

PUBLIC INFORMATION ADVICE STATEMENT:
**FOOD STANDARDS SCOTLAND'S ADVICE ON MEASURES REQUIRED TO PROTECT CONSUMERS FROM
INFECTION WITH SHIGA TOXIN PRODUCING *E. COLI* (STEC)**

This advice statement is issued to ensure that consumers are made aware of the scientific evidence relating to the risks associated with Shiga toxin producing *Escherichia coli* (STEC), and can have confidence in the measures that are taken by food authorities to protect the public from food safety risks. It is also intended to provide food businesses with an accurate and up to date account of scientific opinion in this area, and the action that is required when STEC is detected in their products. In drafting this statement, FSS has consulted with the following UK public health stakeholders who are in agreement with it: Food Standards Agency, Health Protection Scotland, Public Health England, The Moredun Research Institute, Royal Environmental Health Institute of Scotland, Chartered Institute for Environmental Health, the Scottish *E. coli* O157/STEC Reference Laboratory, Association of Public Analysts Scotland, the Directors of Public Health in Scotland, the Faculty of Public Health UK and the Chief Medical Officer, Scotland.

STEC is defined as an *E. coli* bacterial cell which contains a Shiga toxin producing gene (also known as *stx*). FSS's position is that ready to eat foods should not contain STEC. This is on the basis of current, expert scientific consensus that the presence of STEC in food which will not be cooked prior to consumption has the potential to cause human illness.

When FSS is made aware that STEC has been identified in a food, it considers that a risk assessment should be carried out in accordance with Article 6 (2) of Regulation (EC) No. 178/2002. That risk assessment should take account of all relevant information relating to the food and the food business which has produced it, including evidence gathered through investigations by the relevant enforcement officials and public health experts which could indicate a potential food safety risk.

Laboratory testing provides a means by which food businesses and enforcement authorities can check that the measures taken to produce food safely are capable of controlling STEC contamination. If STEC is grown from a food sample, a method known as whole genome sequencing (WGS) can then be used to produce a genetic fingerprint of the bacterium, and this allows the STEC found in the food to be compared with STEC that have been found elsewhere, e.g. in people who have become unwell, in animals, the environment or in other foods. The WGS method of testing is recognised internationally and has helped to improve our understanding of the main sources of STEC, and how it can infect humans.

Currently, FSS considers that the presence of **any** STEC in a ready to eat food should be regarded as a potential risk to human health, and this position concurs with the most recent expert scientific opinion. The following statement was published in 2018 by the Food and Agriculture Organisation of the United Nations and World Health Organisation¹:

'It is, therefore, not prudent to regard any STEC strain as being non-pathogenic or not posing a health risk, as all STEC strains probably have the potential to cause diarrhoea and to have the potential to cause diarrhoea and be of risk, especially to susceptible individuals.'

This opinion is also shared by the UK Advisory Committee on the Microbiological Safety of Food² because, whilst other genes in addition to *stx* have been linked to serious infection, it is not possible to guarantee that a STEC lacking these other genes will not cause illness.

Therefore, FSS recognises the need for a precautionary risk management approach to the detection of STEC in a ready to eat food, which is in line with the policies of many other countries.

E. coli O157 is the strain of STEC most commonly associated with human infection and serious health complications. However, other strains of STEC (non- O157 STEC) have also been shown to cause infection, and on occasion, serious illness. In Scotland, up to 30% of STEC cases reported each

¹ <http://www.fao.org/3/ca0032en/CA0032EN.pdf>

² https://acmsf.food.gov.uk/sites/default/files/acm_min_93_october.pdf

year have been proven to be infected with non-O157 STEC strains. Furthermore, around a third of these strains lack the other genes that some reports have said are necessary to cause infection. In light of this evidence, we consider it to be appropriate to regard the presence of **any** STEC in a ready to eat food as a potential risk to health, regardless of its strain or genetic fingerprint.

