

NORDIC ISAE 2016

PROCEEDINGS OF THE 26TH NORDIC REGIONAL SYMPOSIUM OF THE INTERNATIONAL SOCIETY FOR APPLIED ETHOLOGY,
20-22 JANUARY 2016 AT VINGSTED HOTEL AND CONFERENCE CENTRE

EDITORS: MARGIT BAK JENSEN, KAREN THODBERG AND JANNE WINTHNER CHRISTENSEN

DCA REPORT NO. 070 • JANUARY 2016



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The reports contain mainly the final reportings of research projects, scientific reviews, knowledge syntheses, commissioned work for authorities, technical assessments, guidelines, etc.

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Preface

The Nordic regional meeting of the ISAE provides a forum for scientific discussions and networking and has a tradition for placing special emphasis on the inclusion of students and young researchers. To stimulate this we have organized this meeting in connection with the PhD course 'Maternal and neonatal behaviour'. The programme reflects this by having three sessions on this theme as well as a workshop on 'The role of mother-young interaction for the welfare of farm animals'. The programme also includes sessions on 'Tail-biting', 'Management and housing of sick animals' and 'Free papers'. We wish to thank the NKJ (Nordic Joint Committee for Agricultural and Food Research) for funding the workshop and the ISAE council for funding, enabling us to reduce student registration fees. We are happy to present this interesting programme. Please help us to make this a memorable event. We welcome you to the 26th Nordic Regional ISAE meeting.

Yours sincerely,

The Organising Committee

Margit Bak Jensen, Karen Thodberg and Janne Winther Christensen

**Programme of the Nordic ISAE Regional Meeting
Vingsted, Denmark, 20 – 22 January 2016**

20 January		Wednesday	
	Lunch		12.00 – 13.00
	Symposium opening and welcome		13.00 – 13.15
Session 1	Maternal behaviour and off-spring survival <i>Chair: Linda Keeling</i>		
	Cathy Dwyer (plenary)		13.15 – 13.45
	María Díez-León		13.45 – 14.00
	<i>Short break</i>		
	Toke Munk Schou		14.15 – 14.30
	Marko Ocepek		14.30 – 14.45
	Elisabeth Jonas		14.45 – 15.00
	Becky King		15.00 – 15.15
	Maria Vilain Rørvang		15.15 – 15.30
	<i>Coffee/tea break</i>		
Session 2	Weaning <i>Chair: Cecilie Mejdell</i>		
	Allison N. Pullin		16.00 – 16.15
	Braden J. Campbell		16.15 – 16.30
	Jens Malmkvist		16.30 – 16.45
	Lena Lidfors		16.45 – 17.00
	Dinner		19.00
21 January		Thursday	
Session 3	Maternal and social effects on behaviour <i>Chair: Lene Munksgaard</i>		
	Janne Winther Christensen (plenary)		08.30 – 09.00
	Julie Føske Johnsen		09.00 – 09.15
	Dan Weary (plenary)		09.15 – 09.45
	<i>Short break</i>		
Workshop	The role of mother-young interaction for welfare of farm animals – part 1		10.00 – 12.00
	<i>Lunch</i>		12.00 – 13.00
Workshop	The role of mother-young interaction for welfare of farm animals – part 2		13.00 – 13.30

Excursion	Visit Givskud Zoo	13.30 – 17.00
ISAE matters	Regional secretary Lena Lidfors	17.00 – 18.00
	Dinner	19.00
22 January	Friday	
Session 4	Tail-biting Chair: Katrine Kop Fogsgaard	
	Pälvi A. Palander	08.30 – 08.45
	Mona Lilian Vestbjerg Larsen	08.45 – 09.00
	Anna Valros	09.00 – 09.15
	<i>Short break</i>	
Session 5	Free papers Chair: Anna Valros	
	Sofia Wilhelmsson	09.30 – 09.45
	Laura Hänninen	09.45 – 10.00
	Karen Thodberg	10.00 – 10.15
	<i>Coffee/tea break</i>	
Session 6	Management and housing of sick animals Chair: Mona Lilian Vestbjerg Larsen	
	Mette S. Herskin (plenary)	10.45 – 11.15
	Katrine Kop Fogsgaard	11.15 – 11.30
	Anne S. Bak	11.30 – 11.45
	Closing of symposium	11.45 – 12.00
	Lunch	12.00 – 13.00

Applying research on mother-offspring behaviour to improve lamb survival

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Neonatal lamb mortality has remained stubbornly unchanged at 15% of liveborn lambs for the past 40 years, across all sheep producing countries. Half of these deaths occur on the day of birth, and most mortality occurs in the first week of life. Thus birth, the establishment of independent life and the formation of a strong attachment between ewe and lamb are crucial for lamb survival. The factors affecting birth difficulty and trauma at delivery, the onset of maternal care and the development of neonatal behaviour have received considerable research attention, and the neuroendocrine basis for some of these types of behaviour are now quite well understood. However, the apparent lack of an impact on lamb mortality in the field suggests that this increased knowledge has not yet been implemented on farm. How can behavioural research on mother-offspring behaviour be translated into practical impacts on farm to improve survival? We have used three different methods to improve uptake of mother-offspring behavioural knowledge to improve lamb survival. Firstly, farmer meetings have been used to explain the science behind the formation of ewe-lamb attachment or 'bonding'. A better understanding of the behavioural cascade that leads to the formation of the ewe-lamb bond, and the role played by sensory inputs, can ensure that management actions do not disrupt these processes and provide ewes and lambs with the best possibility of developing a secure bond. Secondly, behavioural studies have disentangled the roles of maternal and offspring behaviour in lamb survival, which demonstrated that lamb vigour was a key component in survival and is independent of maternal care. This understanding, and the significant impact of sire on neonatal behavioural expression, has led to the development of genetic solutions to improve lamb vigour. Importantly, some of this work was done with the participation of farmers, who helped to develop the scoring systems used to derive breeding values for survival traits. This helped both with increasing their knowledge of important lamb traits and to improve the acceptability of collecting data on lamb vigour. Lamb mortality is, however, a multifactorial issue, with ewe nutrition, ewe health, stress in pregnancy and at birth, lambing management, breed, ewe age, litter size and farming system all contributing to the between-farm variation in mortality. This suggests that each farm may need to develop a tailored solution, with the inputs of specialist advisers, to identify the key components on their farm which could be changed to have an impact on lamb survivability. We are currently working closely with consultants and advisers to help farmers identify and develop their own solutions by providing the scientific background to each problem and potential solution. Overall, the aim is to reduce mortality and improve lamb welfare by applying our behavioural research in the field.

