

## Full details

All details held on the selected case study are shown below.

Went live on	Title	Reference
15 Jul 2010	Nematodes (eelworms) as novel vectors and reservoirs of human pathogens in the environment	SID0286

### Synopsis

Study provides the first direct evidence that nematodes can transmit harmful bacteria, and cause infection in vertebrates. The findings have far-reaching implications for animal husbandry and public health.

### Description

Over recent decades there has been a marked increase in reports of human sickness caused by food-borne pathogens. These have generally been attributed to food management practices including large-scale farming and production techniques and the increased consumption of uncooked vegetables.

However, a report produced in the United States by The Centers for Disease Control and Prevention pointed out that such explanations are insufficient. There appears to be other - unknown - factors involved in the emergence of food-borne diseases.

One possible factor, says microbiologist Professor Vyv Salisbury, is the presence of an environmental refuge in which bacterial pathogens may show increased survival and which may facilitate subsequent infection. With colleagues at the University of the West of England, the University of Bristol and Penn State University in the US she has postulated that one such refuge could be provided by free-living helminths (eelworms). They not only provide a suitable vector for transport to the vertebrate host, but they also provide protection against environmental hazards and primary host defences.

Because nematodes can be present on grass eaten by ruminants and salad vegetable crops for human consumption, their potential to carry live bacterial pathogens and to give protection from harsh environmental conditions such as chlorine washes and UV light is likely to affect the persistence of infectious bacteria in the environment.

The NERC-funded project investigated whether particular bacterial pathogens of humans - in this case, Salmonella - can survive better inside nematode worms than free in the environment. It also asked if accidental ingestion of the nematodes can subsequently cause disease in humans and livestock.

"We used genetically modified bacteria that were self bioluminescent and gave out light as long as they were alive. This allowed us to directly monitor the bacteria inside worms and show that they were able to survive harsh environmental conditions and cause disease," says Professor Salisbury.

The team compared the survival of Salmonella bacteria that had been ingested by the helminth *Caenorhabditis elegans* with that of the bacteria alone. Using lux gene technology to record the growth of Salmonella, they found that when inside *C. elegans*, more of the bacteria survived at pH 2 and 3, in the presence of chlorine and when exposed to UV irradiation, providing an environmental refuge or reservoir for the bacteria.

On inoculating laboratory mice with *C. elegans* that had been fed on bioluminescent Salmonella, real-time imaging showed that the animals developed a systemic bacterial infection. This indicated that free-living helminths could play a role as a vector of pathogens.

"The results from our project are set to help inform guidance for the decontamination of pasture land and salad vegetable crops to limit future food-borne pathogen threats," says Professor Salisbury.

The research was supported by NERC's Environment and Human Health programme.

### References and links

#### Hyperlinks

1. [Bristol UWE - News - Do worms transmit disease causing bacteria to humans?](#)
2. [Environmental Health Journal - Bacteria isolated from parasitic nematodes - a potential novel vector of pathogens?](#)

### Impacts

#### Impact evidence

The results from this project are set to help inform guidance for the decontamination of pasture land and salad vegetable crops to limit future food-borne pathogen threats.

<b>Research and funding</b>	
<b>Funding type</b>	Research Programme
<b>Date of research</b>	August 2007 - January 2009
<b>Researchers at Universities</b>	
<b>Grant reference</b>	NE/E009085/1
<b>Investigator</b>	Professor VC Salisbury University of the West of England, Faculty of Health and Life Sciences
<b>Classification</b>	
<b>Science themes</b>	Environment, pollution and human health
<b>Science areas</b>	Terrestrial
<b>Policy areas</b>	Agriculture, food and fisheries, Land use, Pollution, Waste, Health
<b>Keywords</b>	Environment, Health, Nematodes, Vectors