The GroupHouseNet COST Action: exploiting European synergy to reduce feather pecking in laying hens

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Abbreviated Title: GroupHouseNet – Synergy to reduce feather pecking

Summary

The COST Action GroupHouseNet focuses on the reduction of damaging behaviour in laying hens and pigs, benefiting from the fact that there are many similarities in causation and solutions for feather pecking and tail biting. The research in the network focuses on three main topics, addressed by the three working groups: 1) Genetics and damaging behaviour, 2) Effects of development

on damaging behaviour, and 3) Relationships between health and damaging behaviour. For the work on genetics, we focus on developing new techniques to measure relevant phenotypes (e.g. sensor technology) and investigate methods to link these sensor data to genomic data. Regarding development, the network will review the effects of parental conditions on offspring behaviour. Further, the role of incubation conditions (light, noise, temperature) and early-life environment in the development of damaging behaviour will be explored. On the relationship between health and damaging behaviour, interesting associations are found between immune responses and development of damaging behaviour, that merit further research. Here we will also focus on the complex interplay between the immune system, the HPA-axis, microbiota, gut and brain. Taken together, the network aims to provide new knowledge that can be applied to further develop production systems where laying hens with intact beaks can be optimally managed and damaging behaviour can be controlled.

Key words: feather pecking, genetics, prenatal effects, health, damaging behaviour, sensor technology

Introduction

The GroupHouseNet COST Action aims to exploit synergy between poultry and pig scientists to prevent damaging behaviour in both pigs and chickens (www.grouphousenet.eu). Feather pecking (FP) in laying hens and tail biting in growing pigs are very similar behaviours that share a common causation (Brunberg et al., 2016). In the COST Action GroupHouseNet, 29 European countries and the USA as international partner country currently collaborate on the topic of reducing damaging behaviour. New countries and new individual scientists are very welcome to join this open network. Activities supported by the COST Action include network meetings, workshops, PhD and post doc courses and international exchange visits. COST does not fund actual research projects, but provides opportunities to link ongoing, national projects in an international framework.

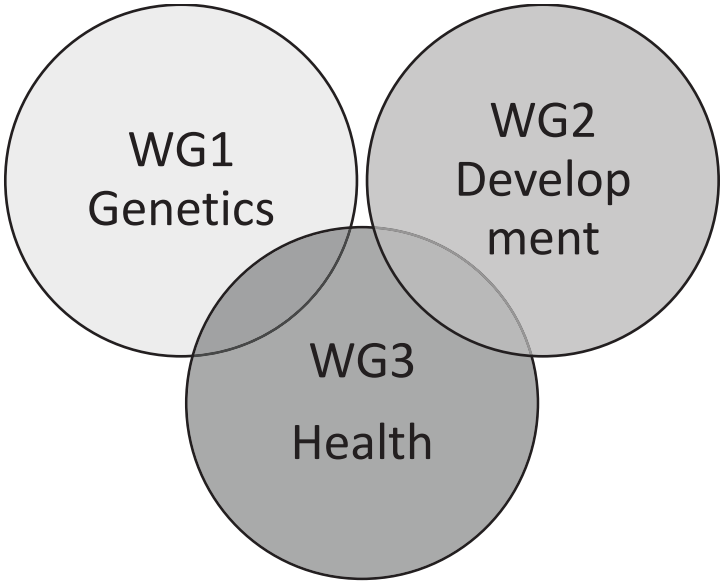

Figure 1. Schematic overview of the three interconnected working groups of GroupHouseNet, aiming to reduce damaging behaviour by investigating 1) the role of genetics and breeding, 2) the role of development and 3) the relationship with health.

GroupHouseNet focuses on three separate topics in its three working groups: 1) Genetics and damaging behaviour, 2) Effects of development on damaging behaviour, and 3) Relationships between health and damaging behaviour (Figure 1). The overall aim of GroupHouseNet is to provide the European livestock industry with innovations in breeding and management for pigs and poultry that are needed for a successful transition to large group housing systems without necessitating painful tail docking and beak trimming. Large group housing is associated with increased risks of damaging behaviours among the animals, such as FP and cannibalism in laying hens in non-cage systems. Recent research suggests the key to reducing the incidence of these behaviours lies in refining and applying methods of genetic selection, and developing husbandry innovations that improve early and later life conditions and that support animal health and resilience.