Effects of environmental enrichment and stereotypic behaviour on maternal behaviour and infant viability in a model carnivore, the American mink (*Neovison vison*)

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In several species, stress compromises maternal behaviour that is important for infant viability (e.g. licking and grooming). Understanding how stress in captivity affects maternal behaviour could, therefore, be beneficial, especially for carnivores in zoos and breeding centres where infant mortality is often high. We used a model carnivore - American mink - to test two hypotheses, namely that maternal investment and/or behaviour is 1) improved by environmental enrichment; and 2) compromised by stereotypic behaviour. We observed 22 females raised in an indoor facility, 9 enriched (E), 13 non-enriched (NE). At birth, and at post-natal day 20 when altricial infants were still fully dependent on their mothers, the following offspring variables were recorded: litter size, infant mortality, litter sex ratio (post-natal day 1) and weight. Maternal behaviour was assessed by recording nest shape (postnatal day 1), and the frequency of licking and grooming (postnatal days 1-7). Data on maternal stereotypic behaviour came from a previous study (Díez-León 2014, PhD thesis, University of Guelph, 2014). Non-enriched females stereotyped more, had female-skewed litters at birth (E: 54.52 ± 9.5 ; NE: 30.48 ± 6.87 ; $F_{1,18}=6.67$, $P<0.01$) and tended to make poorer, flatter nests (E: 2.12 ± 0.34 ; NE: 1.55 ± 0.25 ; $F_{1,18}=2.89$, $P=0.053$). Maternal licking and grooming showed large, stable individual differences, but appeared unaffected by enrichment. High levels of maternal stereotypic behaviour predicted slower offspring growth (female kits: $F_{1,9}=5.33$, $P<0.01$; male kits: $F_{1,6}=4.28$, $P<0.05$), replicating previous findings for farmed mink. Nevertheless, enrichment did not significantly increase infant growth rates nor decrease infant mortality. Due to small sample sizes, our study now needs replicating, particularly to explore the potential benefits of enrichment on nest building, sex ratio effects and the implications of maternal licking and grooming for offspring stress reactivity. Findings could then apply to endangered mustelids like the European mink.

Early kit mortality and growth in farmed mink are affected by litter size rather than nest climate

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We aim to investigate the effect of nest box climate on early mink kit mortality and growth. We hypothesised that kits in warm nest boxes experience less hypothermia-induced mortality and have higher growth. This study includes 749, one-year-old, breeding mink dams. All dams had access to nesting materials in the cages. Kits were weighted day 1 and 7, and dead kits were collected until day 7 after birth. Nest temperature and humidity were measured every 15 minutes from day 1 to 6 postnatal. We tested the effect of daily temperature (T) and humidity (H) (T_{mean} , T_{min} , T_{max} , T_{var} (*fluctuation*) and H_{mean}), on the number of liveborn kits that died, and kit growth. Litter size of total born (*totborn*) and liveborn kits were included in the models. Nests buffered the climate with higher temperature and reduced temperature and humidity fluctuation relative to ambient temperature. Day 0-1 counted for 77% of the liveborn kits that died the first week. Seven out of 15 climate parameters had significant effect on the number of liveborn kits that died. However, conflicting effects between days, marginal effects and late effects indicate that climate was not the primary cause of kit mortality. Only 5 out of 30 climate parameters had a significant effect on kit growth. Few and conflicting effects indicate that the effect of climate on growth is negligible. One exception was that nests with high temperature fluctuations on day 1 had a low number of liveborn kits that died (estimate=-0.16±0.038; P<0.001) and a high kit growth (estimate=0.687±0.228; P<0.003). Litter size affected kit vitality as the larger *totborn* litter size, the higher risk of dying for the individual kit (estimate=0.24±0.018; P<0.001) or the higher risk to have reduced growth (estimate=-0.830±0.113; P<0.001). The number of living kits in litters had the opposite effect as kits in large *liveborn* litters had reduced risk of dying (estimate=-0.25±0.020; P<0.001) and kits in large mean litter size day 1 to 7 had higher growth (estimate=0.261±0.261; P<0.026). Nest box temperatures postnatal had surprisingly small effects on early kit survival and growth. The fact that kits in large live litters had increased growth and reduced risk of dying indicates that there is no postnatal competition within litters the first week. Concerning kit mortality, the results indicate that the focus should be on litter size and dam welfare around gestation and birth.

Physical and behavioural traits of importance for piglets' survival in purebred and crossbred sows

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In Norway, sows are kept loose during farrowing and lactation. This type of environment puts more demands on the maternal skills than a confined environment where the sows are not able to control or communicate with the piglets to the same extent. The main aim of the present study was to find sow characteristics, including both physical and behavioural traits, that can affect piglet survival directly in three different breeds purebred (Norsvin Duroc (n=12), Norsvin Landrace (n=12)) and crossbred (Norsvin Landrace and Yorkshire (n=15)) pigs. The following sow characteristics were scored as follows: physical traits (shoulder ulcer development with a scale from 0-3 (0: not developed, 1-3: degree of shoulder ulcers development during lactation)); body condition losses with a scale from 0-4 (0: without losses, 1-4: degree of body condition losses during lactation) and behavioural traits (sows' nest building activities scored from 1 to 3 (assessed as rooting, pawing, carrying or chewing nest building material at daily control during 12 h prior to parturition) and sow response as well as sow communication scored from 1 to 4 (assessed during sow's movement, before and/or after the feeding time or at the moment the sow is about to lie down, on day 1 postpartum). The effect of physical traits, behavioural traits, breed, litter size and piglets mortality were analysed using a GENMOD procedure in SAS. Mortality of liveborn piglets was $15.9 \pm 4.7\%$ in Norsvin Duroc, $12.3 \pm 4.2\%$ in Norsvin Landrace and $12.3 \pm 3.6\%$ in Norsvin Landrace \times Yorkshire sows, whereas the number of weaned piglets was 7.6 ± 0.8 , 12.7 ± 0.7 and 11.9 ± 0.7 , respectively. Starvation and crushing were the most common causes of death affected by breed ($P=0.003$; $P<0.001$), parity ($P<0.001$; $P=0.001$) and litter size ($P=0.096$; $P<0.001$). There was a positive relationship between shoulder ulcers developed and proportion of piglets that died of crushing ($P<0.001$). Body condition losses during the lactation period were on average -1.7 ± 0.2 , and the higher the losses the fewer piglets died of crushing ($P<0.001$). Sows being more active pre-partum doing nest building were those with lower mortality due to fewer piglets dying from starvation and crushing. Moreover, starvation and crushing declined in litters where sows showed higher level of communication toward new-borns after parturition. Sows with higher degree of response towards new-borns lost fewer piglets due to crushing ($P<0.001$). Promising results from the present study showed that it is possible to score physical and behavioural traits that affect piglets' survival and thus these traits should be implemented in the breeding program.

