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Creating a bacteria-free slaughterhouse - thanks to an e-learning course

Researchers may have figured out how to reduce the risk of becoming ill from eating chicken, and the answer is surprisingly simple. After trying without success to eliminate risky bacteria by vaccinating poultry or using viruses to kill bacteria, they have now launched an e-learning programme to prevent bacteria being carried into the slaughterhouse.

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The most frequent cause of bacterial food-borne illness in humans is campylobacter. It causes diarrhoea, cramping, abdominal pain and fever within two to five days of eating contaminated chicken.

Not only is this deeply unpleasant for those affected, it imposes a significant cost on the economy. The estimated 9 million cases of human disease caused by campylobacter in the EU costs around EUR 2.4 billion per year in public health resources and lost productivity – meaning the impact is greater than that of salmonella poisoning.

'There is no easy way to handle campylobacter, which is why the rates are higher than they were 10 years ago,' said Dr Mogens Madsen, chief executive of food safety company Dianova in Denmark.

Although it does not cause health problems for most animals, millions of campylobacter bacteria can infest the intestines of poultry. Once excreted, it swiftly spreads throughout the flock and contaminates meat when it is cut during the slaughter process.

Dr Madsen and partners from seven countries have been working out how to prevent affected chickens arriving at a slaughterhouse, as part of the EU-funded CamCon project.

‘We have studied the kinds of measures that can be introduced at farm level to avoid campylobacter being carried into the chicken house,’ he said.

‘This led us to develop an e-learning course for farmers, farm staff, vets and technical assistants working directly with chickens – it's a kind of best practice manual for anyone who wants to upgrade their biosecurity.’

Strict procedures

The major sources of infection in chicken houses are from farm staff entering the poultry house. Simple but strict procedures – such as handwashing and having separate clothes for the broiler house – can stop bacteria being introduced to a flock and reduces the risk of it being carried from one poultry house to another.

"Farms should also have dedicated equipment for each poultry house to control the infection risk," says Dr Madsen.

Previously the research group tried a number of separate approaches to campylobacter control with mixed results. The first was to deploy bacteriophages – a kind of virus that infects bacteria – to destroy campylobacter.

They succeeded in finding a virus that would kill campylobacter bacteria. But there was a problem. The campylobacter becomes resistant to the virus very quickly and soon the chicken's intestine is taken over by these resistant bacteria. This makes a bad situation worse.

‘It's possible to kill campylobacter with a phage and reduce their number but the effect is very short-lasting,’ said Dr Madsen.

A second effort focused on developing a vaccine against campylobacter. The idea would be to vaccinate a mother hen or her eggs so that the next generation of chickens would have antibodies to protect them from campylobacter.

But while it was possible to produce antibodies against campylobacter, these did not provide sufficient protection against infection.

Antimicrobial resistance

Choosing the best approach to minimise the threat of campylobacter and other microbes in the food chain does not only depend on how effective it is in the short term. Researchers also have to consider the risk of knock-on effects, such as antimicrobial resistance (AMR).

The widespread use of antibiotics can cause the development of new, resistant strains of bacteria which reduce how effectively the drugs can treat disease. It is a growing problem, with more than 25 000 European deaths attributed to antimicrobial resistance each year.

The trouble is that nobody is precisely sure whether the use of antibiotics on sick farm animals is a major piece of the puzzle.

‘At the moment there is a debate about how antimicrobial use in animals contributes to the AMR threat that humans face – but we know it's not zero,’ said Dr Jaap Wagenaar, from Utrecht University, who is the coordinator of an EU-funded project known as EFFORT.

The EFFORT project is looking at antimicrobial use on poultry and pig farms – and in smaller animal production sectors – in nine European countries, and collecting data on biosecurity, animal welfare, vaccination, and the level of resistant bacteria on the farm.

Researchers will take DNA from faecal samples in search of resistant genes and will look to build a large databank for resistance surveillance purposes.

Then, harnessing the power of big data, it will crunch the numbers to find patterns that lead to the best outcomes for animals without exacerbating the problem of AMR.

‘We don't think you can achieve large-scale food production without using antibiotics, but there could be an optimal basic level that is sufficient,’ said Dr Wagenaar.

The project will also look at the degree to which animal products expose humans to AMR by examining resistant bacteria on meat.

One of the outcomes will be a protocol for reducing antimicrobial usage on farms without jeopardising the welfare of their animals or the profitability of agribusinesses.

‘We know it's possible to reduce antibiotic use as we have seen good examples from Denmark and the Netherlands,’ he said. ‘Our research could help us to learn from those who are doing it well.’

Expo Milano

The EFFORT and CamCon projects form part of a presentation by the EU at the Expo Milano 2015 world fair, which runs from 1 May to 31 October and focuses on feeding the planet sustainably.

Among the other EU-funded projects included in the presentation are AIV-VACC, which has contributed to the development of vaccines against avian flu, and FMD-DISCONVAC, which worked on developing vaccines for Foot and Mouth Disease.

For more about the EU pavilion at Expo Milano visit: http://europa.eu/expo2015/

More info

Online course: Campylobacter and Biosecurity

Camcon project

EFFORT project