

NSF-CMI Guidance Note

Escherichia coli (VTEC): Implications and practical consumer protection controls for the UK catering sector

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1. Executive Summary

First recognised in the 1980s, verocytotoxin-producing *Escherichia coli* (VTEC) are a group of toxin-producing strains of *E. coli* bacteria that are pathogenic to humans. *E. coli* O157 is the VTEC strain that has been most commonly implicated in UK food-poisoning outbreaks although recent media attention has highlighted other emerging strains e.g. *E. coli* O104, associated with the serious May 2011 outbreaks in Germany & France linked with sprouting seeds.

The increase in the number of cases of *E. coli* outbreaks is causing significant concern for public health authorities because of the risks it poses to vulnerable segments of the population where infection can be fatal or lead to long term complications. Young children, the elderly and the immunosuppressed are particularly at risk.

E. coli can be particularly dangerous and hard to control because of its ability to cause infections at very low levels of concentration and to survive in frozen, chilled and ambient stored foods and grow quickly at ambient temperatures. Catering environments are considered to be particularly vulnerable because storage, handling and preparation of both raw and ready-to-eat foods often takes place in close environmental and physical proximity which can significantly increase the risk/potential of cross-contamination from raw to ready-to-eat foods.

This requires food catering businesses to have in place the highest standards of control to eliminate the risk of cross-contamination and subsequent infection.

The purpose of the document is to provide specific guidance to the catering and food service sector on procedures and controls to prevent *E. coli* infection.

2. *E. coli* Background

The organism

First recognised in the 1980's, verocytotoxin-producing *Escherichia coli* (VTEC) are a group of toxin-producing strains of *E. coli* bacteria that are pathogenic to humans. *E. coli* O157 is the VTEC strain that has been most commonly implicated in UK food-poisoning outbreaks although recent media attention has highlighted other emerging strains e.g. *E. coli* O104, associated with the serious May 2011 outbreaks in Germany & France linked with sprouting seeds.

The illness

Infection can be asymptomatic or can result in mild abdominal pain/diarrhoea through to serious conditions including haemolytic uraemic syndrome (HUS) which can lead to renal failure, which may be fatal or lead to long term complications. Young children, the elderly and the immunosuppressed are particularly at risk.

Epidemiology

Cattle are widely accepted as the primary reservoir for *E. coli* O157 although it has been isolated from other animals including sheep, pigs, goats etc. Since the 1980's it has become a serious pathogen in developed countries with reported outbreaks in North America, EU and Japan as well as the UK.

Transmission from the animal reservoir can occur via food-, water-, environmental- and animal-to-person spread and person-to-person spread has been reported in domestic, hospital and institutional settings.

The increasingly widespread nature of the organism means that many raw foodstuffs can become contaminated with the organism including meats, milk, fruit, vegetables and salad vegetables.

Although there are general year-on-year fluctuations in reported cases, the general underlying trend is increasing across the UK with 793 laboratory confirmed cases of *E. coli* O157 infection in England and Wales in 2010.

Any presumptive/suspect VTEC organisms isolated from clinical sources are required to be sent to a reference laboratory e.g. HPA Central Public Health Authority in England & Wales for confirmation and sub-typing to assist in building a national picture of outbreaks and sources which can show possible connections between the people that are infected.

Why is concern heightened in the catering sector?

By comparison with other food-poisoning organisms such as *Salmonella* and *Campylobacter*, *E. coli* O157 is known to cause very serious illness and even death from isolated incidents of very low (e.g. <100 bacteria) contamination of ready-to-eat foods. Because of this, there is no acceptable critical limit for *E. coli* O157 in ready-to-eat foods.

E. coli O157 is able to survive in frozen, chilled and ambient stored foods and will grow quickly at ambient temperatures. Catering environments are considered to be particularly vulnerable because storage, handling and preparation of both raw and ready-to-eat foods often takes place in close environmental and physical proximity which can significantly increase the risk/potential of cross-contamination from raw to ready-to-eat foods. This requires food catering businesses to have in place the highest standards of

control to eliminate the risk of cross-contamination and subsequent infection. Because of the heightened risk presented, local authority enforcement officers (EHO's) will always consider the exposure of ready-to-eat foods to the risk of *E. coli* O157 cross-contamination during their statutory hygiene inspections of catering businesses and will consider the use of statutory Remedial Action Notices (RANs) and further enforcement action where they consider that adequate controls are not in place.

