

**ISAE** Benelux

# Proceedings of the ISAE Benelux conference 2017

12<sup>th</sup> October

Cheese and dairy farm De Ruurhoeve, Hoogeloon, Netherlands



<http://www.applied-ethology.org/benelux>

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ISAE provides a forum for the presentation and discussion of advances in applied animal behaviour science and education and inspires further innovations through an annual international scientific congress and regional meetings. *Applied Animal Behaviour Science* is the official journal of ISAE.

The study of applied animal behaviour contributes to a greater understanding of the interactions between humans and other animals and helps to create a better balance between animal welfare and the requirements that humans have of other animals.

ISAE members work on a wide variety of animal species and topics such as the management and welfare of livestock, the interactions between humans and companion animals, and the impacts of housing on the behaviour and welfare of zoo and laboratory animals.

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# ISAE Benelux Regional meeting 2017 - Programme

9h00 Coffee and registration  
9h30 Opening by Bas Rodenburg

## **Session 1: Individual differences and early development**

*Chair: Adinda Sannen (Odisee)*

- 10h00 Is there a link between the metabolic rate and the personality of two crayfish species (*P. clarkii* and *P. leniusculus*)? – Senne Audier (WUR)
- 10h15 Divergent selection on feather pecking affects coping style and microbiota composition – Jerine van der Eijk (WUR)
- 10h30 Owner dog interactions are organized along human parenting styles – Ineke van Herwijnen (WUR)
- 10h45 Early feeding and the behavioural development of pigs around weaning – Anouschka Middelkoop (WUR)

11h00 Coffee break and posters

## **Session 2: Welfare and management procedures**

*Chair: Eddie Bokkers (WUR)*

- 11h30 Drinking behaviour and performance of drinking systems in poultry: beak-trimmed versus non-beak-trimmed laying hens – Malou van der Sluis (WUR)
- 11h45 Humane methods for killing individual poultry on-farm – a survey – Anneleen Watteyn (ILVO)
- 12h00 The relation between the prevalence of claw lesions in Flemish dairy herds and the perception of the farmers – Beke Nivelte (KU Leuven)
- 12h15 Behaviour of horses during hoof trimming: do they behave more calmly with adhesive tape on the nose? – Hilde Vervaecke (Odisee University College)

12h30 Lunch

## **Session 3: Emotion**

*Chair: Hetty Boleij (UU)*

- 13h30 Keynote: Dog welfare and emotions: The diagnosis and treatment of canine anxiety disorders – Valerie Jonckheer-Sheehy (Dutch Veterinary Specialist Centre De Wagenrenk)
- 14h00 Low birth weight impairs discrimination learning and causes a moderately negative judgement bias in pigs (*Sus scrofa*) - Allyson Ipema (WUR)
- 14h15 Do hens with different feather pecking phenotype differ in decision making under ambiguity? – Katarina Pichova (Slovak Academy of Sciences & WUR)
- 14h30 Validating judgment bias as an independent measure of emotion in pigs – Sanne Roelofs (UU)
- 14h45 Proposal presentation: identification of biomarkers of positive and negative moods in dairy cattle – Laura Webb (WUR)

15h00 Coffee break and tour of the farm

## **Session 4: Precision Livestock Farming**

*Chair: Lenny van Erp (HAS)*

- 16h00 Classification of cows' behaviours using leg- and neck-mounted accelerometers in dairy barns – Said Benaissa (UGent & ILVO)
- 16h15 Using sensors to monitor behaviour at the dairy farm – Frank van Eerdenburg (UU)
- 16h30 PhenoLab: automatic recording of location, activity and proximity in group-housed laying hens – Bas Rodenburg (WUR)
- 16h45 Closing
- 17h00 Drinks and presentation award



## Theatre Session 1 – 10h00

Is there a link between the metabolic rate and the personality of two crayfish species (*P. clarkii* and *P. leniusculus*)?

Audier, Senne C.<sup>1</sup>, Rodenburg, Bas<sup>1</sup>, Roessink, Ivo<sup>2</sup>

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Individual differences within populations are important evolutionary and ecological characteristics. Behavioural differences between individuals which are consistent within individuals over time and across contexts form personality traits. Multiple correlated personality traits form a behavioural syndrome, or a personality. A possible explanation for these inter-individual differences can come from energy management. Currently two models exist that combine personality with energy consumption. The first model, the performance model, states that more energy should result in a higher activity level (a personality trait), while the allocation model states that energy is distributed between metabolism and activity. In this research we try to unravel which model fits best in two species of crayfish, *Procambarus clarkii* and *Pacifastacus leniusculus*. We studied if the crayfish had personalities, and if this could be linked with their metabolism. We expected that *Procambarus clarkii* would be bolder, as was shown by earlier studies. We expected that the metabolism of individuals would be consistent over two months (measured twice). Lastly, we expected that personality and metabolism would be linked. Twenty individuals of each species underwent three behavioural tests twice: a novel environment, a novel food test and a provocation test (measuring the initial reaction to a ball held above the water). Furthermore, we determined the resting metabolic rate for each individual crayfish by measuring its oxygen consumption for two hours, when resting. We found that individual behaviours within behavioural tests were consistent (Novel environment:  $r=0.45$ ,  $p<0.05$ ; Novel food:  $r=0.48$ ,  $p<0.005$ ; Provocation:  $r=0.66$ ,  $p<0.001$ ), but no personalities were found, as the personality traits could not be correlated. Furthermore, resting metabolic rate did not appear to be consistent within individuals ( $p\approx 0.8$  for both species), and could not be linked to personalities. These findings are new for the crustacea, and form a basis for future studies on crustacean metabolism and personality.