Effects of oxytocin genes on maternal behaviour in sows

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The project we are working on is based on two hypotheses: there is a variation between Swedish Yorkshire sows in oxytocin genes, and some alleles in these genes have favourable effects on maternal behaviour. The hormone oxytocin affects maternal behaviour. But the hormone level in blood fluctuates, and regular sampling is needed to investigate oxytocin. However, blood sampling, also using a fixed cannula, might alter the behaviour. Here, we focus on candidate genes for oxytocin and sow behaviour instead of measuring oxytocin levels. The experiment is ongoing at the Swedish Livestock Research Centre Lövsta (SLU) using purebred Yorkshire sows. Husbandry and management follow the routines of the farm (one sow with litter per pen, straw, no crates, cross fostering avoided). Behavioural observations are performed by the staff during the routine work, and cameras are installed above the pens. Sow body weight and body condition during lactation and piglet weight are recorded regularly. The behaviour is recorded using cameras and with a questionnaire answered by the staff at day 1 and day 21 on 100 sows. Behavioural records include nest building, sows' carefulness and reaction towards their piglets, anxiety, fear of humans, aggression and nursing. Blood samples were collected from all potential breeding sows and used for DNA extraction. Nine genes related to maternal behaviour and the regulation of oxytocin were identified in the literature: Fosb and Peg3 on chromosome (SSC) 6, CD38 on SSC8, AVPR1B and Grb10 on SSC9, Oxyr on SSC13, Oxy and AVP on SSC17 and Mest on SSC18. One or two fragments from each gene were sequenced to identify single nucleotide polymorphisms (SNP). These SNP and some known genetic markers located close to the genes were used to genotype 181 sows. Genotyping was done by the MAF laboratory at the Karolinska Institute. Thirty-one out of 45 markers segregated in the population, i.e. there was genetic variation between sows in all candidate genes. We are currently analysing the associations between markers (alleles) and behavioural traits as well as traits related to piglet survival and growth, and sows' use of body reserves during lactation. We will continue with more detailed information from the camera recordings on sows with interesting alleles. Preliminary results from 68 sows show that there is phenotypic variation between sows with regard to nest building, being careful with the new-born piglets, anxiety and reaction to the piglets when returning from weighing, whereas most sows showed no aggression towards piglets or humans. Aggression towards humans and anxiety tend to be repeated from day 1 to day 21.

Does the farrowing environment affect current and future sow maternal behaviour and piglet mortality?

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As the concept of indoor loose farrowing becomes more widely accepted, an EU policy objective is that more commercial farmers will phase out farrowing crates in favour of alternative loose pen designs. As farmers move in this direction, it is likely that there will be a phased transition in which they install a number of loose pens whilst continuing to concurrently use their previous crated system. It was hypothesised that the 'switching' of individual sows between crates and pens for each farrowing that could occur during the transition phase may compromise the sow's maternal ability and therefore piglet survival. This has been hypothesised because the current farrowing environment can have a profound effect on sow maternal behaviour and piglet mortality, and because sow maternal behaviour develops over a number of parities. Therefore, in the second parity a sow which is housed in the same system may have an adaptive advantage by recalling and performing the most appropriate behaviours from the previous farrowing. In contrast, if a sow housed in a different system performed the same previously beneficial behaviours these may now have no benefit, or even be detrimental to piglet survival. The current research is being conducted on a commercial pig breeding unit consisting of 1,350 sows and three very different farrowing systems – standard farrowing crates (crates), solari straw pens (pens) and a temporary crate system – the 360o farrowers (360s). At the beginning of data collection, before the 360s were installed, the farm consisted of 62 pens and 132 crates; whereas to date the farm now utilises 62 pens, 20 crates and 168 360s. The first phase of research is to create a farrowing performance database for the first and second parity of each sow. This includes the farrowing system, farrowing date, number of born alive, stillborn and causes of live born deaths before litter equalisation; as well as any subsequent (post-equalisation) causes of piglet mortality, date and litter size at weaning. Live born deaths are recorded as crushed, non-viable, savaged or other; and analysed as pre-equalisation, post-equalisation and total piglet mortality for each and all causes of death. The second phase is to identify any differences in behaviour between the second parity sows with differing previous farrowing experience. Video cameras are being used to record a number of second parity sows in the pens and 360s from 24 hours before the birth of the first piglet (BFP) until three days after BFP. Sow behaviour will be analysed in three distinct parts – the nesting phase (-24h – BFP), farrowing phase (BFP – 24h) and maternal phase (48h – 72h after BFP). The data obtained will further our understanding of the role of experience in the regulation of maternal behaviour, and highlight the importance of taking this into account when evaluating systems in transition.

The effect of choice of individual calving pen design on progress of calving in multi-parous dairy cows

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Parturition is painful, and dystocia is associated with both economical losses and compromised animal welfare. Previous studies have shown that dairy cows prefer shelter at calving (Proudfoot et al., *J. Anim. Sci.* 97: 2731-2739, 2014) and that moving the cow late before calving prolongs the process of calving (Proudfoot et al., *J. Dairy Sci.* 96: 1638-1646, 2013). Therefore, taking the cow's preferences into account may improve cow welfare at calving. The aim of this study was to investigate if the degree of isolation in an individual calving pen affects the process of calving. Thirty-seven multiparous Holstein dairy cows were moved from a group pen to an experimental calving pen 3 days prior to expected calving date. The experimental calving pen consisted of three compartments (3.00 m × 4.5 m each) between which the cow could move freely. Each compartment had a distinct barrier [height × width; 1.8 m × 1.5 m (A), 1.0 m × 2.5 m (B) and 1.8 m × 2.5 m (C)] shielding the cow from a group pen. The length of second stage labour (from first rhythmical abdominal contraction to the calf was born), the number of lying bouts on the day of calving, the final choice of calving compartment, the number of compartments visited on the day of calving and after the onset of second stage labour, as well as the time spent in the finally chosen compartment, were recorded. No significant effect of compartment choice on the duration of second stage labour was found (mean ± sd (min): 108.44±67.57). Twelve cows out of 37 had rhythmical contractions when making their final choice. These 12 cows had significantly longer second stage labour durations compared to cows not having contractions when making the final choice (167±78 vs. 84±35 min (mean ± sd); t-test: P<0.01). Cows with rhythmical contractions when making their final choice did not change calving compartment more often on the day of calving (average and sd: 61.83±28.79). However, these cows changed posture significantly more often than cows without rhythmical contractions when making their final choice (50±17 vs. 33±11 times/24 h; t-test: P<0.01). However, neither the final choice, the number of compartment changes nor the number of lying bouts had a significant effect on the duration of second stage labour. These results indicate that the process of calving can be affected by the cow being restless after entering second stage labour. This may be because a sensitive point in the calving process occurs when the cow enters this stage, which is in accordance with the findings by Proudfoot et al. 2013 (*J. Dairy Sci.* 96: 1638-1646). Interruption of second stage labour prolongs the calving, and information on the preferences of cows may help ensure a calmer calving.