3. Food Standards Agency Guidance

The Food Standards Agency have developed comprehensive guidance, Q & A and a factsheet for food business operators following the serious *E. coli* O157 outbreaks in 1996 (Scotland) and 2005 (Wales) both of which were linked to cross-contamination/poor handling of food and both of which led to fatalities and serious long-term health problems for exposed individuals. Whilst the focus in these FSA documents is on the measures required to control cross-contamination from *E. coli*, the general measures outlined are also designed to help in controlling other food-poisoning bacteria such as *Salmonella* and *Campylobacter*.

All food businesses handling both raw and ready-to-eat foods should ensure that published guidelines are considered as part of their established processes for food safety review, monitoring and control protocols, both to ensure compliance with UK/EC Food Hygiene Regulations (including the application of management procedures based on Hazard Analysis Critical Control Point (HACCP) principles), whilst minimising the risk of infection from *E. coli* O157 and other food-borne pathogens.

3. Procedural Guidance

3.1 Cross-contamination

Catering businesses handling raw foodstuffs in the same physical location as ready-to-eat foods are potentially at greater risk because of the increased risk of cross-contamination.

Raw foods in this context means foodstuffs such as raw meat and un-washed fruit & vegetables (i.e. not supplied as ready-to-eat) which should all be handled as if they were contaminated with *E.coli O157*.

The pathogen is commonly associated with raw red meat (e.g. beef, lamb) but has also been isolated from raw pork and poultry. Caterers should avoid washing raw meats to prevent cross-contamination by splashing/aerosol.

Leafy and root vegetables (not supplied as 'ready-to-eat') should be handled as 'raw', particularly if visible soil/manure evident. (see also 'Washing Fresh Fruit & Vegetables')

N.B. ready-to-eat foods are those that will not be cooked/re-heated before serving and include e.g. cooked meats, cheese & dairy products, sandwiches, salads and desserts and finished, ready-to-serve meals, drinking water, ice and cold-drinks.

Summary of the key control measures required to avoid cross-contamination includes:

- **Separation of raw food equipment and staff from ready-to-eat food equipment and staff**
- **Effective cleaning & disinfection**
- **Effective personal hygiene including hand-washing.**

Separation of raw food equipment and staff from ready-to-eat food equipment and staff

Work Areas:

Food law requires that the layout, design, construction, siting and size of food premises must permit good food hygiene practices, including protection against contamination in rooms where food is stored/prepared.

Wherever possible, separate physical designated 'clean' areas should be established for the preparation, storage and handling of ready-to-eat foods. The 'clean area' includes the space above the work surface and no raw foods or equipment that may be contaminated by raw food should be carried over the top of the work surface or stored above it.

If full separation is not possible, managers and supervisors must ensure a full clean and disinfection of the area before handling ready-to-eat foods.

Non-food contact surfaces e.g. worktops/walls which may be subject to food splashes, should be smooth, impervious and easily cleanable using an approved cleaning and disinfection procedure before handling ready-to-eat foods in the area concerned.

Product & Ingredient Storage:

As for work areas, including refrigerators and freezers..where separate storage units are not available ensure clear identification and separate shelving between raw foods and ready-to-eat foods, with raw foods being stored *below* (and not in contact with) ready-to-eat foods. Particular care is required to avoid cross-contamination of ready-to-eat foods and ingredients from outer packaging.

Food Equipment & Utensils:

Separate equipment including chopping boards/ knives/ tongs/ temperature probes etc. must be used for raw and ready-to-eat foods unless thoroughly cleaned and heat-disinfected (>82degC) between use.

Complex and/or difficult to clean food equipment must never be used for both raw and ready-to-eat foods e.g. vacuum packers, slicers, mincers, where such equipment cannot be adequately cleaned to ensure complete disinfection over all surfaces and its internal components

Machinery should be CE marked to indicate design compliance with the European Machinery Directive (2006/42/EC) which includes requirements for hygienic design.

In its November 2011 (2nd Edition) Q&A (Ref #14) , the FSA have also provided specific guidance on the use of probe thermometers to avoid this equipment becoming a vehicle for cross-contamination.

Packaging:

Any customer tableware or packaging for ready-to-eat food should be stored in a designated 'clean' area to protect it from cross-contamination.

This applies to all types of packaging including cling-film, aluminium foil, plastic bags, greaseproof paper etc.

Other non-food equipment:

Similar post-handling and/or segregation controls should be in place when handling e.g. waste bins, cleaning equipment, paper-work/pens, cash tills etc.

Effective cleaning & disinfection**Cleaning equipment:**

Ensure cleaning of equipment/utensils/foodstuffs/floors etc. avoids water spray/aerosol contamination of uncovered ready-to-eat foods.

Commercial Dishwashers:

Ensure hot water rinse reservoirs are >80degC with a contact time of at least 15 seconds; if in doubt, refer to the manufacturer's instructions. Clean dishwashers regularly including ensuring jets, filters and drains are free from debris.