## Theatre Session 1 – 10h15

### Divergent selection on feather pecking affects coping style and microbiota composition

van der Eijk, Jerine A.J.<sup>1,2</sup>, Rodenburg, T. Bas<sup>1,2</sup>, Lammers, Aart<sup>1</sup>

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Feather pecking (FP), i.e. hens pecking and pulling at feathers or tissue of conspecifics, is a serious welfare and economic issue. Excessive damaging behaviours, such as severe FP, are indicative of an animal's inability to cope with environmental stressors. The hypothalamic–pituitary–adrenal (HPA) axis plays an important role in stress coping and can be influenced by the gut microbiota. Therefore, to better understand the relation between the gut microbiota, stress coping and feather pecking, we investigated whether lines divergently selected on FP differ in coping style, stress response and microbiota composition. We used laying hen lines selected for high (HFP, n=72) and low (LFP, n=63) feather pecking. Lines were housed separately with 8 pens per line, 9 birds per pen. Two batches were used which differed 2 weeks in age. At 24 weeks of age birds were subjected to a 5 min manual restraint test. Blood was collected 10 min after the test was finished for analysis of plasma-corticosterone levels. At 30 weeks of age we sampled gut content from the ileum, caecum and colon. Data were analysed using mixed models, with selection line, batch, experimenter and test time as fixed factors and pen within line as random factor. HFP birds had a shorter latency to vocalize compared to LFP birds (HFP=124s and LFP=173s,  $F_{1,12}=8.45$ ,  $P<0.05$ ), indicating a more proactive coping style. However, lines did not differ in their latency to struggle or in corticosterone levels after manual restraint. We found first indications that the HFP and LFP line differ in microbiota composition ( $P<0.1$ ). These results show that FP seems to be related to coping style which might indicate that birds with a certain coping style are predisposed to develop FP behaviour. Further research is needed to identify whether microbiota composition could have a causal role in this.

## Theatre Session 1- 10h30

### Owner-dog interactions are organized along human parenting styles

van Herwijnen, Ineke R.<sup>1</sup>, van der Borg, Joanne A.M.<sup>1</sup>, Naguib, Marc<sup>1</sup>, Beerda, Bonne<sup>1</sup>

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Human parents interact with their children along parenting dimensions of demandingness and responsiveness, that are translated into four parenting styles: authoritarian, authoritative, permissive and uninvolved. Parenting styles are known since the late 1960's and impact on child development. Given the similarities in the relationships between parent-child and owner-dog, we hypothesized human parenting styles to be present in the owner-dog relationship. We used an adapted parent-child Parenting Style and Dimensions Questionnaire (PDSQ, including 62 items) for assessing patterns in owner-dog interactions. Owner self-reports on 5-point scale items, from 518 Dutch dog-owners, who also had one or more children, were subjected to Principal Component Analyses (PCA). Outcomes confirmed construct validity and resulted in a Dog-Directed Parenting Style and Dimensions Questionnaire (DD-PSDQ). Dog-directed parenting items grouped into a distinct authoritarian component, with 11 items explaining 16% of the variation, and two authoritative components: 9 items explaining 11% of the variation and 4 items explaining 8%. The first authoritative component reflected awareness of the needs and feelings of the dog, the second reflected manners in training a dog how to behave. The newly constructed 20-item DD-PSDQ measures on three parenting styles. An authoritarian-correction orientated style mirrors variation within high demandingness. An authoritative-intrinsic value orientated style captures variation within high responsiveness especially, where an authoritative-training value orientated style captures variations within demandingness and responsiveness. Our findings support the presence of dog-directed parenting styles in dog owners and raises questions about how these parenting styles impact on dog behaviour and quality of life.



# Theatre Session 1- 10h45

## Early feeding and the behavioural development of pigs around weaning

Middelkoop, Anouschka<sup>1</sup>, Choudhury, Raka<sup>2</sup>, Gerrits, Walter J.J.<sup>3</sup>, Kemp, Bas<sup>1</sup>, Kleerebezem, Michiel<sup>2</sup>, Bolhuis, J. Elizabeth<sup>1</sup>

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To date, no information is available on the behavioural development of early-fed (**EF**, i.e. piglets provided with solid feed before weaning) and non-fed piglets (**NF**, i.e. no solid feed before weaning). Therefore we studied the role of early feeding vs. no feeding during lactation on the development of damaging behaviour around weaning. We provided 12 litters (n=143 piglets) with solid feed from 2 days of age and 10 litters (n=113 piglets) were not provided with solid feed during lactation. Piglets were weaned at 4 weeks and studied until 6 weeks of age. From weaning onwards, four unfamiliar piglets from the same treatment were housed together and received a weaner diet (n=64 piglets/treatment). Live home pen observations (4.5-min. scan sampling) were performed pre- and post-weaning on a weekly basis to study explorative, social and damaging behaviours. Moreover, damage scores on ears and tails and skin lesions were determined -1d, 5h, 24h, 48h, 5 and 14 days post-weaning. Data were analysed using repeated mixed models. NF piglets showed more sow-directed behaviour such as nosing + manipulating the sow at d22 (2.8% vs. 1.7%;  $P=0.04$ ) and massaging the udder + suckling at d16 (17.2% vs. 12.7%;  $P=0.03$ ) and d27 (16.0% vs. 11.1%;  $P=0.09$ ), but damage scores on sows and the occurrence of belly nosing after weaning did not differ between NF and EF piglets. Post-weaning, NF piglets chewed more on faeces or air compared to EF piglets (1.6% vs. 0.9%;  $P=0.01$ ). In addition, NF piglets tended to nose the pen mates' body more than EF piglets in the second week post-weaning (2.7% vs. 2.2%;  $P=0.08$ ). In conclusion, our results suggest that early feeding during lactation affects the behavioural development of piglets around weaning compared to no feeding, but whether these behavioural changes are beneficial for piglet welfare or not remains unclear.

## Theatre Session 2 – 11h30

### Drinking behaviour and performance of drinking systems in poultry: beak-trimmed versus non-beak-trimmed laying hens

Van der Sluis, Malou<sup>1</sup>, Pieters, Remco P.M.<sup>2</sup>, Muijres, Florian T.<sup>2</sup>, Rodenburg, T. Bas<sup>1,3</sup>

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A ban on beak trimming will come into force in The Netherlands in 2018. Laying hen flocks with untrimmed beaks have been suggested to spill more water from the currently used drinking systems compared to beak-trimmed flocks. Water spilling reduces litter quality, possibly resulting in foot-pad dermatitis and increased ammonia levels, and could hereby negatively affect hen welfare. This study aimed to investigate whether beak-trimmed (BT) and non-beak-trimmed (NBT) hens (*Gallus gallus domesticus*) differ in their drinking behaviour, water intake and water spilling, and whether these variables differ between flexible and classic drinking nipples at different heights. The components of drinking behaviour were studied using high-speed video recordings of twelve BT and twelve NBT hens. Their drinking duration, total water intake and amount of water spilled were measured in trials using drinking reservoirs and water-resistant flooring, allowing water usage measurements. BT chickens were found to drink with their beaks more tilted down compared to NBT chickens (Independent samples T-test,  $N = 19$ ,  $t = -2.488$ ,  $df = 17$ ,  $p = 0.024$ ). Using Linear Mixed Models, the water intake rate was found to be lower for NBT chickens compared to BT chickens ( $df = 35.418$ ,  $F = 7.184$ ,  $p = 0.011$ ), higher for flexible drinking nipples compared to classic nipples ( $df = 35.147$ ,  $F = 16.757$ ,  $p < 0.0005$ ) and higher for higher situated drinking systems ( $df = 35.546$ ,  $F = 11.830$ ,  $p = 0.002$ ). The water spilling rate was found to be higher for NBT chickens than for BT chickens (LMM,  $df = 31.071$ ,  $F = 21.117$ ,  $p < 0.0005$ ) and higher for flexible drinkers compared to classic drinkers (LMM,  $df = 32.448$ ,  $F = 22.682$ ,  $p < 0.0005$ ). To allow sufficient water intake, flexible drinking nipples are advised for NBT chickens, with cups underneath to avoid high spillage levels.

