
| Autumn | $3.54 \pm 0.35^{b}$ | $3.14 \pm 0.10^{a}$ |
| Winter | $2.54 \pm 0.26^{b}$ | $2.27 \pm 0.20^{a}$ |

Table 1. The salivary HSP70 concentration (ng/ml) in high and low producing groups of cows

Descriptive statistics are based on mean ± SD of non-transformed data.
Different superscripts show significant difference (P<0.05): a,b within a column; A,B within a row



**P.13**

**The Importance of Dry Cow Welfare for a Healthier Dairy Herd**

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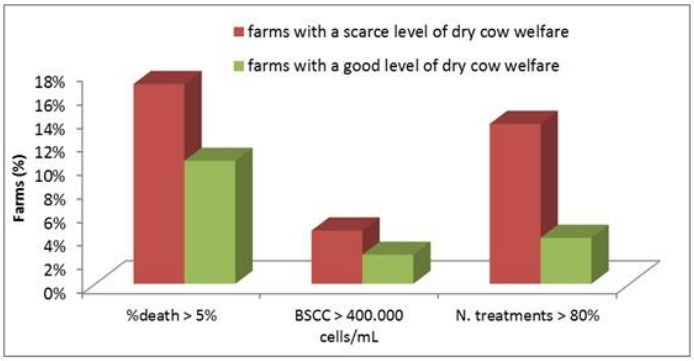
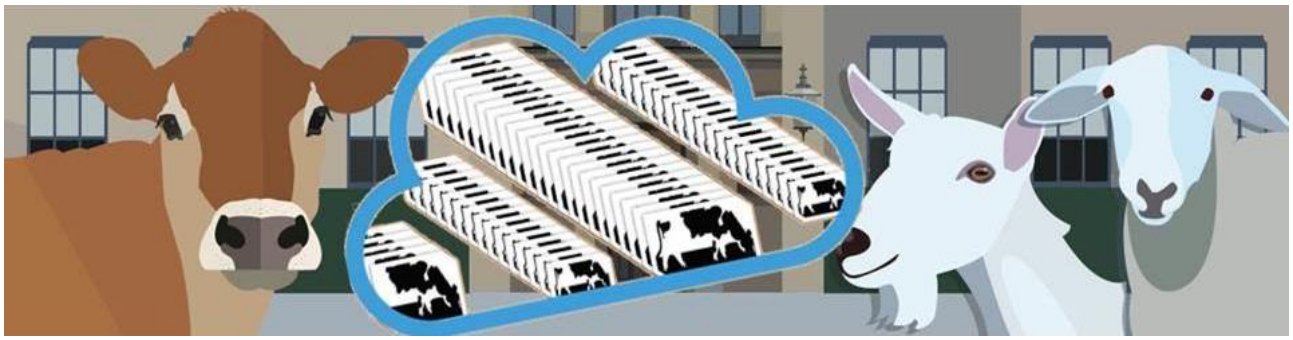
Management of the dry period has a key role in the protection of cow health and welfare. In fact, the dry period is a very important stage for the mammary gland health, for the success of the following lactation and for the prevention of post-partum diseases. In particular, the dry period can play an important role for the control of mastitis, that is still the most common and costly disease and the main cause of antibiotic consumption in the dairy industry. The aim of the present study was to assess the level of welfare of dry cows in Italy and to investigate its relationship with on-farm mortality of adult cows, bulk somatic cell count and number of antibiotic treatments for mastitis. The survey was conduct in 1432 Italian dairy farms, with an average size of 246 cows (range 7-2736 cows) and a mean milk production of 27.8 kg/day per cow (range 10-41 kg/day per cow). The welfare of dry cows was assed using management, resource and animal base measures listened in Table 1. In the investigated farms, the main welfare hazards linked to dry cows management were found to be: non-use of calving pen or use of a calving pen with poor hygienic conditions (26.96%), presence of dirty floors (17.88%) and poor bedding hygienic condition (11.38%). 20.95% of the investigated farms had an insufficient number of water points in the dry cow pen (less than 1 water bowl for 10 cows or less than 6 cm/cow of trough) and in 14.18% of the farms dry cows were overstocked. Concerning animal based measures, 38.76% of the studied herds showed more than 20% of dirty animal, instead in 11.10% of the dairy farms more than 30% of the animals displayed integument alterations. Overall, 177 (12.36%) dairy farms were found with a scarce level of dry cow welfare and these herds show higher rates of mortality, BSCC and antibiotic treatments than the other studied herds (Figure 1).The obtained results underlie the importance of a good dry cow management and welfare for the safeguarding of dairy cows health.