Alternative weaning strategies influence lamb behaviour

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In the Eastern United States, lambs are commonly weaned at 60 days of age onto pasture with similar aged lambs. The weaning process is stressful for both the lamb and ewe as demonstrated through deviations in behavioural responses. More specifically, locomotion is a key behaviour noted to increase during the weaning process. Mitigating stress at weaning is important to reduce negative affective stress states as well as improve overall productivity and health. The objective of this study was to assess the effects of alternative weaning strategies on lamb locomotory behaviour during the first 52 hours post-weaning. A total of 18, 60 day-old lambs ($19.1 \text{ kg} \pm 2.8 \text{ kg}$) were blocked by bodyweight and randomly allocated to one of three treatments. Treatment one: lambs weaned at 60 days of age and placed with similar aged lambs ($n=6$ lambs; lamb treatment); Treatment two: lambs weaned at 60 days of age and placed with similar aged lambs and mature, non-familiar, non-lactating ewes ($n=6$ lambs, 3 ewes (social facilitators); social facilitator treatment); and Treatment three: lambs kept with their ewes and weaned at 116 days of age ($n=6$ lambs, 6 ewes; ewe-lamb treatment). Locomotion behaviour (defined as body supported by four legs while in motion) for each treatment was collected continuously for 52 hours post-weaning with one Foscam colour wireless outdoor IP camera per treatment. All video output was observed with a continuous sampling method by one trained observer using The Observer software by Noldus Information Technology. Data collected included total locomotion duration, frequency and average time spent per bout. Data were analysed using PROC MIXED in SAS. Treatment did not have an effect on total time spent in locomotion ($P>0.05$), but had an effect on locomotion bout frequency and average time spent per bout. Lambs allocated to the ewe-lamb and social facilitator treatments demonstrated less bouts of locomotion (Lamb: 101.7 ± 7.4 , Ewe-lamb: 68.4 ± 7.4 , Social facilitator: 43.1 ± 7.4 bouts; $P<0.03$) and average time spent per bout was less (Lamb: 18.4 ± 1.4 , Ewe-lamb: 11.6 ± 1.4 , Social facilitator: 7.9 ± 1.4 minutes; $P<0.03$). Weaning lambs at 60 days of age resulted in deviations in locomotory behaviour suggestive of stress. However, presence of a mature, non-lactating, non-familiar ewe had a similar effect on lamb locomotion 52 hours post-weaning as compared to those lambs not weaned. The number of bouts ($P=0.07$) and time spent per bout ($P=0.15$) were not different between the ewe-lamb and social facilitator treatments. Results from this study suggest that utilizing a non-familiar social facilitator may be an alternative and successful approach to mitigate weaning stress in lambs.

Alternative weaning strategies affect parasitic infection in pasture raised lambs

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In the Eastern United States, lambs are traditionally weaned at 60 days (d) of age, resulting in physiological and behavioural indicators of stress. Stress associated with the weaning process is an animal welfare issue that can negatively impact lamb immune response and increase susceptibility to parasitic infection. Minimizing stress during this time may be an important means for maximizing immunity and mitigating parasite load. The objective of this study was to evaluate the impact of alternative weaning strategies on lamb health in response to infection with *Haemonchus contortus*. A total of 54, 60 d old lambs (19.1 kg±2.8 kg) were blocked by bodyweight and randomly allocated to one of three treatments. There were three replicate pasture groups per treatment with six lambs per pasture. Treatment one: lambs weaned at 60 d of age and placed with similar aged lambs (n=3; WL); Treatment two: lambs weaned at 60 d of age and placed with similar aged lambs and three mature, non-familiar, non-lactating ewes (n=3; SF); and Treatment three: lambs kept with their ewes and weaned at 116 d of age (n=3; E). Blood and feces were collected on days 1, 7, 14, 28, 42 and 56 post-weaning to evaluate packed cell volume (PCV) and fecal egg counts (FEC). In addition, lambs were assessed for clinical signs of anemia using the FAMACHA eye scoring system. Data were analysed using PROC MIXED in SAS. Treatment had no effect on FEC, but had an effect by day on lamb PCV and FAMACHA scores on days 28, 42 and 56 post-weaning. On day 28, lambs allotted to E demonstrated greater PCV values compared to lambs in WL (P=0.0008), but SF was not different (P=0.08) from either E or WL (E: 31.9±0.8, WL: 28.0±0.8, SF: 30.0±0.8, PCV %). On day 42, lambs in E demonstrated greater PCV values compared to lambs in either SF or WL (P≤0.001); however, SF and WL were not different from one another (P=0.19; E: 31.0±0.8; WL: 26.4±0.8; SF: 24.9±0.8 PCV %). Lastly, on day 56, lambs in E had greater PCV values compared to lambs in either SF or WL (P≤0.0001; E: 30.7±0.8; WL: 25.1±0.8; SF: 26.1±0.8 PCV %) and lower FAMACHA scores when compared to WL (E: 1.3±0.3; WL: 2.3±0.3; P=0.008). Treatment SF and WL did not differ in PCV (P=0.41) or FAMACHA values (P=0.15) and SF did not differ from E when evaluating FAMACHA (P=0.22). The weaning process negatively impacted lamb health as indicated by lower PCV values and greater FAMACHA scores. This suggests that lambs weaned at 60 d of age have increased susceptibility for developing clinical signs of parasite infection. Results from this study suggest that maintaining the lamb on pasture with the ewe optimizes lamb health when challenged with parasite infection.

Separating the farmed mink dam from the litter at 7 or at 8 weeks after delivery?

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The optimal timing of separating the mink dam from the litter is suggested to be a balance between the partly conflicting needs of the mother and the kits. Early removal of the dam or partial removal of the litter may protect the dam against exhaustion. Little is known, however, about dam stress and maternal motivation around the time of separation. Therefore, we investigated the effects of separating the dam from the litter, using first-parity brown farm mink dams (*Neovison vison*; n=374) randomly assigned within each date of delivery to two treatment groups: The dam was removed from the litter either day 49±1 (7w, n=185) or day 56±1 (8w, n=189) after birth. The aim was to investigate whether the dams experienced stress and had a different motivation to take care of the litter after 7 and 8 weeks, estimated by non-invasive determination of cortisol (FCM: Faecal Cortisol Metabolites) and dam behaviour including calls the first week after separation (D0, D1, D7). The two treatment groups had an equal litter size at time of separation (age 7w: 5.5±0.17; 8w: 5.5±0.17 kits; range 1-11; P=0.76). Likewise, there was no significant difference in dam body weight (7w: 1420±15.0 g, 8w: 1404±14.7 g; range 930-1680 g, P=0.43). However, the litter size negatively influenced both the dam weight and her BCS (P<0.001) regardless of the litter age. Dams separated at 7 weeks postpartum had higher concentrations of cortisol during the first week after removal (day of separation, D0: 18.8%, D1: 34.5%, D7: 36.9% higher FCM) than dams separated at 8 weeks postpartum (P=0.014). Likewise, the dam calls increased on the separation day, peaking on the first day after separation (D1). The proportion of dams with calls decreased with litter age at separation (P=0.024). We interpret these results as a higher maternal motivation in dams at 7 weeks than at 8 weeks after delivery. Additionally, the amount of dam calls after separation decreased with the litter size (P=0.022). Thus in addition to litter age, the size of the litter is important for the maternal motivation. These factors should, therefore, be taken into account in the optimal separation time on mink farms.

