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Managing *E. coli* O157 disease risk in the British countryside

A Rural Economy and Land Use project investigating the risk that *E. coli* O157 poses to public health and eliciting the views of scientists and stakeholders on strategies to reduce its occurrence.

Policy and Practice Notes

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E. coli O157 mainly enters the food chain from faecal contamination of meat products, but an increasing number of cases are linked to the environment. The causes of these can include drinking of contaminated water, ingestion of soil contaminated by animal faeces and petting of farm animals. _E. coli_ O157 poses a major risk to human health, particularly to people living in rural areas, and to visitors and tourists to the countryside. _E. coli_ O157 has also been responsible for a number of serious food-borne outbreaks in the UK. Outbreaks drive public awareness, and concerns and reactions to them lead to demands to control this bacterium.

What is *E. coli* O157 and what risks does it pose?

***Escherichia coli* O157 is a pathogen passed to humans from farm animals (especially cattle and sheep) which causes around 1,200 cases of illness reported each year in the UK.**

— Humans need to swallow the germ to fall ill.
— When first isolated in 1982 in England the bacterium was linked with eating beef, and hence was historically considered a food-borne pathogen.
— The two largest food-borne outbreaks of *E. coli* O157 reported in the UK occurred in North Lanarkshire in 1996 and South Wales in 2005. Both of these outbreaks were attributed to cross-contamination arising from poorly managed food-handling practices.
— Since the mid-nineties *E. coli* O157 has been more frequently associated with environmental sources such as farm animal faeces and private water supplies, and there has been growing concern about the increased risk to people living in rural communities.
— *E. coli* O157 has a record of outbreaks and deaths. It causes mild to severe bloody diarrhoea. It can also cause potentially-fatal conditions (Haemolytic Uraemic Syndrome and Thrombotic Thrombocytopaenic Purpura) that affect the blood, kidneys and sometimes the central nervous system.

1. How can the problem of *E. coli* O157 risk be framed?

In order to address the risks of any infectious disease, first the problem must be defined and framed.
For *E. coli* O157:
— Outbreaks have played a major role in how the disease is perceived.
— A small number of stakeholders have direct experience of the disease, but their experience is often very distressing.
— Developing a better understanding of the disease will require the knowledge of stakeholders as well as scientists, and an evaluation of the financial and social costs it entails.

In order to manage the risk, we have to understand:
— How and when stakeholder groups perceive the risk as acceptable.
— Which strategies will be effective and acceptable to reduce the risk.

Those affected by the risk must be consulted and this process must take into account the context including:
— Stakeholder knowledge and values.
— Geographical location.
— Economic imperatives.
— Impact of any policy measures on stakeholders.

A framework for risk governance (modified from IRGC, 2008)

2. What do people think about the risk of *E. coli* O157?

The people involved may have different concerns and fears:

— *E. coli* O157 is seen as a problem at national level, because of high profile outbreaks.
— Those without direct experience regard it as a serious but minority problem.
— Individuals such as farmers may underestimate the likelihood of infection because of their relative immunity.

Their awareness of risk also varies:

— Among rural residents, farmers, visitors and abattoir workers in the two study areas (Grampian and North Wales), visitors were the least aware of *E. coli* O157.
— Visitors viewed *E. coli* O157 as a food hazard, not an environmental hazard.
— Knowledge of symptoms was remarkably poor and respondents were more likely to think, incorrectly, that vomiting was more common than bloody diarrhoea.
— People in areas of highest risk claim greatest knowledge of *E. coli* O157.

They disagree about who should take responsibility for managing risk:

— People believed others should do more to reduce the risk of infection.
— For example, in the food chain, farmers thought that abattoirs should do more to prevent outbreaks; abattoir owners said that farmers should do more and butchers claimed that meat inspectors could be more effective.

Some groups are at greater risk than others:

— Young children have immature immune systems and are the group at greatest risk, particularly those living in rural areas.
— People living in Grampian are four times more likely to fall ill compared with residents of North Wales. The cause of this difference is unknown, but it could be that cattle and sheep in this part of Scotland are more likely to carry the bug.
— Visitors to rural areas, including petting farms, are also at higher risk because they lack knowledge of the disease and how to reduce the risk.
— The risk can be amplified because the pathogen survives in soil for months and can reactivate to infect animals and humans and can contaminate stiles and fence posts.
— Farmers in England and Wales can have prolonged exposure to *E. coli* O157 in the farming environment, indicating that the build-up of some immunity is important. It is likely that this is also the case in Scotland.

3. How can *E. coli* O157 risk be characterised?

The number of cases in the UK each year is fairly small, but acceptability of the risk by the general population is likely to be low because:

— It is most common in young children.
— The symptoms can be severe.
— Food scares and petting farm outbreaks sensitise the public to the risk.

4. How can *E. coli* O157 risk be managed?

Individuals can reduce their risk of infection by:

— Ensuring foods made from minced beef such as burgers and meatballs are cooked properly.
— Taking steps to prevent cross-contamination between raw foods and ready-to-eat foods. This includes using separate utensils and chopping boards, or making sure they are cleaned thoroughly between uses.
— Washing hands thoroughly after handling raw meat and soiled vegetables.
— Not camping on fields recently grazed by cattle or sheep.
— Washing hands with soap and water after contact with farm animals.

Farmers and land managers could reduce risk by:

— Removing animals that produce high numbers of *E. coli* O157 from the food chain.
— Keeping animals off pasture before its use for camping.
— Excluding livestock from the vicinity of springs/streams used for private water supplies and treating private water supplies in areas of high cattle/sheep density.

What are the implications for policy and practice?

Measures that combined the highest practicality with the highest effectiveness scored by scientists and farmers were:

— Washing hands with soap and water, particularly after touching farm animals and before eating food.
— Cattle vaccination.
— Removing farm animals from the proximity of private water supplies.

For policymakers there are also areas to be addressed:

— Public health authorities, the Food Standards Agency and local government need to put out clear messages to stakeholders (open farms, owners of private water supplies etc) about the importance of hand washing after contact with farm animals, ensuring meat products are cooked properly, providing information to parents of young children, e.g. by articles in magazines, through schools and play/toddler groups, and explaining the consequences of long term survival of *E. coli* O157 in the environment.
— Organisations such as the NFU can help to inform farmers who may underestimate the risk of disease to visitors and children.
— Additional measures where further investigation and research is required include removing high-shedding *E. coli* O157 animals from the food chain, vaccinating cattle and carcass-cleaning.

For effective implementation, the following should be considered:

— Since the financial costs of the disease (in excess of £7.2 million) are lower than the costs of effective intervention there is little incentive for organisations or enterprises to intervene, making it more imperative for government to take a lead.
— In order to be effective these measures need to be applied simultaneously by all the relevant government agencies and stakeholders have to be fully involved.

Further information

The research was carried out at the universities of Aberdeen, Bangor and Manchester, the London School of Hygiene and Tropical Medicine, RIVM (the Netherlands) and the Animal Health and Veterinary Laboratories Agency.

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Project Website: www.abdn.ac.uk/reluecoliproject

Useful resources:

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Useful websites:

Health Protection Scotland
http://www.hps.scot.nhs.uk/giz/e.coli0157.aspx?subjectid=18

Health Protection Agency *E. coli* O157 Independent Investigation Report June 2010 www.griffininvestigation.org.uk/

International Risk Governance Council http://www.irgc.org/

UK *E. coli* support group (HUSH) www.ecoli-uk.com/home.php

Welsh Assembly Government *E. coli* Public Inquiry
http://wales.gov.uk/ecoliinquiry/?lang=en

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