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ANIMAL LIVES WORTH LIVING

edited by:
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Bjarne O. Braastad

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Early life microbiota transplantation affects behaviour and peripheral serotonin in feather pecking selection lines

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Early life environmental factors have a profound impact on an animal's behavioural and physiological development. In animal husbandry, early life factors that interfere with the behavioural and physiological development could lead to the development of damaging behaviours. The gut microbiota could be such a factor as it influences behaviour, such as stress and anxiety, and physiology, such as the serotonergic system. Stress sensitivity, fearfulness and serotonergic system functioning are related to feather pecking (FP), a damaging behaviour in chickens which involves pecking and pulling out feathers of conspecifics. Furthermore, high (HFP) and low FP (LFP) lines differ in gut microbiota composition. Yet, it is unknown whether gut microbiota affects FP or behavioural and physiological characteristics related to FP. Therefore, HFP and LFP chicks orally received 100µL of a control, HFP or LFP microbiota treatment within 6 hrs post hatch and daily until 2 weeks of age (n=96 per group) using a pipette. FP behaviour was observed via direct observations at pen-level between 0-5, 9-10 and 14-15 weeks of age. Birds were further tested in a novel object test at 3 days and 5 weeks of age, a novel environment test at 1 week of age, an open field test at 13 weeks of age and a manual restraint test at 15 weeks of age after which whole blood was collected for serotonin analysis. We analysed treatment effects within lines using mixed models with treatment, batch, sex, observer and test time as fixed factors and pen within treatment as random factor or Kruskal-Wallis tests. Early life microbiota transplantation influenced behavioural responses and peripheral serotonin, but did not affect FP. HFP receiving HFP microbiota tended to approach a novel object sooner and more birds tended to approach than HFP receiving LFP microbiota at 3 days of age ($P<0.1$). HFP receiving HFP microbiota tended to vocalise sooner compared to HFP receiving control ($P<0.1$) in a novel environment. LFP receiving LFP microbiota stepped and vocalised sooner compared to LFP receiving control ($P<0.05$) in an open field. Similarly, LFP receiving LFP microbiota tended to vocalise sooner during manual restraint than LFP receiving control or HFP microbiota ($P<0.1$). LFP receiving HFP microbiota tended to have lower serotonin levels compared to LFP receiving control ($P<0.1$). Thus, early life microbiota transplantation had short-term effects (during treatment) in HFP birds and long-term effects (after treatment) in LFP birds. Previously, HFP birds had more active responses and lower serotonin levels compared to LFP birds. Thus, in this study HFP birds seemed to adopt behavioural characteristics of donor birds, while LFP birds seemed to adopt physiological characteristics (i.e. serotonin level) of donor birds. Interestingly, homologous microbiota transplantation resulted in more active responses, suggesting reduced fearfulness.