Play and other behaviour indicative of affective state in lambs around weaning

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The aim of this study was to investigate in what way and for how long different behaviour of lambs were affected by weaning (separation from the mother and changes in social environment and pen size) at around 8 weeks of age. The study was carried out at Götala Beef and Lamb Research station at SLU in southwest of Sweden. Twin lambs (n=15 pairs; 16 males, 14 females) from ewes of Finewool × Dorset and sire of Texel were housed in straw bedded pens with their mother (6 m²). The animals were fed grass silage and lamb concentrate daily and had ad libitum access to water, mineral lick and mineral supplements. The lambs were weighed every week. Lambs could walk out of the home pen through a small gate to enter a playground (8-16 m²) where they could interact with 1-6 other lambs before weaning (BW). During weaning (DW, 50-65 days old, 28.8 kg) the mother was removed from the home pen and placed within hearing distance of the lambs, and the gate to the playground was closed. After weaning (AW, 55-70 days old) the mother was removed from the barn, and the gate to the playground remained closed. Lambs were habituated to the observer during 7 days before observations started. Behaviour was observed 3 sessions during 3 days BW, 5 sessions during 6 days DW and 5 sessions during 6 days AW. Each session included 15 s observations per focal twin during 4 min which was repeated 6 times, thus giving a total of 24 min of observation per session. Instantaneous recordings were done at 15 s intervals of body postures, feeding, exploration, comfort behaviour and ear posture. Frequencies of locomotor and social play, social contact and vocalizations were recorded within each 15 s. Statistical analysis was done in Genstat for Windows (2004, 7th ed.) with a Restricted Maximum Likelihood analysis where the model tested for effects of weaning period (BW, DW, AW), sex and their interactions. There was a significant effect of weaning period on total play (P<0.01), social play (P<0.05) and locomotor play (P<0.05) with a reduction in play DW. Social contact with the twin lamb and vocalisations increased DW to regain its previous level AW (both P<0.001). Increases DW lasted respectively 2 and 3-4 days. Percentage of lying declined DW (P<0.05). Plain ear posture was shown less DW than BW (P<0.001), whereas raised and asymmetrical ear postures both increased DW. Play behaviour was affected by sex differences, playground size, sex ratio of the playmates and hour of the day. In conclusion, removal of the mother from the home pen to another pen in the same barn, and concurrent reduction of space and separation of playmates by bars DW, evoked behavioural changes indicative of negative affect that lasted 2-4 days. The removal of the mother from the barn after another 5 days AW had minimal effects on the behavioural parameters.

Maternal transmission of behaviour

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Social transmission of behaviour patterns is affected by familiarity, kinship and dominance. Thus, animals appear to be selective with regards to whom to learn from, and this reliance on social information is shaped by natural selection. For a young mammal, the mother is one of the most salient aspects of its environment, and she is of primary importance in the regulation of the offspring's behaviour. Maternal effects on foraging behaviour, fear and stress responses appear particularly robust and remain after the end of maternal contact. In this plenary, I will discuss the adaptive benefits of maternal transmission of behaviour and present results from recent experiments on horses. Henry et al. (*Appl. Anim. Behav. Sci.* 93:341, 2005) allowed foals to observe their mothers interacting friendly with humans on days 1-5 postpartum and found that foals in the observation group showed reduced fearfulness towards humans and during human handling up to one year later, compared to control foals. The authors repeated the experiment with 6 months old foals and found that the effect of the foals' observation of mare-human interaction was less pronounced when carried out 6 months postpartum (Henry et al., *Dev. Psychobiol.* 49:514, 2007). This suggests an increased effect of observation of the mare's behaviour at an early age. In a new study, we further explored effects of maternal transmission on offspring behaviour (*Anim. Cogn.* DOI 10.1007/s10071-015-0924-7). The experiment investigated whether fearfulness in foals could be reduced through weekly exposure to usually frightening objects with a habituated mother during the first 8 weeks of life. Prior to foaling, the mares (n=22) were habituated to five initially fear-eliciting situations, including exposure to novel stationary and moving objects. At birth, the foals were randomly assigned to either a demonstration group (DEMO; n=11) or a control group (CON; n=11). DEMO mares demonstrated habituation towards the objects to their foals once per week in weeks 1-8 postpartum. CON mares were inside the empty test arena with their foals for the same amount of time. The foals were tested at 8 weeks and 5 months of age in four standardised fear tests. DEMO foals showed significantly reduced fear responses (behaviour and heart rate) and increased exploratory behaviour at both 8 weeks and 5 months of age. It was concluded that fearfulness in foals may be reduced through exposure to frightening objects together with their habituated mother during the first 8 weeks of life. The effect in this and in the studies by Henry et al. (2005, 2007) was likely achieved through a combination of maternal transmission and individual learning.

Is the establishment of a bond between cow and calf dependent upon nursing?

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Most calves born in dairy producing herds are separated from their dam shortly after birth and are reared artificially. However, systems where calves are kept with the cow have received increasing attention due to potential welfare benefits. Nevertheless, little is known about which factors are important for the establishment of the cow-calf bond after birth. This study evaluated the effect of nursing on affiliative behaviour between the dam and her calf including allogrooming, proximity and latency to reunite after a period of separation. We hypothesised that nursing is an important prerequisite for the development a bond and affiliative behaviour. To investigate this, Holstein cow-calf pairs were randomly allocated to three treatments differing only in nutritional dependency on the dam: milk feeder (n=10 pairs), combined (n=10 pairs) or nursing (n=10 pairs). For milk feeder calves, suckling was prevented by an udder net, 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 (between 20:00 h and 08:00 h) and were housed adjacent to each other during the day (between 08:00 h and 20:00 h). 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 ($10 \pm 0.8\%$ vs. $0.4 \pm 0.7\%$, $t_{29}=168.8$, $P < 0.001$). The time cow-calf pairs spent allogrooming did not vary with treatment; $10.0 \pm 0.8\%$, $F_{2, 27}=0.4$, $P=0.696$). Similarly, time spent in close proximity without nursing did not differ among treatments; $31 \pm 2.6\%$ $F_{2, 27}=0.6$, $P=0.543$). The percentage of occasions a pair did not reunite (i.e. not observed within 1 m of each other within 3 min) was 23% for the milk feeder pairs, 38% for the combined pairs and 32% for the nursing pairs ($\chi^2=3.9$, $P=0.415$). Nevertheless, suckling from another cow than own dam was observed at least once by 19 of the 20 calves that were allowed to suckle. 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 ± 8.3 and 12.9 ± 5.8 ; $F_{2, 24}=3.1$, $P=0.062$). These results indicate that we could reject our hypothesis and thus conclude that cow and calf form a bond independent of nursing. By showing that the cow-calf bond extends beyond that of a nutritional aspect and includes elements of caretaking and emotions, the complexity of the mother-young relationship is confirmed also for cattle.

Social calves are smarter calves — the effects of maternal and other social influences on cognitive and behavioural development

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In nature, cattle live in complex social groups, but on many dairy farms the calves are separated from the dam soon after birth and housed individually for the first weeks of life. Work on other species has shown effects of early maternal and social separation, most notably increased fearfulness and reduced behavioural flexibility. Our group at UBC has now completed a series of experiments investigating the effects of individual housing versus various forms of social housing on different measures of calf cognition and behaviour. We have found that, in comparison to socially housed calves, individually reared calves are initially more fearful when first meeting a strange calf, but thereafter become more persistent in initiating social behaviour. Individually reared calves are slower to successfully transition to new group housing after weaning, in part because they take longer to discover and make use of the new feeder. Individually reared calves show longer latencies to approach novel objects and novel feeds. They are also reluctant to consume the new feeds after these have been discovered. We have also tested learning abilities, using both y-maze and operant conditioning, to train calves in a simple colour discrimination task. One way to test for differences in cognitive flexibility is to change the rules after animals have learnt to discriminate the colours. We used a reversal-learning task by switching the way in which the previously positive and negative colours were reinforced. Individually reared calves generally failed the reversal-learning test, even when provided twice as many learning sessions as provided to the socially reared calves, and instead continued to respond positively to colours that were no longer positively reinforced. Follow-up work has shown that cognitive impairment and fearfulness both vary with the degree of social enrichment provided. Calves reared in complex social environments with contact with the dam and other cows and calves show the best performance in the reversal task and least degree of fearfulness, while individually reared animals show the worst performance. Calves that were pair housed from an early age respond similarly to the calves reared in the complex social environment, and calves paired only late in the milk-feeding period show intermediate responses. In summary, these results indicate that the routine practice of individual housing for dairy calves has important effects on cognitive performance and behaviour. These results are consistent with other work showing that social housing from a young age is important for calf welfare and development.