## Theatre Session 2 – 11h45

### Humane methods for killing individual poultry on-farm – a survey

Watteyn, Anneleen<sup>1</sup>, Jacobs, Leonie<sup>1</sup>, Moons, Christel P.H.<sup>2</sup>, Garmyn, An<sup>2</sup>, Ampe, Bart<sup>1</sup> and Tuytens, Frank A.M.<sup>1,2</sup>

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In intensive poultry farming, billions of all kind of birds are reared worldwide and during production a small percentage of these animals are killed due to severe illness or lesions. The European Council Regulation 1099/2009 demands that this on-farm killing is done humanely and that the level of suffering is minimized. The regulation allows cervical dislocation for small poultry (<3 kg), while larger poultry (>3 kg) can be killed by a percussive stroke on the head. Given the huge number of birds involved worldwide, it is important to ascertain whether these two methods are truly the most humane for killing individual poultry. The aims of this research were to document the methods used on Belgian farms to kill individual broiler chickens and turkeys, and to gain insight into the opinion of farmers and veterinarians on what constitutes an appropriate method for on-farm killing of poultry. Poultry veterinarians and farmers were surveyed, either online or in-person, about the methods of killing that are used on commercial farms and about their opinion on alternative methods. The surveys for both parties mainly consisted of identical questions, and consisted of 4 sections. Demographic data and work experience data were collected in Section 1. For producers, a question was added on the number of animal places on their farm. Section 2 probed for details on how birds were identified and selected for killing. In addition, veterinarians were questioned about the frequency of farm visits in which they perform selection. Section 3 included questions about the currently applied and preferred method of killing. More information about died and killed animals in the last production round could be given in Section 4. The results and conclusions of this survey will be presented at the symposium.

## Theatre Session 2 – 12h00

### The relation between the prevalence of claw lesions in Flemish dairy herds and the perception of the farmers

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Claw lesions are an important reason for compromised dairy cow welfare, culling and financial losses. Farmers are not always aware of the prevalence and impact of claw problems on their dairy. This study investigated whether Flemish farmers could estimate the prevalence of claw lesions in their dairy. Therefore, all Flemish dairy farmers were invited to complete an online survey involving the management and housing practices they apply. They were asked to estimate the prevalence of interdigital dermatitis (ID), digital dermatitis (DD), sole haemorrhages (SoH), white line disease (WLD), sole ulcer (SU), interdigital phlegmon (IP), swollen heels (SH) and footrot (FR) among their lactating animals. Forty dairies (17.6% of 227 complete surveys) were selected to be visited to assess claw health on their farm. Selection of farms was based on access to pasture, number of lactating cows, herd production level and estimate of ID and DD. These 40 dairies are representative for all respondents of the survey. Between 13 and 40 animals per farm were examined. Selection was based on parity, lactation stage and milk production corrected for age, calving season and lactation stage. ID was scored according to Berry et al. (Vet. J. 193(3), 2012). Other lesions were scored on a 4-point scale. Mobility, body condition, leg condition, hygiene, claw hook and length were determined. About 31.7 ( $\pm$  14.2)% of the examined animals per farm were clinically lame, but percentages varied between 0 and 66.7%. ID (heel horn erosion), DD and SoH were the most common claw diseases, with respectively 55.0%, 27.9% and 31.8% of the animals affected. Farmers could best estimate the presence of FR, WLD and SU, but underestimated ID, SoH and DD strongly. Thus, farmers could estimate the obviously visible lesions, but had difficulties estimating lesions for which detailed inspection of the claw was necessary.

## Theatre Session 2 – 12h15

### Behaviour of horses during hoof trimming: do they behave more calmly with adhesive tape on the nose?

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The “duct tape twitch” – a piece of adhesive tape stuck on the vertical midline of the horses’ nose – is supposed to calm horses down during hoof trimming. The underlying mechanism is unknown. We tested the effect of this tape on 30 horses, with three farriers. For each horse, trimming of one forefoot and one hindfoot was observed with and without tape on the nose, in a randomized order. Relaxed and tensed behaviours were scored during five minutes per hoof for a total of 20 minutes per horse. In one horse the experiment was terminated due to dangerous behaviours. A mixed linear model was used to examine the relationship between relaxed and tensed behaviour and presence of tape. Besides horse identity, identity of farrier, sex (male - stallion or gelding - and female), judgment of owner about calmness of horse (calm, not calm), type of hoof manipulation (lifting, rasping, cutting, clipping), the model also included other factors possibly explaining part of the variance. Mares were more relaxed ( $p < 0.04$ ), there was more relaxed behaviour during rasping compared to lifting, cutting and clipping ( $p < 0.0001$ ) and the horses showed significantly more relaxed behaviour with tape on the nose ( $p < 0.0001$ ). We saw more tensed behaviour in horses that were judged by the owner as “not calm” ( $p < 0.0001$ ). The horses showed more tensed behaviours during foot lifting and when they had no tape on the nose ( $p < 0.0001$ ). The increase in relaxed behaviours and decrease of tensed behaviours when there was tape on the nose was significant but small ( $p < 0.0001$ ). Horse and farrier identity also affected tensed behaviours. The application of tape slightly calms down horses but its’ application or attempts hereto can in some cases cause dangerous reactions.