Reusable cloths:

Whilst disposable, single-use cloths are preferred, re-usable cloths should be hot-washed in a commercial washing machine at >82degC and fully dried before re-use.

Chemical Disinfection: 2-stage process:

Use a cleaning product (e.g. detergent) to remove visible food residues/soiling/grease and rinse thoroughly. Then apply a disinfectant (proven capable of destroying *E. coli* O157) to the visibly clean surface (dilution/contact time as per supplier instructions) and rinse thoroughly.

Sanitiser products that combine cleaning and disinfection properties must still only be used as part of a 2-stage process.

Sanitisers and disinfectants must meet the minimum microbiological efficacy standards required by BSEN 13697:2001 or BSEN 1276:2009 Standard – if in doubt confirm with the chemical manufacturer that the cleaning regime is effective for the contact time/concentrations/temperatures utilised.

N.B. Detergents are products used for general cleaning and do not, in isolation, destroy harmful organisms such as *E. coli* O157.

Full documented work instructions must be in place and staff fully trained to ensure optimum efficacy.

When washing utensils in a single sink, wash those used for ready-to-eat foods first. The sink should be thoroughly cleaned and disinfected following contact with any raw foods equipment/utensils.

Effective personal hygiene including hand-washing

Significant potential exists for indirect cross-contamination of foodstuffs via food handlers.

Hand-washing:

Rigorous training and application of an effective hand-washing regime is critical in avoiding cross-contamination from *E. coli* O157, because it is possible to be infected but not have any symptoms of illness.

Staff should be trained to wash and dry their hands using a recognised technique e.g. Dept. of Health/NHS/HPA that involves pre-wetting of hands, thorough physical hand rubbing using soap, rinsing & hygienic drying.

Hands should be washed before handling ready-to-eat foods, after visiting the toilet, after touching raw foodstuffs e.g. meat and vegetables or surfaces/utensils that may have come into contact with staff handling raw food, after handling waste, eating, cleaning.

Dedicated hand-washing basins must be available with a ready supply of hot water, liquid soap and drying facilities.

Ideally liquid soaps should also provide disinfection properties in line with efficacy requirements of BS EN 1499:1997 Standard.

Non-hand operable taps are recommended; if unavailable it is critical that taps are turned off using a paper towel to avoid re-contamination of hands.

Single-use/disposable towels or air-driers recommended for thorough hand drying.

Anti-bacterial gels and/or hygienic hand rubs can provide additional protection but, if available, should only be used *after* thorough hand-washing as they are unable to remove visible dirt. Hand rubs should comply with efficacy requirements of BS EN 1500: 1997 Standard.

Disposable gloves:

Disposable gloves must not be used as a substitute for regular hand-washing as indicated above; always wash hands before putting on gloves and after removal. Gloves must be changed between tasks i.e. between handling raw and ready-to-eat foods and before handling ready-to-eat foods if hands have previously been in contact with 'non-clean' items e.g. waste, cleaning equipment, money/cash-tills etc.

Disposable gloves must also be changed at every break and when damaged.

Dispose of dirty/damaged gloves in a hygienic manner.

Maintain the integrity of packs of disposable gloves by protecting them from cross-contamination

Use designated tongs and other utensils to handle food; keep hands clean to avoid cross-contamination of handles.

Clean clothing/aprons:

Wear clean, protective clothing before handling ready-to-eat foods. Wash hands after changing protective clothing after handling raw foods. The use of disposable aprons may be beneficial where there is a need for frequent changing.

3.2 Washing fresh fruit & vegetables

Caterers must establish with their suppliers which products are supplied as ready-to-eat and therefore requiring no further washing e.g. prepared, bagged salad leaves.

All other untreated fruit and vegetables, particularly those which are visibly contaminated with soil/manure, should be stored and handled in such a way to prevent cross-contamination.

Particular care is required when handling herbs such as parsley, mint, basil, coriander etc. that may be used as a garnish/drinks ingredient as these are generally supplied to caterers as 'ready-to-wash' rather than 'ready-to-eat'.

Wash produce thoroughly in fresh, cold running water to remove soil and other surface debris. All surfaces of vegetables must be washed vigorously with salad leaves being separated during the wash process. Such a process will help to reduce overall microbial loading on the surface of fresh produce although it cannot be relied upon to eliminate pathogens.

Peeling or cooking fruit and vegetables can also remove bacteria.

Once the produce has been prepared, it should then be handled/stored as 'ready to eat' to protect from cross-contamination.

If chlorination tablets or other approved food sanitisers are used e.g. for fresh salad, it is important to ensure that manufacturers usage instructions are followed precisely.