Breeding for reduced feather pecking

Working Group 1 focuses on genetics of FP and breeding for reduced FP. Activities in this working group are currently focused on the use of smart technology and genomic tools to make the next step in breeding for reduced FP. We hope to do this by learning from recent research projects on novel selection methods to reduce damaging behaviour and mortality in group-housed laying hens (Ellen et al., 2014). Furthermore, the high (HFP) and low (LFP) FP selection lines, originally selected in

Denmark by Kjaer et al. (2001) have been characterised both for behavioural and physiological characteristics (Kjaer, 2009) and for genetic and genomic differences (Bennewitz et al., 2014). However, to be able to make the next step in breeding, an accurate phenotype for giving and receiving FP is needed by commercial breeders. This phenotype could link directly to FP (i.e. automatic recording of FP interactions) or be linked to associated traits such as activity levels or use of space. For this, we will investigate new options for automated phenotyping using smart technology such as ultra-wideband tracking, video tracking or RFID tracking (Rodenburg and Naguib, 2014; Campbell et al., 2016). The first two methods have recently been tested and compared in the PhenoLab project in The Netherlands (de Haas et al., this conference). Furthermore, we will link to research groups active in developing technology for precision livestock farming (PLF) projects, such as KU Leuven in Belgium.

Effects of development on feather pecking

In Working Group 2, the role of the prenatal period on the development of FP is explored. Recent studies indicate that the conditions of the parent stock can affect behaviour of the offspring. This may happen both through hormones transferred from the mother hen to the egg and by epigenetic programming (Janczak et al., 2007; Jensen, 2014; Rodenburg and de Haas, 2016). Recent work in commercial flocks indicates a relationship between performance of the parent stock and FP in the offspring. Parent stock flocks with high levels of feather damage, high fearfulness and high basal corticosterone levels produced offspring that develop severe FP already in the first week of life (de Haas et al., 2014). The effects of age, nutritional status, social environment, housing conditions and potential stressors on behaviour of both parents and offspring will be investigated. A second important topic of this working group is the role of incubation conditions. Commercial chicks are normally hatched in dark and noisy incubators and hatchers. Both light and noise have been found to affect chick behaviour and development (O'Connor et al., 2011). In broilers, Archer and Mench (2014) recently found reduced fear and stress sensitivity in chicks incubated with 12 hours light and 12 hours dark, instead of complete darkness. Preliminary findings indicate that a 16 hours light and 8 hours dark schedule during incubation may also reduce fear in layer chicks (Dayıoglu and Özkan, this conference). As FP has been found to be related to fearfulness (Rodenburg et al., 2004), light during incubation might help to reduce FP. Similarly, reduction of noise levels during incubation may favour early chick development. Novel developments such as in-ovo techniques, early feeding and hatching directly in the rearing house may also hold promise to reduce FP. In addition, the particularities of the early social and physical environment can shape the way animals respond to stimuli and to new environmental conditions that they will encounter later in life. Research on the impact of early life experience may provide new insights into the causation of FP and may be a source of practical strategies for FP control.

Relationship between feather pecking and health

Research in Working Group 3 focuses on the relationship between FP and health. Both in pigs and laying hens, relationships are found between immune challenge and damaging behaviour. It seems that inflammatory immune responses may increase the risk of damaging behaviour developing, possibly through the action of cytokines. To test this hypothesis, relationships between immune activation, the HPA-axis, the gut microbiota and behavioural development will be explored. In laying hens, it was found that challenging young hens with human serum antigen (HuSA) early in life led to much more feather damage later in life compared with hens that received a sham treatment (Parmentier et al., 2009). As this challenge is similar to a routine vaccination, this leads to the question whether the intensive vaccination schedule that we currently subject hens to increases the risk of FP. Also in selection experiments, relationships between FP and immunity have been found: Birds from a HFP line were found to have higher levels of the natural antibody (NAb) IgG (Cheng et al., 2001). Interestingly, divergent selection on NAb levels showed a similar relationship, with the high NAb line showing more feather damage than the low NAb line (Ba et al., this conference). We have only begun to understand the complex relationships between health and damaging behaviour and much work is needed in this area, especially in poultry.

Conclusion

The COST Action GroupHouseNet enables us as European poultry welfare researchers to work together on reducing FP in laying hens. Furthermore, by collaborating with scientists working on tail biting behaviour in pigs, we can also exploit the similarities between these two research fields. On the topic of FP, a lot of basic research has been done focusing on the causes of FP and the motivation to develop FP, for instance om the relationship to foraging behaviour. In tail biting, more research is available on the relationship between damaging behaviour and health. By linking together the two species and utilising the knowledge of scientists from 30 different countries, we expect to come to novel insights that will benefit both species. GroupHouseNet also has the ambition to support the development of welfare-friendly housing systems for non-beak trimmed laying hens and intact pigs that are not subject to significant problems with damaging behaviour.

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