## Theatre Session 3 – 13h30 Keynote

### Dog welfare and emotions: The diagnosis and treatment of canine anxiety disorders

Jonckheer-Sheehy, Valerie S.M.<sup>1,2</sup>, Baeken, Chris<sup>3</sup>, Overall, Karen L.<sup>4</sup>, Peremans, Kathelijne<sup>5</sup>

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Behaviour problems in dogs are a major reason why veterinarians are requested by owners to euthanise dogs. Behaviour problems are also among the main reasons that dogs are relinquished. As such, a serious welfare problem becomes apparent. Welfare is further compromised when these animals are also subjected to inaccurate diagnoses, or flawed treatment strategies when correctly diagnosed. Behaviour problems can be a manifestation of undesirable (as far as the owner is concerned) but perfectly normal behaviour. Behaviour problems can also be a result of an animal suffering from pain or metabolic disease. Aside from this, behaviour problems can be due to neurochemical imbalances in the brain such as those that result in true anxiety disorders. Validated diagnostic criteria in dogs are largely lacking. Currently we rely on phenotypic descriptions that are thought to reflect the emotional state of the animal but which are seldom sufficiently discrete to inform diagnoses of neuropathology. Veterinary behaviour specialists rely on measuring behaviour through direct and indirect observation, questionnaires and consultation for patient monitoring, all of which are currently unstandardised. In this presentation we will review the current literature as pertains to diagnosing anxiety disorders in dogs based on symptoms and suggest where diagnostic nuclear imaging techniques can be used to validate true neuropathology. We will review the current literature as pertains to available routine treatment modalities and diagnostic nuclear imaging techniques that can be used to validate these treatment protocols. We will also expound in this presentation on treatment modalities that are currently explored in treatment of refractory human depressive and pathologically anxious patients that are of potential interest for our veterinary patients.

## Theatre Session 3 – 14h00

### Low birth weight impairs discrimination learning ability and causes a moderately negative judgement bias in pigs (*Sus scrofa*)

Ipema, Allyson F.<sup>1,2</sup>, Roelofs, Sanne<sup>1,3</sup>, van der Staay, Franz Josef<sup>1,3</sup>, Nordquist, Rebecca E.<sup>1,3</sup>

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In humans, low birth weight (LBW) has been associated with behavioural problems and reduced cognitive abilities, resulting in a suboptimal quality of life. As LBW in piglets is common and impaired cognitive and emotional abilities could potentially harm pig welfare, the consequences of LBW for pigs must be studied. The current study investigated the effect of LBW on discrimination learning ability and emotional state in piglets by having LBW (<1 kg, n=10) and normal birth weight (NBW, n=10) piglets participate in an active choice judgement bias task. First, all piglets were trained during several weeks to discriminate between two tone cues (200/1000 Hz), one signalling a positive outcome (large food reward) and the other signalling a negative outcome (smaller food reward) in distinct locations. A correct response was scored when a pig approached the appropriate location corresponding with the tone. The percentage of correct responses to negative cues per session was taken as a measure of learning. After training the LBW (n=8) and NBW (n=7) piglets that learned the discrimination between tones were confronted with intermediate, near-positive and near-negative ambiguous cues during four sessions, to which their response was recorded as being optimistic (positive location) or pessimistic (negative location). During testing NBW piglets were continuously heavier than LBW piglets ( $T=-3.82$ ,  $P=0.001$ ). A mixed model ANOVA showed a trend for an effect of birth weight on learning ( $F=3.60$ ,  $P=0.059$ ), with NBW piglets temporarily outperforming LBW piglets. The interaction between cue type and birth weight influenced optimistic choices ( $F=2.59$ ,  $P=0.046$ ), mainly in response to the near-positive cue where LBW piglets responded less optimistic than NBW piglets ( $F=9.64$ ,  $P=0.003$ ). Our findings suggest that LBW negatively impacts discrimination learning ability and judgement bias of piglets, which is likely associated with a negative mood and impaired welfare experienced by LBW pigs in husbandry conditions.

## Theatre Session 3 – 14h15

### Do hens with different feather pecking phenotypes differ in decision making under ambiguity?

Pichová, Katarína<sup>1,2</sup>, de Haan, Tara<sup>2</sup>, de Haas, Elske<sup>2</sup>, Košťál, Lubor<sup>1</sup>, Rodenburg, Bas<sup>2</sup>

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Damaging pecking represents a major welfare problem within the egg industry. Certain management strategies can partially reduce the consequences of damaging pecking but the behaviour remains present. It is possible that the chronic presence of inadequate behaviour may negatively influence the affective states of the hens. To investigate this, hens from two lines selected for high and low rates of feather pecking behaviour were tested in a judgement bias test. The aim was to investigate whether a higher incidence of feather pecking alters the emotional state of hens and their decision making under ambiguity. Twenty laying hens from the high feather pecking line (HFP) and twenty hens from the low feather pecking line (LFP) were trained to discriminate feeders of two different colours. Half the animals from each line were trained to approach the white feeder to obtain a reward (mealworms) and refrain from approaching the black feeder to avoid punishment (water spraying). The other half was trained in an opposite manner. After successful mastering of discrimination between the positive and negative feeder colours, hens were exposed to a feeder with an ambiguous colour (grey) in three consecutive tests. The mean latency to reach the feeder was calculated and analysed using the SAS software. Within ten training sessions 36 out of 40 hens learnt to discriminate positive and negative feeder colours. The learning process was slower in HFP line. While there were no differences between lines in the latency to reach the two known stimuli, the hens from the HFP line approached the ambiguous feeder significantly faster than hens from the LFP line (HFP  $13.59 \pm 0.59$  s, LFP  $16.68 \pm 0.79$  s,  $P < 0.05$ ). This could be caused by the higher locomotor activity and propensity to search stimuli for pecking in birds from the HFP line.



## Theatre Session 3 – 14h30

### Validating judgment bias as an independent measure of emotion in pigs

Roelofs, Sanne<sup>1,2</sup>, Murphy, Eimear<sup>1,2,3</sup>, Ni, Haifang<sup>1,4</sup>, Gieling, Elise<sup>1,2</sup>, Nordquist, Rebecca E.<sup>1,2</sup>, van der Staay, Franz Josef<sup>1,2</sup>

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Judgment bias is a measure of emotional state used for a variety of species, including pigs. It can be assessed in behavioural tasks, where animals have to interpret ambiguous stimuli as predicting either a positive or negative outcome. Animals displaying an expectation of a positive outcome are categorized as optimistic, which is assumed to be the result of a positive emotional state. Although judgment bias tasks assess emotion through cognitive processes such as decision-making, their results should not be influenced by an animal's cognitive abilities. To assess whether judgment bias in pigs is independent of discriminative and spatial cognitive abilities, we analysed data from 3 separate studies (Study 1: N=15; Study 2: N=37; Study 3: N=18). Each study assessed pig optimism in a judgment bias task along with multiple cognitive measures (working memory (WM) and reference memory (RM) in a spatial holeboard task, and number of training sessions required to successfully perform in a discrimination task). Updated Bayesian hypothesis testing was used to provide evidence for the null hypothesis ( $H_0$ ) that pig optimism in the judgment bias task and cognitive measures are not correlated. In this analysis, a model assuming  $H_0$  and alternative hypothesis ( $H_1$ ) are equally likely is updated with data from each separate study. This leads to  $p(H_0|D)$ : the probability of  $H_0$  over  $H_1$ , based on all data combined. Probabilities  $>0.50$  indicate data support  $H_0$ , with probabilities closer to 1 implying stronger evidence for independence of judgment bias and cognition. All found probabilities support the  $H_0$  that optimism in the judgment bias task is independent of different measures of cognition (WM:  $p(H_0|D)=0.962$ ; RM:  $p(H_0|D)=0.962$ ; discrimination learning:  $p(H_0|D)=0.914$ ). These findings suggest that judgment bias in pigs is not confounded by their cognitive abilities, providing further support for the use of judgment bias tasks to assess emotional state in pigs.

