Feasibility of introducing methods, in the UK, for reducing shedding of E. coli O157 in cattle

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Background

E. coli O157 is a relatively rare but significant gastrointestinal pathogen in the UK. Complications of the infection can lead to renal damage and death. E. coli O157 is shed in the faeces of ruminant animals. It has been implicated in outbreaks of human disease via the cross-contamination of foods and direct contact with the faeces of affected animals.

The public inquiry into the September 2005 outbreak of E. coli O157 in South Wales recommended that the feasibility of identifying 'supershedder' cattle on farms should be explored as a potential means of reducing the likelihood of spreading the pathogen to other cattle.

The routine testing of livestock may not be a cost-effective or practicable means of preventing 'supershedders' entering the slaughterhouse. As a result, measures aimed at reducing shedding in the entire herd, prior to slaughter, could be easier to administer while providing a similar level of control.

Research Approach

The objective of this study was to evaluate the feasibility of introducing currently available methods to reduce E. coli O157 shedding in cattle on UK farms. Measures aimed at doing this may provide pre-slaughter control to reduce human cases of infection arising through food chain contamination of the slaughter process, or contamination of fresh produce. It should additionally offer benefits by reducing risks to humans from environmental exposures, including those arising through direct animal contact at open farms or in the rural environment.

The first part of the study involved a review of published data on the cost, practicality, evidence for adoption and efficacy of various on-farm controls. This information was used to examine the potential of controls to reduce E. coli O157 shedding in cattle on UK farms, to estimate the costs associated with their implementation, and to calculate the possible public health benefits that would result from their uptake across the UK.

Practicality and efficiency are important criteria for the adoption of on-farm controls. However, the major issue with on-farm controls is that cattle do not exhibit signs of infection from E. coli O157. Therefore as there is no production loss, such controls convey no direct benefit to the farmer or producer.

There therefore needed to be an understanding of farmers' intrinsic behaviours that underpin their motivations for adopting improved on-farm controls.

Intrinsic patterns of behaviour are also influenced by the extrinsic demands that may be driven by:

- producers or retailers for market gain
- legislators or the industry seeking to implement or encourage controls for the public good

The second part of the work therefore aimed to identify both the intrinsic and extrinsic factors which impact on the attitudes of farm owners, including open farm managers and food producers, to on-farm control of E. coli O157.

Finally, stakeholder engagement was undertaken to share the intelligence obtained from the above objectives, but also to seek their views on the implementation of controls.

Results

- A literature review on the efficacy of control measures for reducing E. coli O157 shedding in livestock identified a total of 221 relevant scientific publications dating from 1990 to 2011. It was noted that the majority of peer-reviewed work on this subject was dominated by publications from North America.
- From these publications, three control strategies were identified for which there was sufficient quantitative data on their ability to reduce shedding levels and/or the prevalence of infected cattle, to allow models to be developed to undertake cost-benefit analyses. These were:

1. the use of probiotics in feed
2. the vaccination of animals
3. a combined package of eight biosecurity measures

- The results suggested that using vaccines or probiotics to control E. coli O157 could, in some circumstances, payback the costs. However, this outcome is heavily dependent on the preventable human losses, especially the severity of human illnesses, and not just the number of cases prevented.
- The views of UK farmers on adopting measures for controlling E. coli O157 in cattle were also examined. This was done via a telephone survey of 405 cattle farmers and an online survey of 91 farmers who deliberately open their farms to the public. The findings of the survey suggested that increasing all farmers' access to information would help to improve levels of awareness and change attitudes with regard to the adoption of on-farm controls for E. coli O157.
- Both vaccines and probiotics have shown promise in North American studies. However, the findings from the survey of farmers showed that although there is an awareness of the human health risks associated with E. coli O157, and recognition that farmers have a responsibility to address the issue, the benefits are not currently obvious, and there is a reluctance to adopt any control measures that are not known to be efficacious and safe. The authors also highlighted the lack of incentives for farmers to adopt controls; given the fact that E. coli O157 does not cause disease in livestock.
- Further engagement with relevant stakeholder groups indicated that the open-farm sector was interested in exploring the use of vaccines. However, it was concluded that demand for the application of on-farm controls for E. coli O157 by beef and dairy farmers in the UK would likely to be limited in the absence of clear evidence that such measures would be effective in protecting public health.
- The report makes a number of recommendations for future work needed to drive the uptake of on-farm interventions and research to strengthen the evidence base for the efficacy of controls in reducing shedding in UK farming systems and the subsequent benefits to human health. The FSA is planning to publish its requirements for research to address these recommendations later in 2013.

Research report

England, Northern Ireland and Wales

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