**Table 1.** Management, resource and animal based measures recorded for dry cows in the analyzed farms

| | |
|---|---|
| **Management based measures** | Cleanliness of the water points |
| | Cleanliness of the floor |
| | Bedding material management |
| | Use and management of the calving pen (hygiene and bedding management) |
| **Resource based measures** | Functioning and number of water points |
| | Feed bunk space |
| | Type of floor |
| | Surface area provided for lying down: m²/cow or number of cubicles |
| | Type of bedding material |
| | Presence of the calving pen and its size (m²/cow) |
| **Animal based measures** | Avoidance distance |
| | Body Condition Score |
| | Cleanliness score (udders, flank/upper legs and lower legs) |
| | Integument alterations |

**Figure 1.** Comparison between farms with a scarce level of dry cows welfare (N=177) and farms with a good level of dry cows welfare (N=1,255). A higher percentage of "farms with a scarce level of dry cow welfare" is characterized by an on-farm dairy cow mortality rate (%death) > 5%, bulk somatic cell count (BSCC) > 400.000 cells/mL (geometric mean) and number of antibiotic treatment for mastitis (N. treatments) > 80% of the number of lactating cows.



**P.14**

**Ruminal degradation and response of dairy goats under heat stress conditions to dietary L-carnitine supplementation**

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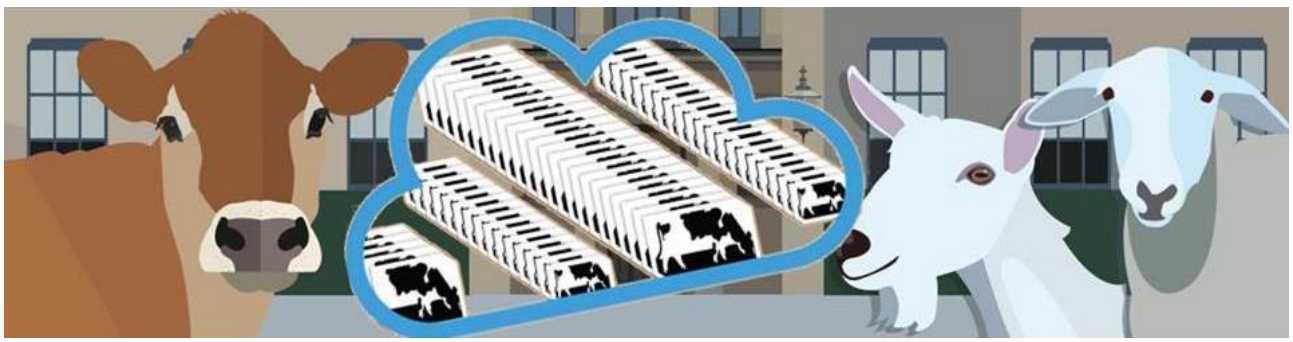
The objective was to measure the resistance to rumen degradability of 2 commercial L-carnitine sources (CAR, CarnEon 20 Rumin-Pro, Lohmann Animal Health, Germany; SIN, Sintal Carnitina 20%, Vicenza, Italy) and to determine the effects of supplementation to heat stressed dairy goats. Rumen degradability was determined in situ using a cannulated dairy cow fed 20:80 or 100:0% forage:concentrate diets. For the lactation experiment, 6 Murciano-Granadina dairy goats at mid-lactation (2.48 ± 0.02 L/d, 134 ± 2 DIM, 46.1 ± 0.5 kg BW) were allocated into a 6 × 6 Latin square design with 16-d experimental periods, and fed 3 total mixed diets under 2 ambient conditions. Diets were: control (CON), and supplemented (1 g/d, as fed) with CAR or SIN. Ambient conditions were: thermoneutral (TN, 15 to 20°C, 50 ± 5% humidity) or heat stress (HS, 35°C from 0900 to 2100 and 28°C from 2100 to 0900 h, 45 ± 5% humidity). Feed intake, water consumption, milk yield and composition, rectal temperature, and respiratory rate were recorded daily. Particle size (Penn State particle separator) of the diet offered and orts were measured for each period. Glucose, urea, creatinine, hematocrit, hemoglobin, non-esterified fatty acids, β-hydroxybutyrate, triglycerides, cholesterol and carnitine fractions (free-, acetyl- and total-carnitine) were analyzed in plasma. Changes in BW and subcutaneous fat (ultrasonography) were also assessed. The effective DM and crude protein rumen degradabilities were similar for both L-carnitine sources (75.4 and 94.4%, for DM and CP, respectively). Furthermore, DM degradability increased when the diet was shifted from 80 to 0% concentrate. Despite the high values of degradability, plasma carnitine fractions increased ($P < 0.01$) in CAR and SIN goats. However, L-carnitine supplementation had no effect on feed intake, milk yield, milk composition and plasma metabolites ($P > 0.05$). Compared to TN, HS goats lost more subcutaneous fat during the experiment and tended ($P < 0.06$) to eat larger dietary particles than TN goats. In conclusion, despite being rumen degradable, the supplemented L-carnitine sources were effectively absorbed by dairy goats, although no lactational effects or heat stress alleviation signs were observed under thermo-neutral or heat stress conditions.