## Theatre Session 3 – 14h45

### Proposal presentation: identification of biomarkers of positive and negative emotional states in dairy cattle

Kremer, Louise<sup>1</sup>, Webb, Laura<sup>1</sup>, Van Reenen, Kees<sup>1,2</sup>

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The definition of welfare incorporates the experience of positive emotions and the absence of negative ones. Several methods have already been proposed to study emotional states in cows, but are criticised regarding their subjectivity and practical feasibility. This project therefore aims to 1) identify objective and measurable indicators of emotional states of different valence and 2) provide dairy farmers with a practical tool allowing them to detect an impaired welfare at an early stage. The promising link between emotional states and variation in neuroendocrine and immune substances found in humans led us to focus on the physiological component of an emotional state. The physiological indicators reviewed in the literature as potential biomarker of emotions will be measured in a group of heifers. These heifers will be first housed under conventional dairy farm conditions to obtain the baseline levels of the putative biomarkers. The group will then be split into two groups raised under contrasted conditions, respectively negative and positive. The quality of the human-animal relationship, the social stability of the group, and the barn enrichment will be modified to achieve this contrast. The animals will be exposed to a judgment bias test to ensure the acquisition of emotional states of different valence among the groups. The measurements of these biomarkers will involve non-invasive sampling media, such as milk, to ensure their feasibility under real-farm conditions. The non-invasive measures will be compared to those obtained from blood samples to ensure their validity. Furthermore, the physiological parameters varying among the two groups will then be measured in practice in different herds assumed to be in different emotional states according to the welfare assessment protocol. The biomarkers varying both experimentally and on real farm conditions will therefore be considered as reliable, objective and easily measurable indicators of positive or negative emotional states.

## Theatre Session 4 – 16h00

### Classification of cow behaviours using leg- and neck-mounted accelerometers in dairy barns

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Monitoring changes in behaviours could provide insight into the reproduction status, health, and overall well-being of dairy cows. Traditional methods based on direct observation of the herd, either live or from video recordings, are becoming increasingly labour-intensive and time-consuming as herd size increases. Thus, automatic behaviour recognition systems using accelerometers, in combination with machine learning algorithms become more important to continuously and accurately quantify cow behaviours. The aim of this study was to automatically classify cow behaviours (i.e., lying, standing, and feeding) based on leg- and neck-mounted accelerometers. Lying, standing, and feeding behaviours of 16 different lactating dairy cows were logged for 6 hours with 3D-accelerometers. The sensors were attached to the hind leg and the collar of the cows. Behaviours were simultaneously recorded using visual observation and video recording as reference. Features were extracted from the logged raw data and classification algorithms (K-nearest neighbours, naïve Bayes, and support vector machine) were used to classify the cows' behaviours. The classification models using combined data of the neck- and the leg-mounted accelerometers classified the three behaviours of interest with high precision (80-99%) and sensitivity (87-99%). For the leg-mounted accelerometer, lying behaviour was classified with high precision (99%) and sensitivity (98%). Feeding was classified more accurately by the neck-mounted versus the leg-mounted accelerometer (precision 92% versus 80%; sensitivity 97% versus 88%). Standing was the most difficult behaviour to classify when only one accelerometer was used with a precision and sensitivity of 70% and 65% for leg-mounted accelerometer and 74% and 68% for the neck-mounted accelerometer. These results suggest that the classification of cow behaviours depends on the position where the accelerometer is attached. The collar is preferable for detecting feeding behaviour, the leg for lying behaviour, and a combination of the two position for an accurate classification of the three behaviours.

## Theatre Session 4 – 16h15

### Using sensors to monitor behaviour at the dairy farm

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Sensors can automatically measure various types of behaviour in a dairy herd. They can, therefore, be used to monitor a herd and the computer can detect deviations of normal behavior and give an alert to the farmer. In order to do so, normal baseline values are needed. Since these may vary due to parity and housing conditions, the aim of this study was to investigate the effects of parity and freestall bedding (cow matras vs. deep litter) on daily lying time, locomotion, standing and eating time from 42d ante-partum – 28d post-partum. Sixteen Dutch dairy farms (3158 cows) were used in this study and the number of steps per day, time of standing and lying (in sec/2 h period) and time eating (in sec/2 h) were collected by means of Nedap smart tags (Groenlo, the Netherlands). Furthermore, in the first two weeks post-partum, blood samples were collected to measure Beta Hydroxy Butyrate levels. T-tests and time-series were used for comparison. The results of locomotion revealed that primiparous cows made 833 (SD 132;  $P < 0.001$ ) more steps on a daily basis in comparison with multiparous cows. Animals housed on cow mattresses made on average 621 (SD 30;  $P < 0.001$ ) more steps per day vs animals in stalls with deep litter bedding. Primiparous cows spent on average 64 minutes (SD 4.8;  $P < 0.001$ ) less time lying down per day and animals on farms with cow mattresses lie around 30 (SD 17.3;  $P < 0.001$ ) minutes less per day compared with animals housed on farms with deep litter bedding. The number of lying bouts increased from 6 to 9 per day, 1 day before calving and decreased to 7 bouts per day after calving. Daily lying time decreased before calving. And the average lying time increases again in the first week post-partum. Cows that had a subclinical ketosis post-partum were eating half an hour less during the dry period. Already 42 days before calving this difference could be observed. It became clear that, with sensors, differences in behaviour during the dry period can be detected that could lead to managerial interventions to reduce the risk for diseases post-partum. This study is ongoing and more data will be obtained.