Liquid feeding, number of feeding times and ingredient content of the diet are associated with tail biting at farm level

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Pigs will forage for individual nutrients where they experience a shortage. Both qualitative (nutrient inadequacy) and quantitative (amount below voluntary intake) diet restrictions might cause pigs to increase foraging behaviour. Excess foraging behaviour due to non-optimal diet can further cause tail biting behaviour. In the literature and practice, tail biting has been connected to deficiencies in diet, such as lack of protein or salt, and competition for feeder space. A case control study with a questionnaire was carried out to compare feeding practices and diet composition in 38 case and 40 control herds, with or without a history of tail biting, in Finland. Tail biting was measured as the mean annual prevalence score of tail biting damage (TBD) for the whole farm estimated by veterinarians. Type of feeding system and management of feeding were classified for different production units (piglet, weaner, finishing). Information regarding the use of all the common feed ingredients was gathered separately for diets of different aged pigs. For purchased compound feeds (PCF), the list of ingredients was obtained from the manufacturer. Pearson- χ^2 was applied to identify the reference category and univariate logistic regression to obtain unadjusted odds ratios (OR) and 95% confidence intervals (CI) for those variables significantly associated with TBD. SPSS 18.0 was used. No association of feeding practice-related factors in the piglet or weaner units with TBD was found. Liquid feeding in the finishing unit resulted in increased risk for TBD compared to dry feeding (OR=4.0 CI 1.3 – 12.1; P<0.05). Having more than two meals a day for finisher pigs was connected to TBD when compared to one to two meals or *ad libitum* feeding (OR=4.0 CI 1.4 – 11.9; P<0.05). No association of individual ingredients with TBD was found for the piglet or finisher diets. In the weaner diet, use of wheat, dry or liquid whey and PFC were found as risk factors for TBD. Farms using whey for weaned pigs had an 8.3 fold OR (CI of 1.03 – 67.1; P<0.05) for risk of TBD. Use of PCF increased OR for TBD by 6.9 fold (CI 1.1 – 41.8; P<0.05). Use of wheat was associated with TBD ($\chi^2=3.98$; df=1; P<0.05), but the magnitude of the risk could not be measured. The results might indicate that many time-restricted quantitatively small meals induce hunger in pigs after a meal, while frequent competition at feeders may increase the risk of stress and tail biting. Decreased dry matter content of the diet might prevent satiety of pigs in farms using a liquid feeding system and increase foraging behaviour. A highly mechanized liquid feeding system is also more vulnerable to undetected errors. PCFs for weaners usually include wheat and whey powder and are pelleted. Finely ground wheat is connected to gastrointestinal problems, and pelleting is connected to risk for tail biting.

How expected stressful factors affect the tail posture of slaughter pigs

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Tail biting and tail damage are related to the tail posture of pigs. Thus, tail posture might function as a predictive indicator of tail biting. However, tail posture might also be affected by other factors in the pig's environment. The aim of the present study was to investigate whether the tail posture of pigs is affected by tail docking status, stocking density and straw provision. A pig's tail could either be curled or not curled. It was hypothesised that pigs experiencing expected stressful factors (higher stocking density and no straw provided) would show a higher percentage of tails not curled. So far, the study includes two batches of slaughter pigs with 32 pens in batch 1 and 16 pens in batch 2. In each batch, the pens were randomly assigned to a combination of the three factors: (1) docked tails (n=28) vs. undocked tails (n=20), (2) 18 pigs in the pen (n=24) vs. 11 pigs in the pen (n=24) and (3) no straw provision (n=24) vs. provision of 150 g straw per pig per day (n=24). Through the entire slaughter pig period (from 30 kg to 110 kg; 10 weeks), the tail posture of the pigs was observed at pen level three times per week, and data were averaged per week. Tail posture was observed by standing in the middle of the pen while all the pigs were standing. Data are currently being analysed, and preliminary results will be presented.

On-farm tail biting prevention in long-tailed pigs – results from a producer questionnaire in Finland

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Tail biting is a serious welfare problem in pigs, causing substantial economic losses. In the majority of the EU countries, tail docking is used to reduce the incidence of tail biting. However, many of the risk factors for tail biting are related to suboptimal management, and tail biting can be reduced by corrective management decisions. There are few studies on which preventive measures producers themselves value as most important. A questionnaire was distributed via slaughterhouse webpages in 2015. Producers were asked to score the importance of handling different tail-biting risk factors on their own farms as well as about which manipulable materials they use and find efficient. In addition, we asked about their opinions on tail biting and tail docking. A total of 70 producers replied, 54 of these replies were regarding fattening pigs and 16 regarding weaned pigs. The size of the pig units varied between 100 and 6400 pigs, with an average of 1307 pigs. Finland banned tail docking in 2000, so all farms raised long-tailed pigs only. On average, the producers reported a prevalence of tail biting of 2.3% on their farms, which corresponds well with values reported at Finnish abattoirs. Most producers found tail biting not to be a big problem on their farms, and 62% of the farmers found it very unlikely that they would raise tail docked pigs even if it was legal in Finland. The more tail biting reported on the farm, the more problematic the farmers found tail biting, and the more prone they were to say they would probably tail dock if they were allowed to. According to the Finnish producers, the most important factor to prevent tail biting is that there is enough feeding space for the pigs. Altogether, four feeding-related risk factors were included in the top-10 measures to prevent tail biting. Also pig health was considered very important as well as a good quality of piglets and controlling air movements in the pen. Straw, newspaper, hay and cardboard were considered the most efficient manipulable materials to prevent tail biting. If tail biting has already started in the pen, the producers ranked identifying and removing the tail biter from the pen as most important, followed by adding bedding-type manipulable materials. The results are partly in accordance with experimental and epidemiological studies on risk factors for tail biting, but the high focus on feeding-related and health factors is interesting. Finnish farmers appear to handle the tail docking ban well, and do not, on average, find tail biting a very serious problem.