**P.15**

**Accuracy of BHB concentration in dairy cows' blood measured by two methods**

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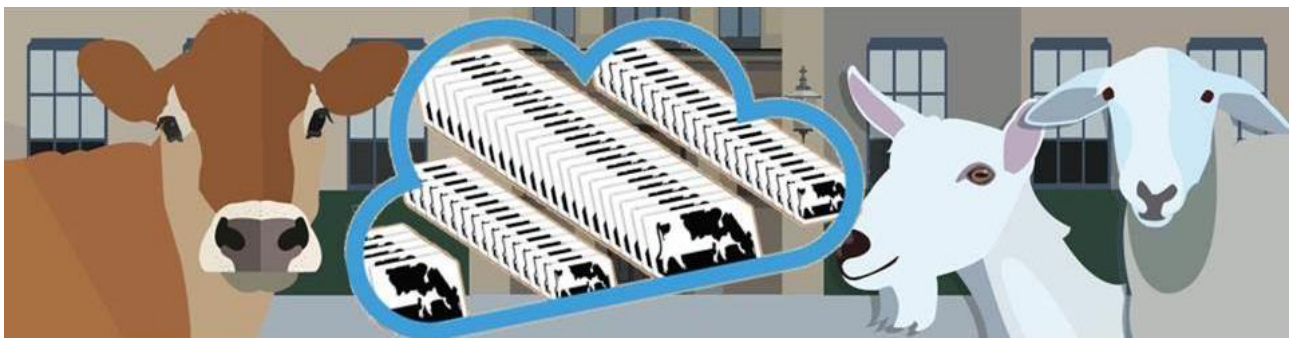
Introduction: Higher ketone bodies concentration in ruminants' blood is sign of faster fat mobilization as a response on low glucose availability. This state known as ketosis typically occurs in dairy cows in early lactation, but under some circumstances it occurs later during lactation as a subclinical ketosis. Ketosis requires the combination of intense adipose mobilization and a high glucose demand. Both of these conditions are present in early lactation, at which time negative energy balance leads to adipose mobilization, therefore it is priority to set diagnose to prevent higher loss. Laboratory methods are reliably and more appropriate for higher number of cows (because of reagents profitability) but they require more time to get results. Rapid tests are good because farmers can get results immediately after sampling and can intervene on time.
Materials and methods: Blood samples were taken from dairy cows at one commercial farm in Croatia and one in Slovenia. Blood was taken from caudal vein into the lithium heparin vacuum tube. WellionVet Belua test strips (Med Trust, Austria) were used immediately after sampling to determine BHB concentration. After taking all samples, blood was centrifuged on 3000 rpm 10 minutes and plasma was separated. In laboratory BHB concentration was determined by Beckman Coulter AU400 automatic analyzer with Randox kit (Ranbut RB1007) in Croatia and RX Daytona (Randox, UK) in Slovenia which is an enzymatic method with assay range 0.1-3.2 mmol/L. Investigation was done with 23 dry-off cows and 51 lactating cows in Croatia and 57 lactating cows in Slovenia, from the first to the fifth lactation.
Results: Significantly strong correlation was determined between both measurements in Slovenia and Croatia, especially in early lactation (Table 1).
During the first month of lactation, coefficient of correlation (R) between milk yield and BHB concentration was negative and weak, but statistically significant, by both methods. Considering the level of BHB concentration (low 0.7 mmol x L-1) R was strong and significant under low strip values (0.99 in both countries), and moderate but significant under high strip values in Croatia (R= 0.55) and strong and significant in Slovenia (R=0.87).
Conclusion: We can conclude that WellionVet Belua strips are reliable tool for fast and on-farm BHB determination.

