

## Monitoring chicken flock behaviour could help combat leading cause of food poisoning

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Image from Wikipedia

A new technique that monitors the movement of chickens can be used to predict which flocks are at risk of becoming infected with *Campylobacter* - the most common bacterial source of food poisoning in humans in the UK.

Research by scientists at Oxford University has found that by using a camera system to analyse the 'optical flow' of chickens, at-risk <u>flocks</u> can be detected when the birds are only seven to 10 days old - much earlier than is usually possible with conventional on-farm sampling methods.

Despite efforts to improve biosecurity, *Campylobacter* - which can reach humans through raw or undercooked chicken - has so far been



persistently difficult to eliminate from the <u>food chain</u>. This new early warning system has the potential to transform the way *Campylobacter* is controlled, benefiting producers, consumers and the birds themselves.

The study is published in the journal Proceedings of the Royal Society B.

Dr Frances Colles from Oxford University's Department of Zoology, lead author of the study, said: 'Humans consume nearly 60 billion chickens a year - more than any other animal. At the same time, there is a worldwide epidemic of human gastroenteric disease caused by *Campylobacter*. It is estimated that up to four-fifths of this disease originates from contaminated chicken meat.

'Despite intensive efforts to improve on-farm biosecurity practice over the past decade, more than 70% of EU broiler [meat] chicken flocks remained *Campylobacter*-positive at slaughter during 2008, and the incidence of human disease continues unabated. This suggests that environmental contamination of growing broilers may not be the only cause of high rates of *Campylobacter* infection in chickens and that key points for intervention - for example, in breeder flocks, hatcheries, or management in the first week of chick life - remain unrecognised.'

The Oxford team tested the hypothesis that flocks colonised with *Campylobacter* might be distinguishable by their behaviour, following suggestions that infection could have an impact on chickens' welfare.

Professor Marian Dawkins, Professor of Animal Behaviour at Oxford and corresponding author on the paper, said: 'We used a novel and noninvasive way of monitoring the behaviour of chickens throughout their lives that involved analysing the optical flow patterns from cameras inside broiler houses.

'Optical flow works by detecting the patterns formed by changes in



brightness in moving images, both temporally and spatially. It is computationally simple and does not require tagging or marking individual animals, making it ideal for long-term continuous monitoring of large groups of similar animals such as egg-laying hens and broiler chickens, where optical flow is predictive of key welfare measures such as mortality rate.'

To test the hypothesis that optical flow analysis might also be able to detect when flocks become infected with *Campylobacter*, the researchers collected data for 31 commercial broiler flocks. They also collected faecal samples from those same flocks and tested them for the presence of *Campylobacter* at different ages (21 days, 28 days and 35 days) using standard laboratory methods. This gave a direct comparison between optical flow and testing from faecal samples.

*Campylobacter*-positive flocks showed lower mean optical flow (less average movement) and higher kurtosis (less uniform movement) than flocks without the bacteria - as early as the first 10 days of life. Additionally, this link was independent of external temperature.

Professor Dawkins said: 'Our results provide statistical evidence of a link between broiler chicken flock behaviour and *Campylobacter* status. It is not certain whether the changes in optical flow are a direct effect of *Campylobacter*, or whether a general reduction in the birds' overall health predisposes them to *Campylobacter* colonisation at a later date. However, the findings are compatible with the growing evidence that *Campylobacter* may be detrimental to chickens' health, rather than simply being harmless gut bacteria.

'Use of this optical flow information has the potential to make a major impact on the management of commercial chicken flocks, for the benefit of producers, consumers and the birds themselves. Farm managers able to access such information in real time would have early



warning of which of their flocks were most at risk of health and welfare problems, enabling them to intervene before these became serious and helping them to produce higher quality, healthier food with better welfare.'

The researchers are working with Isis Innovation, Oxford University's technology transfer company, to ascertain how to make maximum impact from this technique.

**More information:** Monitoring chicken flock behaviour provides early warning of infection, *Proceedings of the Royal Society B: Biological Sciences*, <u>rspb.royalsocietypublishing.or</u> ... .1098/rspb.2015.2323

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