## Theatre Session 4 – 16h30

### PhenoLab: automatic recording of location, activity and proximity in group-housed laying hens

Rodenburg, T. Bas<sup>1,2</sup>, van der Eijk, Jerine A.J.<sup>1,2</sup>, Pichová, Katarina<sup>1,3</sup>, van Mil, Bram<sup>4</sup>, de Haas, Elske N.<sup>1,2</sup>

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With the transition to larger group housing systems in farm animals, it is becoming increasingly important to be able to record the performance of individual animals housed in groups. With traditional methods, such as live and video observations, this is difficult and time consuming. Recent developments in sensor technology offer new possibilities for automatic tracking of the behaviour of individuals. The aim of the PhenoLab project is to develop methods for automatic recording of location, activity and proximity in group-housed laying hens. Laying hens from three feather pecking selection lines (high and low feather pecking (n = 45 and 41) and an unselected control line (n = 45)) were tracked using two different tracking systems: video-tracking using EthoVision and ultra-wideband tracking using TrackLab (tracking individual tags placed on the bird in a backpack). Birds were tracked in three different situations: in an individual novel environment test, in a group novel environment test and in a preference test offering four different functional areas (perches, feed/water, litter and feathers). For the individual novel environment, video tracking and ultra-wideband tracking yielded similar results ( $R^2=0.74$ ). For the group tests, ultra-wideband tracking seems the better option, as this method is better able to track multiple individuals simultaneously. Previously found line differences in activity were confirmed by the ultra-wideband tracking system. Furthermore, the system provides valuable information on the behaviour of specific individuals within a group, allowing us to investigate differences in activity patterns between feather peckers, victims and neutral individuals.

## Poster presentation

### From theory to therapy room: a dog's point of view

de Cartier, Aymeline<sup>1</sup>, Moeyersons, Sam<sup>1</sup>, Vervaecke, Hilde<sup>1</sup>, Sannen, Adinda<sup>1</sup>

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Animal Assisted Therapy is a growing sector in human health care. Using animals as co-therapist urges for advice to guarantee the welfare of the animals involved. The goal of this study was to develop guidelines for creating a dog-friendly therapy room, keeping also human needs in mind. To this end, we combined a literature review of 300 papers on dogs' senses, physiological and behavioural needs with advisory groups of experts on these subjects and in-depth interviews with five AAT-therapists. Main topics in our guidelines include: (1) A dog's most important sensory input is smell. Avoid using cleaning products with strong odors or wearing strong perfume. Note that lavender and chamomile have a calming effect on dogs and humans, as does soft easy listening music. (2) Dogs' eyes can distinguish 70 to 80 frames per second. Light fluctuations in older fluorescent and LED lights have a stroboscopic effect on dogs' eyes. This probably is a continuous nuisance to dogs since in humans it causes headaches. Use high frequency light sources instead (at least 100Hz). (3) Avoid slippery floors like e.g. textured laminate floors, which are also easy to clean. (4) Ideal room temperature for both humans and dogs is between 18°C and 22°C, depending on humidity, degree of activity and for dogs also the breed. Above 25°C, avoid active sessions since this increases the risk for heat stroke in dogs. Provide drinking water ad lib. (5) An outside area with various natural elements (grass, trees, ...) creates extra room for therapeutic exercises, and stimulates natural behaviour in dogs. These guidelines focus on general aspects of dogs' needs. Each dog has its own preferences so observe the behaviour to notice signals of discomfort. Furthermore, also the quality of the relationship among therapist, dog and client highly affects the wellbeing of all parties.

## Poster presentation

### Behaviour of weaner pigs during ear biting as possible indicators for automatic detection

Carpentier, Lenn<sup>1</sup>, Diana, Alessia<sup>1,2,3</sup>, Boyle, Laura<sup>3</sup>, Norton, Tomas<sup>1</sup>, and Berckmans, Daniel<sup>1</sup>

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Reports indicate that ear biting (EB) is an increasing issue on commercial pig farms. This damaging behaviour and resulting lesions are, however, hardly studied making it difficult to address this welfare issue. Usually monitoring is done by on-farm assessment using direct observation, which is labour intensive and possibly prone to errors. Automatically monitoring the animals in real-time could overcome those difficulties. A first step in developing such an automatic tool is defining behaviours specific to the damaging behaviour. The objective of this study was to specify behaviours from the bitten and biter when EB occurs. Videos were taken on a commercial Irish farm. Six pens of 35 pigs were monitored during the weaner stage and 13.2 hours of image and sound data were labelled for biter and bitten pigs. In total seven different behaviours of the biter pig were observed: quick biting (19.4%: short duration bites directed towards penmate's ears), shaking head (1.5%: lateral movement of the head with penmate's ear in mouth), pulling the ear (13.7%: taking hold of penmate's ear in the mouth and moving it towards itself), chewing (30.3%: prolonged mastication of the penmate's ear), attempt ear biting (13.1%: unsuccessful attempt to bite ear), and gentle manipulation (18.2%: soft chewing of the penmate's ear). These behaviours were often followed by a reaction of the bitten pig: biting (6.3%), moving away (24.8%), moving head away (35.5), and knocking the biter with the head (33%). In 86.7% of the cases the bitten pig also responded vocally. The specific vocalisations could be labelled as scream, acute, or grunt in 55% of the cases. In the other cases it was unclear which vocalisation was made. Looking at the results both sound (vocal response) and image (specific behaviour) could possibly be used in a tool for automatic detection of EB.

# Attendees

## **Adinda Sannen**

Adinda Sannen is researcher at Odisee University College (Belgium). Recent project topics range from reptile welfare to animal assisted interactions in healthcare facilities and in schools. She is trained as biologist and her PhD studied the relation between hormones and behaviour in bonobos. She lectures ethology and zoology, and coordinates the postgraduate course in Applied Animal Behaviour. [adinda.sannen@odisee.be](mailto:adinda.sannen@odisee.be)

## **Akke ten Berge**

Akke ten Berge is a master student animal sciences at Wageningen University in the Netherlands. During her studies she focussed on Animal Production Systems, with special interest in animal welfare and behaviour. She researched risk factors for dairy cattle in her Bsc thesis and the relation between aggressive behaviour and feed efficiency in beef steers in her Msc thesis. [akke.tenberge@wur.nl](mailto:akke.tenberge@wur.nl)

## **Allyson Ipema**

Allyson Ipema is a MSc Biology student, specializing in Animal Adaptation and Behavioural Biology, at Wageningen University. She is currently doing her internship at the University of Utrecht, where she studies the effect of low birth weight on welfare in pigs. Previously, she did her thesis on parenting styles of dog owners and their effect on dog behaviour. [allysonfiona@hotmail.com](mailto:allysonfiona@hotmail.com)