Table 1. Coefficient of correlation between the BHB concentration measured by rapid strip test Belua and biochemical analyzers according the days in lactation and milk yield

| Parameters | Croatia | | Slovenia | |
|---|---|---|---|---|
| | < 30 DIL | >30 DIL | < 30 DIL | >30 DIL |
| Strip x lab | 0.98 | 0.87 | 0.99 | 0.99 |
| Strip x MY | -0.27 | 0.30 | -0.11 | 0.09 |
| Lab x MY | -0.25 | 0.06 | -0.12 | 0.23 |

DIL-day in lactation; MY- milk yield



**P.16**

**Changes in dairy cow body weight and milk yield due to diet change**

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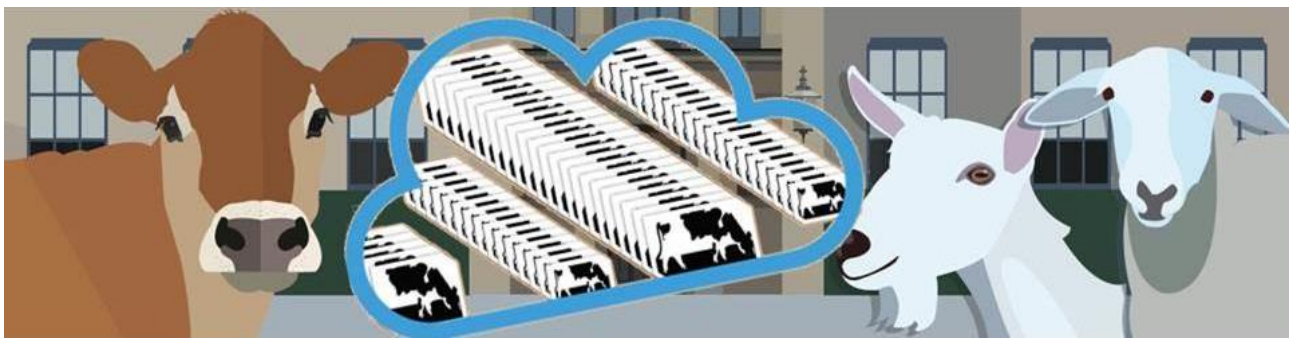
Diet changes may have large effects on body weight (BW). This study aimed to quantify the effect of diet change between summer grass and TMR on dairy cow BW and milk yield (MY) in comparison with cows housed and fed TMR all year-around. Data from 2009 and 2010 were obtained from SRUC (Crichton Royal Farm, Dumfries, UK). Cows calved continuously throughout the year, were milked 3 times daily and were weighed automatically after each milking. Diet was either grazing during the summer and feeding on TMR when housed (Grass/TMR), or always feeding on TMR (Control). In each year, the Grass/TMR group had a diet change from TMR to grass and one from grass to TMR, these were gradual during one week per milking window and cows had access to TMR part of the day. Data from day 1 to 305 in milk were used, and outliers deviating more than 50 kg from the mean of the previous two observations in a lactation were removed. After cleaning, 192 periods (coming from 157 lactations made by 140 cows) from 30 days before to 30 days after each grass event were selected, and the equivalent periods for Control cows. To minimize the influence of meal-related gutfill, BW were smoothed by quantile regression using the 20% lower quantile. The difference in MY and smoothed BW 20 days before and after 20 days after a diet change were calculated and tested in a mixed model: Y = diet + season + year + parity + merit + diet*season*year*merit, with cow as random effect. Non-significant interactions were removed stepwise. Results showed that Control cows gained weight regardless the season, whereas Grass/TMR cows lost weight at turn-out but gained weight at turn-in ($Chi^2$= 114; P<0.001), see Table 1. Further, Control cows reduced MY in autumn, whereas Grass/TMR cows reduced MY at turn-out ($Chi^2$=4.55; P=0.03). Overall, cows that did not experience any diet change gained 24 kg, whereas cows that went to summer grass gained less than 1 kg, a diet effect of 23 kg BW, even though BW were adjusted for meal-related gutfill.