Behaviour and health in two broiler hybrids with different growth rates

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Until recently, fast growing broiler hybrids have been used exclusively in both conventional and the scarce 0.1% organic broiler (OB) meat production in Sweden. The relatively long rearing period in OB production (>10 weeks) has resulted in impaired bird welfare e.g. hunger related behaviour, ascites and leg disorders in these fast growing hybrid birds. This study aimed to quantify differences in behaviour and health between a fast growing hybrid, Ross 308 (R), and a slower growing hybrid, Rowan Ranger (RR), that were reared for 10 weeks in a semi-organic production environment with organic feed and space allowances but without outdoor access. In the study, 218 R and 211 RR day old chicks were split into 20 groups with 10 replicates of each hybrid. Behavioural and clinical records were obtained at 2, 6 and 9 weeks of age, and mortality was recorded continuously. Behaviour was recorded through scan sampling and continuous observations. The day after the behavioural observations, a welfare assessment was performed according to the Welfare Quality® Assessment Protocol for Poultry. The results show that RR birds were more active than R birds as RR were standing more in week 6 ($40.9 \pm 3.20\%$ vs. $30.4 \pm 3.20\%$, LSM \pm SE; $P < 0.05$) and 9 ($28.1 \pm 3.71\%$ vs. $14.2 \pm 3.71\%$, LSM \pm SE; $P < 0.05$). Furthermore, RR were perching more than R in week 6 ($8.9.x \pm 1.51\%$ vs. $2.6.x \pm 1.51\%$, LSM \pm SE; $P < 0.05$) and 9 ($3.8 \pm 0.71\%$ vs. $1.1 \pm 0.71\%$, LSM \pm SE; $P < 0.05$). The R birds had more leg and feet problems than the RR birds, i.e. worse gait score in week 2, 6 and 9 ($P < 0.05$), worse foot pad dermatitis score in week 6 and 9 ($P < 0.05$) and worse hook burn score in week 9 ($P < 0.001$). As a result of more severe leg problems, a higher proportion of the R compared to the RR birds were culled ($9.7 \pm 1.83\%$ vs. $3.3 \pm 1.83\%$, respectively, $p < 0.05$). Both R and RR showed health problems at older ages, likely due to the increased body weight. However, our results imply that fast growing birds are poorly suited for a long rearing period (>10 weeks), whereas the slower growing RR birds seem better suited for the rearing periods stated by the organic regulations.

The effect of pressure vest on the behaviour, salivary cortisol and urine oxytocin of noise phobic dogs

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Fear of loud noises is a very common welfare problem in pet dogs. The severity of fearful reaction varies from mild anxiety to severe phobia. Commercial treatment vests have been tested on dogs to relieve noise phobia, and peripheral oxytocin has been suggested to be one of the stress-relieving mediators. The effect of vests has not been tested in a controlled situation. We tested 1) whether pressure vests calm noise phobic dogs in a double-blinded experiment, 2) whether the possible effect differs between vests with different pressure level and 3) if the pressure vest increases oxytocin secreted in urine. A total of 28 dogs (2-11 years), both female (18) and male (10), were recruited via an ongoing study on the genetic background of noise sensitivity by the Finnish Canine Genetic Research Group. Two commercial vests of similar texture were individually customized for each dog: a DEEP pressure vest (c. 10-12 mmHg) and a LIGHT pressure vest (c. 2-3 mmHg). Each dog was tested three times in a semi-randomized order, either without vest (CONTROL) or with vest. The dogs' behaviour was filmed during three consecutive 2-minute periods: PRE-NOISE, NOISE (70-73 dB firework sound) and RECOVERY. Saliva samples were collected four times during each test. Urine samples were collected once when the deep pressure vest was first fitted: before dressing the dog (OXY1) and after 30 min (OXY2). We present here results from the differences between treatments (CONTROL, DEEP and LIGHT) in time spent near owner and saliva cortisol (linear mixed models), activity (Wilcoxon and Friedman) and urine oxytocin samples (Friedman), and correlations between behaviour, cortisol and oxytocin concentrations (Spearman-rank). The DEEP vest reduced median lying time in the dogs during NOISE ($P < 0.05$). Saliva cortisol measured after test correlated positively with the total lying time during NOISE with DEEP and LIGHT vest (Spearman cor. 0.57 and 0.49, $P < 0.05$ for both). Both DEEP and LIGHT vests increased the time the dogs spent near their owners during NOISE ($P < 0.05$). Time spent near the owner when wearing the DEEP vest during the RECOVERY correlated positively with OXY1 and OXY2 (Spearman r : 0.44 and 0.50, $P < 0.05$ for both). These results indicate that increased lying time was a sign of higher stress level in the dogs, and oxytocin might be related to the dog's tendency to seek owner support, and the vests might affect this behaviour positively. We did not find a clear therapeutic effect of using pressure vests in noise phobic dogs in a double-blinded experimental set-up. However, the pressure vest might reduce the acute stress reaction and speed up the recovery after stress, possibly partly by facilitating more owner support seeking in the dogs.

Behaviour of nursing home residents towards a visiting animal and the human companion - A randomized controlled trial in 4 Danish nursing homes

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The use of animals, especially dogs, for pleasure or as a therapeutic tool in nursing homes is becoming more widespread. Previous studies suggest that contact to dogs can have positive effects on elderly people, but there is a lack of knowledge about specific pathways of such effects. One such pathway could be the behavioural interactions between the human and the dog. The present study compared acute behavioural effects of bi-weekly visitors accompanied by either a dog, a robot seal (PARO) or a soft toy cat and aimed to investigate whether the type of visit affected the receivers differently. A total of 100 nursing home residents completed the study after a declaration of informed consent had been signed. Each participant received 12 10-minute visits (two visits/week for six weeks), during which the behavioural interactions between the visitor and the accompanying animal were registered. The behavioural elements included physical contact between resident and animal, eye contact with the animal and conversation to the animal and the visitor. Furthermore, data on the level of cognitive impairment, the presence of depressive symptoms, age and gender were collected. We found that behaviour in general, and the immediate response to and interaction with the visiting animal in particular, depended on the type of animal that was brought along. The dog and the interactive robot seal triggered the most interaction in the form of physical touch ($F_{2,103}=7.50$; $P<0.001$), eye contact ($F_{4,151}=6.26$, $P<0.001$) and verbal communication ($F_{4,195}=2.87$; $P<0.05$). Furthermore, the cognitive impairment level of the residents affected with whom they interacted. The higher the cognitive impairment level, the more interaction was directed towards the animal and less towards the human, regardless of visit type ($F_{2,101}=4.10$; $P<0.05$). The live dogs and the robot seal elicited more interaction compared with the toy cat, but over time, the robot seal failed to maintain the attention to the same level as the dog. The cognitive functioning of the residents correlated with the level of interaction, and this needs to be studied further. These results suggest that the ability of the animal (or the object) to interact and give feedback affects the response of the residents, even though the interest for the robot seal decreased during the intervention period. The findings will be one step on the way to optimize future dog visitation programs in nursing homes.

Do hospital pens match the special needs of diseased dairy cows?