For the reasons outlined above, FSS advise that appropriate action is taken to prevent the sale of ready to eat foods that are found to be contaminated with any STEC. Food business operators have a legal obligation (under Article 19 of Regulation (EC) 178/2002) to inform the relevant enforcement authorities if they consider or have reason to believe that a food which they have placed on the market may be injurious to human health.

This advice is based on current expert opinion and will remain the case until the scientific evidence provides greater certainty about the risks associated with STEC in food. FSS will keep this advice under review in light of emerging scientific evidence and expert opinion, and will inform businesses and consumers of any changes.

It should be noted that the protection of the public from risks to health is a priority for FSS, and it will continue to apply the highest levels of protection based on the most robust scientific evidence that is available.

Background information on STEC

- STEC are a group of *E. coli* which carry a toxin-producing genes called *stx*. They live in the intestines of ruminants including cattle and sheep without causing any illness in the animal but have the potential to cause serious illness and death in humans. The most common type of STEC infection in Scotland is *E. coli* O157, however this is not the only STEC that has been associated with human illness. Up to 30% of STEC isolated from patients in Scotland are non-O157 strains.
- STEC can be excreted (shed) from animals at very high levels which can lead to the contamination of the environment. Humans can become exposed via direct exposure to the animal or its faeces, through contaminated water supplies or foods derived from ruminants such as raw meat or milk or from direct contact with a contaminated person. STEC infection typically causes abdominal pain and diarrhoea which is often bloody. Some people may go on to develop very serious complications such as haemolytic uraemic syndrome (a cause of kidney failure), and in a small number of cases infection may prove fatal. Only a very small number of bacterial cells (in some cases only 10-100 cells) need to be ingested to cause serious illness. The impact of STEC infection can be variable, but it is particularly dangerous for vulnerable groups, especially children under 5 years of age and the elderly.
- The ability of STEC to cause illness is complex, involves a number of factors and is still not fully understood. Key factors include the type of *stx* gene that is present and whether the STEC contains additional genes that assist in the attachment of the bacterium to the wall of the human gut. It has been contended that these attachment genes are always required to cause illness. However, there is evidence from Scotland and worldwide that a wide range of STECs with different genetic characteristics have been implicated in human illness, including some STEC that do not carry some of the more commonly known attachment genes. A recent study has shown that 35% of non-O157 STEC isolated from patients in Scotland did not contain the gene which is most commonly associated with attachment³.
- WGS has greatly improved our understanding of the genetic factors which enable STEC to cause human illness in the UK and other countries, and has allowed us to more accurately compare food, environmental and clinical isolates. However, the scientific uncertainty surrounding all of the factors which are needed to make STEC pathogenic to humans means that for certain strains it is difficult to establish, with any confidence, its ability to cause illness. For this reason, a precautionary approach is taken when STEC is identified in food, particularly when the food is ready to eat and likely to be consumed without a treatment (such as cooking) that can kill the bacteria.
- The UN Food and Agriculture Organisation/WHO⁴ and the UK independent Advisory Committee on Microbiological Safety of Food (ACMSF)⁵ agree that the detection, in a ready to eat food, of any STEC should be considered a potential risk to health. The Public Health England (formerly HPA) guidelines for assessing the microbiological safety of ready to eat foods⁶ determine that the detection of STEC in any ready to eat food is unsatisfactory, potentially injurious to health and/or unfit for human consumption. This definition recognises the need for a precautionary approach because such a wide range of different STECs with different genetic characteristics have been identified in human illness and it is not possible at this stage to be more definitive. A precautionary approach to the detection of any STEC is therefore advisable and is applied by many other countries around the world.

³ Whole Genome Sequencing and Analysis of Non-O157 STEC. Draft report prepared by the Scottish *E. coli* O157/STEC Reference Laboratory (SERL) for publication in Spring 2019.

⁴ <http://www.fao.org/3/ca0032en/CA0032EN.pdf>

⁵ https://acmsf.food.gov.uk/sites/default/files/acm_min_93_october.pdf

⁶ <https://www.gov.uk/government/publications/ready-to-eat-foods-microbiological-safety-assessment-guidelines>