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Validation of the automatic assessment of animal welfare in poultry

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Key words
Broiler, *Campylobacter*, optical flow, surveillance, animal welfare

Aim of the study
One promising method of automatically assessing the welfare of poultry that has already achieved initial validation on British commercial farms involves using the patterns of 'optical flow' created by the natural movements of broiler chicken flocks. Optical flow works by detecting the rate of change of image brightness in different parts of a moving image. It can predict key welfare outcomes in broilers days and even weeks in advance and can distinguish which flocks are at risk from subsequently testing positive for *Campylobacter*. The aim was to validate this system for Swiss flocks and to test if optical flow allows accurate assessment of the health and welfare of individual animals as well as the flock.

Material and methods
Two cameras were mounted in each of 5 broiler barns from one company. Digital videos were recorded from population of the barn until depopulation for 45 flocks of the fast growing hybrid Ross 308. Production, health, and welfare parameters were recorded for each flock towards the end of production and from the records of the abattoir. In 20 flocks from 3 of the 5 farms individual behavior tests were conducted in about 16 chicks (age 25 – 28 days) each (N= 319) and their microbiome was analyzed by 16 S rRNA sequencing. During the behavior test chicks were isolated and the speed of social reinstatement was measured. Individual faecal samples were collected. The correlations between optical flow and health and welfare assessments were calculated. In 8 flocks of one farm the distribution of 8 day-old chicks along feeder and drinker lines was quantified and analyzed. The length of feeding and drinking bouts of focal chicks was measured.

Results and significance
Similarly to the British flocks the optical flow patterns showed a clear distinction between flocks with a low and a high prevalence of hockburn. The outcome of the individual behavior tests was associated with *Campylobacter* load, hockburn, and body mass. Chicks with a short duration of social reinstatement had higher *Campylobacter* loads and appeared more stressed. Chicks with hockburn had a longer duration of social reinstatement than chicks without hockburn. The number of chicks around the feeders was positively associated with the degree of hockburn and *Campylobacter* status. Chicks from *Campylobacter* positive flocks had longer feeding bouts than those from negative flocks.
We conclude that individual variation in movement possibly affected by stress levels during a behavior test and differences in feeding patterns were associated with *Campylobacter* and hockburn which could lead to differences in optical flow in *Campylobacter* positive and negative flocks. This is a possible mechanism for the association between optical flow and health and welfare parameters in broiler chicks. Optical flow might be used as an early warning system for health and welfare problems in broiler flocks on Swiss farms.

Publications, posters and presentations
Gebhardt-Henrich, S.G. Vorstellung des ANIHWA Projekts Validation of automated welfare assessment for poultry. Campylobacter-Plattform, 5.11.2015 am BLV.

Gebhardt-Henrich, S.G. Optic flow and disease state in commercial broilers, Vetsuisse Public Health Conference, 30.11.2017 in Bern.
Gebhardt-Henrich, S.G., Rychlik, I., Stratmann, A. 2019. Association between locomotion behavior and Campylobacter load in broilers. P. 281 In: Proceedings 53rd Congress ISAE, Wageningen Academic Publishers.
Rowe, E., Dawkins, M.S., Gebhardt-Henrich, S.G. 2019. A Systematic Review of Precision Livestock Farming in the Poultry Sector: Is Technology Focussed on Improving Bird Welfare? Animals. In press. https://www.mdpi.com/2076-2615/9/9/614.

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