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In recent years, welfare of diseased dairy cows has received increasing scientific attention (e.g., Weary et al., *J. Anim. Sci.* 87: 770, 2009), based on knowledge from studies of sickness behaviour in animal models of human diseases (Dantzer, *Ann. N.Y. Acad. Sci.* 933: 222, 2001). In the studies of sickness behaviour, diseased animals change behaviour and preferences; e.g. increase isolation seeking, lying and avoidance of physical activity (Tizard, *Anim. Health Res. Rev.* 9: 87; 2008). Thus, diseased animals may have different behavioural needs than their healthy conspecifics. Dairy cows in modern production systems may suffer from production diseases such as lameness (Thomsen et al. *Vet J.* 193: 644, 2012), mastitis (Halasa et al., *The Vet. Q.*, 29: 18, 2007) and periparturient infections (Huzzey et al. *J. Dairy Sci.* 90: 3220, 2007) which lead to reduced animal welfare. Recent investigations have shown that also dairy cows change behaviour when sick. However, the observed behavioural changes seem to depend on the type of disease. Several studies have shown that lameness leads to increased lying (e.g. Chapinal et al., *J. Dairy Sci.* 93: 3039, 2010). However, Fogsgaard et al. (*J. Dairy Sci.* 98:1, 2015) found that mastitic dairy cows, even in milder cases, spend less time lying compared to healthy controls, even though increased lying behaviour was expected based on the animal model studies. Proudfoot et al. (*J. Anim. Sci.* 97: 2739, 2014) showed isolation seeking behaviour in febrile dairy cows in the days after calving (periparturient infections). On the contrary, Jensen et al. (*J. Dairy Sci.* 98: 4552, 2015) did not find evidence for isolation seeking in non-febrile lame dairy cows. Across the different diseases, one way to improve the welfare of diseased dairy cows, and potentially facilitate recovery, is the use of designated hospital pens. For animal welfare reasons, Danish legislation states that dairy farmers must be able to house diseased/injured animals in hospital pens from 2016, and the design of the pens must live up to certain requirements. However, recent surveys showed that 22% of Danish dairy herds did not have individual hospital pens (Houe et al., *Animal*, in press), and that up to half of dairy herds in Iowa did not have a designated hospital area for diseased cows at all (Fogsgaard et al., *Appl. Anim. Behav. Sci.*, in press). Thus, at present the new knowledge about behavioural and motivational changes in diseased dairy cows are not fully utilized. In order to do so, more research is needed, aiming to investigate whether animals with certain diseases/injuries benefit from being separated from the group of healthy cows, and if so, how the designated hospital pens should be designed to facilitate locomotion, rest and isolation seeking and to minimise competition in order to improve animal welfare and facilitate recovery.

Do lame cows benefit from a stay in a hospital pen?

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Despite intensive effort to reduce the number of affected individuals, lameness continues to be a major problem in dairy herds in Denmark and worldwide. For animal welfare reasons, Danish legislation states that dairy farmers must be able to house diseased/injured animals in hospital pens from 2016, and the design of the pens must live up to certain requirements. However, till now no detailed specifications state which animals must be housed in hospital pens, for how long and how the hospital pens should be designed. Studies of diseased animals and their needs are increasing, but at present, the biological basis needed for the formulation of guidelines for the use of hospital pens for diseased animals, including lame dairy cows, is lacking. Recent studies have shown that the behaviour of lame dairy cows differ from healthy controls. Therefore, lame cows probably have altered behavioural priorities and needs, compared to healthy herd mates, and may benefit from a stay in a hospital pen during the recovery period. In order to investigate whether lame cows benefit from a stay in a hospital pen, this study aims to include 800 lame dairy cows from commercial dairy herds, half of them housed in group hospital pens (treatment group) and the remaining kept in their home pen with healthy herd mates (control group). Cows will be lameness scored (scale ranging from 1-5 with 5 being severely lame) weekly. Cows in the treatment group will be housed in hospital pens until they are no longer lame (lameness score ≤ 2) or for a maximum of 6 weeks after detected lameness. During this period, the following will be recorded weekly regarding all cows (treatment and control group); medical treatments, labour, lying behaviour and lameness score. Furthermore, all cows will be followed for 52 weeks and information about milk yield, lameness, reproduction, veterinary treatments and possible culling will be recorded to gain information about possible long-term effects of the stay in the hospital pen. The project seeks to establish knowledge about possible beneficial effects of housing lame dairy cows in hospital pens. The project aims to include effects of the specific cause of lameness and establish recommendations to farmers regarding management of lame cows.

Effect of sand and rubber surface on the lying behaviour of lame dairy cows in hospital pens

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In dairy cows, lameness is a serious problem affecting welfare and productivity and without obvious reduction in the prevalence during the last decades. Hence, in order to mitigate the negative effects of lameness, knowledge about management of lame cows is needed. Moving lame cows to a designated hospital pen with a soft surface may lessen the pain the animal feels when standing, lying and changing posture. However, no studies have investigated the effect of surface in hospital pens on the behaviour of lame cows. The aim of this study was to investigate the effect of lying surface on the lying behaviour of obviously lame cows housed in individual hospital pens. Thirty-two lame dairy cows with a gait score of 4 on a 5-point scale (1 is normal gait, 5 is severely lame), afebrile and diagnosed with either white line disease or sole ulcers were kept in individual hospital pens, where they were restricted to deep-bedded sand for 24 h and rubber mats for 24 h in a cross-over design. The lying behaviour was recorded for 18 h for each cow on each type of lying surface. When kept on deep-bedded sand, cows had a longer lying time ($P<0.001$), a higher frequency of lying bouts ($P<0.01$) and a shorter duration of lying down ($P<0.01$) and getting up movements ($P<0.05$) compared to the period on the rubber mats. More cows were lying laterally on deep-bedded sand compared to the rubber mats ($P<0.01$). In addition, two measures of lying intention movements were shorter on deep-bedded sand compared to rubber mats; the latency from the first intention movement until lying down ($P<0.001$) and the duration of intention movements per lying bout ($P<0.001$). The results showed that the type of lying surface affected the lying behaviour of the lame cows kept in individual hospital pens. When housed on deep-bedded sand, lame cows were less reluctant to lie down and get up than on rubber. Furthermore, when kept on the sand, lame dairy cows lay for longer, and more cows lay laterally than on the rubber. These results suggest that lame dairy cows have less difficulties lying down on deep-bedded sand than on an un-bedded rubber surface, and that deep-bedded sand is more comfortable to lie on. In this study, sand was chosen as a deep bed, but the provision of a deep-bedded lying surface in hospital pens in general may be superior to harder surfaces in terms of allowing the animals to meet their need to lie down. These findings are relevant, not only for the future design of hospital pens, but also for the understanding of behaviour of lame cows in other types of housing as well as the general effect of lying surface on cow comfort. This study investigated the behaviour of lame and afebrile cows. In the future, studies concerning the effect of lying surface on the behaviour of cows suffering from other diseases and disorders would be relevant.

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We look forward to meeting you there!

DCA - National Centre for Food and Agriculture is the entrance to research in food and agriculture at Aarhus University (AU). The main tasks of the centre are knowledge exchange, advisory service and interaction with authorities, organisations and businesses.

The centre coordinates knowledge exchange and advice with regard to the departments that are heavily involved in food and agricultural science. They are:

Department of Animal Science
Department of Food Science
Department of Agroecology
Department of Engineering
Department of Molecular Biology and Genetics

DCA can also involve other units at AU that carry out research in the relevant areas.