Table 1: Body weight and milk yield changes by diet and season.

| | Diet | |
|---|---|---|
| | Control | Grass/TMR |
| Body weight change, kg | | |
| Spring: TMR to grass | 15.6 | -18.2 |
| Autumn: Grass to TMR | 8.4 | 18.9 |
| Milk yield change, kg | | |
| Spring: TMR to grass | -0.16 | -0.59 |
| Autumn: Grass to TMR | -2.26 | -0.03 |



**P17**

**Adipose tissue activity regulates metabolic responses to heat stress in periparturient dairy cows**

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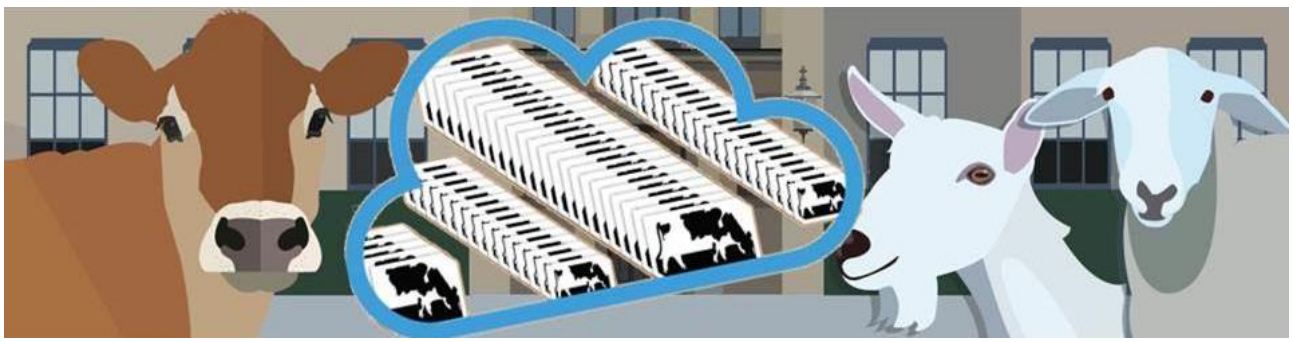
The thermal environment is an important factor that can influence cow's performance and production. Heat stress during the hot season might affect energy metabolism, particularly lipid metabolism and antioxidant status as well as the adipose tissue activity. Adipose tissue is the major source of energy in transition dairy cows and plays a key role in the integration of energy metabolism by producing metabolic hormones, leptin (LP) and adiponectin (ADP), which modulate energy homeostasis. The aim of this study was to investigate the effects of heat stress during summer on adipose tissue activity, lipid metabolism and antioxidant activity. The study was conducted on 24 Simmental dairy cows assigned into two groups according to season: summer (S group, N=12) and autumn (A group, N=12). Blood samples were taken on days -21, -7, 8, 16, 24, 32 and 40 relative to parturition. Serum nonesterified fatty acids (NEFA), β-hydroxybutirate (BHB) and HDL-cholesterol (HDL-C) concentrations were assayed spectrometrically by the standard commercial kits. Serum LP and ADP concentrations were assayed by the quantitative ELISA methods. The paraoxonase-1 (PON1) activity was measured spectrometrically by the method of hydrolysis of paraoxon. The average temperature-humidity index (THI) was calculated and was statistically higher in the S group (78.9) than in the A group (58.6) indicating moderate heat stress in the S group. Serum LP concentration was significantly lower in summer (1.23 ng/ml) than in autumn (1.80 ng/ml), while ADP concentration was significantly higher in summer (9.39 ng/ml) than in autumn (2.88 ng/ml). Additionally, significant inversed correlations have been found between LP and ADP in both the S group ($r = -0.55$; $P<0.0001$) and the A group ($r = -0.69$; $P<0.0001$). There were no significant differences in NEFA and HDL-C concentrations, PON1 activity and the ratio PON1/HDL-C between the groups while BHB concentration was significantly higher in the A group compared to the S group. These results indicate that adipokines by their actions, both LP and ADP, might regulate negative effects of heat stress on energy balance, lipomobilisation and antioxidant activity and thus could counteract an adverse repercussion on cow's production and fertility.



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