## **Anne van Seters**

My name is Anne van Seters and I'm currently a student at the University of Utrecht, where I'll study Behavioural Ecology. I came in contact with ISAE, because of my graduation project at the HAS University that was focused on poultry. [annevseters@hotmail.com](mailto:annevseters@hotmail.com)

## **Anneleen Watteyn**

Anneleen Watteyn is a postdoctoral researcher at the Institute for Agricultural, Fisheries and Food Research (ILVO) in Belgium, studying humane methods for killing individual poultry on-farm. Previously, she researched the efficacy of antimicrobials in poultry. [anneleen.watteyn@ilvo.vlaanderen.be](mailto:anneleen.watteyn@ilvo.vlaanderen.be)

## **Anneloes Tukker**

Anneloes Tukker is a final-year BSc Applied Biology student at HAS University of Applied Sciences in the Netherlands. She is specialising in animal sciences and particularly interested in animal welfare and conservation. [anneloestukker@outlook.com](mailto:anneloestukker@outlook.com)

## **Anouschka Middelkoop**

Anouschka Middelkoop is a PhD candidate at Wageningen University & Research in the Netherlands, working on early nutrition and the weaning transition. Her project aims to develop innovative strategies that stimulate early feeding in suckling piglets whilst promoting behavioural development, microbial colonization and concomitant maturation of the gastrointestinal tract and immune system. [anouschka.middelkoop@wur.nl](mailto:anouschka.middelkoop@wur.nl)

## **Aymeline de Cartier**

Working part-time as Child Psychologist (MSc in Clinical Psychology, degree in Victimology, in hypnosis and in Child-centred play therapy) and part-time as researcher (MSc in Animal Behaviour & Animal Welfare) for the project Zorgbeest (Odisee). [aymelinedecartier@gmail.com](mailto:aymelinedecartier@gmail.com)



**Bas Rodenburg**

Bas Rodenburg is Associate Professor in Behavioural Ecology, WUR, specialised in poultry behaviour and welfare. He did his PhD on feather pecking in laying hens and is interested in social behaviour of poultry and how this can be influenced by genetics and environment. Bas is President of ISAE and active in two European COST Actions on animal behaviour (GroupHouseNet and KeelBoneDamage).  
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**Béke Nivelles**

Béke Nivelles is a PhD-student at KU Leuven in Belgium, working on claw health in dairy cows. The emphasis of her PhD-thesis is on the spreading mechanism, prevention and early detection of digital dermatitis. Previously, she studied the prevalence of claw lesions in Flemish dairy herds in relation to management and housing practises. beke.nivelles@kuleuven.be

**Eddie Bokkers**

Eddie Bokkers is an associate professor at the Animal Production Systems group of Wageningen University. His research and teaching focuses on animal welfare and sustainable development of animal production systems. eddie.bokkers@wur.nl

**Elise Gieling**

Elise Gieling is an Animal Scientist and conducted her PhD research at the Veterinary Faculty in Utrecht, the Netherlands. She studied pigs as animal model for low birth weight using cognitive tests. She is currently working at Aeres University of Applied Science Almere (NL) as a lecturer and researcher within the education Biology, Food and Health, focussing on the biology and behaviour of humans. e.gieling@aeres.nl

**Elly Zeilstra**

Elly Zeilstra is a technician at Utrecht University - behaviour and welfare of farm animals. Specific research on stress factors in the brain of mainly chickens and pigs. By means of immunological techniques, a histological picture is obtained of the various regions of the brain. Furthermore research of corticosteroid hormones in feather and hair. e.c.zeilstra@uu.nl

**Els Peeters**

Lector-researcher at Odisee University College, Agro- & Biotechnology (groenmanagement, dierenzorg, agro-industrie, landbouw). Biologist specialised in cats. Currently working at POPCAT-project: model for the management of stray cat populations. els.peeters@odisee.be

**Fabrice Lepot**

I'm Fabrice Lepot, I'm a veterinary since 1999, I've worked 10 years in practice, 4 years in carcass classification, 5 years in pharmaceutical industry and 2 years at University of Liège (genetic, biostatistics, ecology, ethology and animal welfare). Since 6 months, I work for AWE as collaborator in communication to veterinarians practitioner, fight against antimicrobial resistance and animal welfare. flepot@awenet.be

**Frank van Eerdenburg**

Frank van Eerdenburg is a veterinarian who did his PhD about sexual differentiation in the pig hypothalamus. Since 1993 he studies cattle behaviour and how to measure welfare at dairy farms. Currently active in the project sense of sensors in the transition period. f.j.c.m.vaneerdenburg@uu.nl

**Gleb Dobrovolskiy**

Gleb Dobrovolskiy is a graduate student of Behavioural Ecology at Utrecht University in the Netherlands. He is currently undergoing an internship in the department of Veterinary Medicine where he studies the behavioural and neurological outcomes of low birth weight in domestic pigs, with a focus on emotional states and learning. [g.dobrovolskiy@uu.nl](mailto:g.dobrovolskiy@uu.nl)

**Hetty Boleij**

Hetty Boleij is a lecturer at the faculty of Veterinary Medicine of Utrecht University. Her teaching activities mainly involve subjects relating to animal welfare, laboratory animal science and animal behaviour. Her PhD thesis was on emotional perceptions in mice. Next to teaching she is currently working on a project investigating infrared thermography as possible tool to measure stress in mice. [h.boleij@uu.nl](mailto:h.boleij@uu.nl)

**Hilde Vervaecke**

Hilde Vervaecke is researcher and teacher at Odisee University College. She has worked on competition in primates and ungulates; now she works on applied animal welfare and behaviour in different species and is member of policy advisory groups on animal welfare. [hilde.vervaecke@odisee.be](mailto:hilde.vervaecke@odisee.be)

**Ine Kempen**

I'm Ine Kempen and I work at an applied poultry research center, the EPC in Belgium. We have our own research facilities for 30.000 laying hens and 42.000 broilers. For the moment, we're focusing on managing hens with untrimmed beaks and the effects of homehatching on performance and animal welfare in broilers. [ine.kempen@provincieantwerpen.be](mailto:ine.kempen@provincieantwerpen.be)

**Ineke van Herwijnen**

Ineke van Herwijnen is post-doc researcher at the Behavioural Ecology Group of Wageningen University, studying dog-directed parenting styles and their influence on canine quality of life. She is also director at the Royal Association for the Protection of Dogs, where the animal-human bond is at the heart of dog welfare work. [ineke.vanherwijnen@wur.nl](mailto:ineke.vanherwijnen@wur.nl)

**Iris Boumans**

Iris Boumans is a post-doc researcher at the Animal Production Systems group from Wageningen University in the Netherlands. Her PhD thesis was about understanding motivations, behaviour, welfare and productivity of pigs by using computer simulations, with a special focus on tail biting and feeding behaviour. Currently, she writes a postdoc proposal and is involved in education. [iris.boumans@wur.nl](mailto:iris.boumans@wur.nl)

**Jerine van der Eijk**

Jerine van der Eijk is a PhD candidate at the behavioural ecology group and adaptation physiology group of Wageningen University. Her PhD project focusses on the effects of the early life gut microbiota on the development of feather pecking in laying hens. [jerine.vandereijk@wur.nl](mailto:jerine.vandereijk@wur.nl)

**Md. Kamrul Hasan**

I am Md Kamrul Hasan, MSc student of Animal Sciences at Wageningen University and Research, the Netherlands. Now I am doing my research on 'development of feather pecking behaviour in high and low feather pecking line of laying hens.' [md.hasan@wur.nl](mailto:md.hasan@wur.nl)

**Katarína Pichová**

Katarína Pichová is a post-doc researcher at the Slovak Academy of Sciences. At present, she is involved in research focused on feather pecking as a damaging behaviour in laying hens at Wageningen University in the Netherlands where she applies her previous experiences in field of poultry cognition and affective states. [katarina.pichova@savba.sk](mailto:katarina.pichova@savba.sk)

**Lara van Veen**

Lara is a master student of Animal Sciences at Wageningen University, specialized in animal behaviour, welfare and adaptation physiology. Her bachelor thesis was about the relation between the immune system and the development and performance of maladaptive behaviour in laying hens. She will assist in a research project about the effect of environmental enrichment on (auto)antibodies in pigs. [lara.vanveen@wur.nl](mailto:lara.vanveen@wur.nl)

**Laura Webb**

Laura is currently working as postdoctoral researcher at the Animal Production Systems group, Wageningen University, the Netherlands. Her current research interests include positive and negative affective states, including methods to assess them, abnormal behaviours, mother-young bonds, and resilience, all this mostly in cattle. [laura.webb@wur.nl](mailto:laura.webb@wur.nl)

**Lenn Carpentier**

Lenn Carpentier is a PhD candidate at KU Leuven, his research interest are in audio analyses and signal processing of biosystems. The focus of Lenn's current work is in sound analyses of broiler chickens, pigs and calves with the goal to develop health and welfare monitoring tools. [lenn.carpentier@kuleuven.be](mailto:lenn.carpentier@kuleuven.be)

**Lenny van Erp**

Lenny van Erp works at HAS University of Applied Science at the Department of Applied Biology. She is senior lecturer in animal welfare and behaviour and professor (UAS) in Precision Livestock Farming. Her main focus is on farm animals, data and technology. [el@has.nl](mailto:el@has.nl)

**Linsey van de Reep**

Linsey van de Reep is a junior teacher at the Department of Farm Animal Health of Utrecht University in the Netherlands. She is involved in Bachelor and Master education of Veterinary Medicine students. [l.vandereep@uu.nl](mailto:l.vandereep@uu.nl)

**Lisanne Stadig**

Lisanne is a PhD student at the Flanders Research Institute for Agriculture, Fisheries and Food and Ghent University. She completed a BSc in Veterinary Medicine at Utrecht University, and an MSc in Animal Sciences at Wageningen University. In her PhD, she focuses on the welfare and behaviour of free-range broiler chickens, studying e.g. shelter type preferences and different rearing strategies to promote free-range use. [lisanne.stadig@ilvo.vlaanderen.be](mailto:lisanne.stadig@ilvo.vlaanderen.be)

**Maike Cox**

Maike Cox is a teacher at Aeres Applied University Almere (the Netherlands), faculty Applied Biology. Teaching subjects like animal behavior and animal welfare. [m.cox@aeres.nl](mailto:m.cox@aeres.nl)

**Malou van der Sluis**

Malou van der Sluis recently completed her master Environmental Biology – Behavioural Ecology at Utrecht University. She studied the differences in drinking behaviour between beak-trimmed and non-beak-trimmed laying hens and the related water spilling levels, at Wageningen University & Research. She previously studied the effect of personality and environmental factors on feather damaging behaviour in Grey parrots at Utrecht University. [malouvandersluis@gmail.com](mailto:malouvandersluis@gmail.com)

**Mandy Beekmans**

Mandy Beekmans is behavioural biologist studying the long-term effects of a novel feeding and foraging enrichment on behaviour and welfare of Grey parrots at the faculty of Veterinary Medicine in Utrecht (PhD). She pursues to gain more experience in behaviour, health and welfare of non-traditional companion animals, especially parrots. Additionally, she is a self-taught artists and freelance illustrator. [m.h.c.beekmans1@uu.nl](mailto:m.h.c.beekmans1@uu.nl)

**Margret Wenker**

Margret Wenker is a PhD candidate at Wageningen University in The Netherlands, working on cow-calf rearing. Her project will focus on positive and negative implications of cow-calf rearing for the health and welfare of the animals on both short and long term. [margret\\_wenker@hotmail.com](mailto:margret_wenker@hotmail.com)

**Marieke Bos**

Marieke Bos, lecturer at Aeres Hogeschool Almere. Studied Behavioural Ecology at Wageningen University and currently teaching the 1<sup>st</sup> year students at Aeres different courses about animal behaviour/ethology. [m.bos@aeres.nl](mailto:m.bos@aeres.nl)

**Mariëlle Roijendijk**

Mariëlle Roijendijk just graduated as a MSc of Animal Science at Wageningen University. She specialises in Animal Behaviour and Health & Applied zoology which means she has an interest in health, welfare and biology. She had two graduation projects, one involving the cognitive bias in dogs and another focussing on the effect of a feed additive on the immune response of pigs challenged with Salmonella. [mroyendijk@hotmail.com](mailto:mroyendijk@hotmail.com)

**Marij Tijssen**

Marij Tijssen is a PhD student at the department of Farm Animal Health at the University of Utrecht, studying the welfare and behaviour of animals based on vital and behavioural parameters measured with non-invasive sensors. Previously, she studied Technical Medicine focussing on the technological developments in human health care. [m.tijssen@uu.nl](mailto:m.tijssen@uu.nl)

**Marije de Haan**

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