3.3 Cooking

Thorough cooking of raw foods that may already contain *E. coli* O157 and/or other food-borne pathogens is a critical control measure in eliminating the organism. Regular temperature checks should be conducted using a digital thermometer probe to verify that required product centre temperatures are consistently achieved.

In general, measures used to control the outgrowth of *Salmonella* in food will also control *E. coli* O157.

Care should be taken if using microwave ovens to ensure sufficient holding time and even cooking followed by temperature probe verification.

Where staff are cooking raw food to order, the business must ensure that the raw ingredients are kept in a separate location away from clean plates/utensils and ready-to-eat foods.

Burgers:

The cooking of comminuted raw meat burgers has been shown to present particular risks.

The mincing of meat can spread surface contamination of the raw meat throughout the product (similar concerns apply to meats that have been blade/needle tenderised or injected with marinade).

The UK Chief Medical Officer for Health, supported by the Food Standards Agency, continues to advise that manufacturer's instructions are followed and that burgers are cooked until piping hot throughout, until the juices run clear and that there is no pink meat inside (although colour cannot be relied on in isolation). In 2007, the Advisory Committee on the Microbiological Safety of Food (ACMSF) further advised that "...minced beef and minced beef products, including beefburgers, should be cooked to a minimal internal temperature of 70degC for 2 minutes or equivalent safe time/temperature combination." e.g. 75degC for 30 seconds

Under-cooked burgers should never be served as it is considered this would place consumer safety at risk.

3.4 Cooling & Freezing

Whilst rapid cooling and freezing of foods will prevent multiplication of *E. coli* O157, neither can be relied upon to kill any surviving organisms.

3.5 Other Management Controls

Standardised, Documented Operating Procedures:

Catering businesses must document their proposed control and monitoring measures with sufficient clarity to permit the effective training of relevant staff, including emphasising the importance of regular cleaning, disinfection, personal hygiene, training & supervision and robust hand-washing protocols. NSF-CMi has extensive experience of supporting all types of catering businesses with regard to the design and development of appropriate standard operating procedures.

Sickness reporting procedures:

Staff handling food or working in a food handling area while suffering from certain infections can contaminate food or food contact surfaces. Further guidance can be found in the FSA publication '*Food Handlers: Fitness to Work*' which provides advice on which illnesses and symptoms staff should report and what immediate actions managers should take in response to such reports, including staff exclusion (normally for 48 hours from when symptoms stop naturally for staff working with or around open food).

Because of the heightened risk more stringent precautions are required for food handlers who are known to have been infected with *E. coli* O157, requiring exclusion until full medical clearance has been given. This will be decided by the medical professional but will usually require two consecutive, negative faecal samples, the second sample being taken 48 hours after the symptoms have stopped naturally.

Anyone who has household contact with someone infected with *E. coli* O157 should inform their manager and they should also be excluded from any work that involves direct handling or serving open ready to eat foods until microbiological clearance is obtained in the same way.

Corrective Action Procedures:

Supervisors and managers must take responsibility for ensuring that, in the event of there being a break-down/lapse in control procedures, immediate steps are taken to ensure that no ready-to-eat food is placed at risk from contamination and that any contaminated/potentially contaminated food is identified and quarantined/removed from storage/sale in a timely manner. Where routine checking and/or audit procedures identify that a technical control is not being effectively applied, the validity of the operational procedure and appropriate action should be reviewed in order to provide assurance that effect control has been re-instated.

Serious Incident Management Procedures:

In addition to on-going corrective action mechanisms, all caterers should establish an Incident Management Plan which details the responsibilities and actions required in response to an emerging food safety incident, including suspected and/or actual contamination of product with *E. coli* O157.

An effective plan will ensure compliance with legal requirements; provide a systematic assessment of incidents; manage and control serious incidents and protect company assets, including brand reputation.

It is good practice to ensure that such plans are tested on a regular basis to ensure that they can be implemented in a timely manner in the event of a

serious incident occurring.

Food & Packaging Supplier Assurance:

Caterers should only purchase food, drink and food contact packaging from nominated, approved suppliers who are able to demonstrate compliance with recognised standards of food safety.

Purchasing from unapproved suppliers increases the risk of goods being delivered with pathogenic bacterial contamination, such as *E. coli* O157.

Assurance of good agricultural practices using recognised third party fresh produce schemes e.g. Red Tractor Farm Assurance Fresh Produce Scheme, GLOBALGAP can help to significantly reduce the potential for pathogen contamination of fresh produce and, combined with chill chain maintenance and good washing practice can help to reduce the potential risk of subsequent outgrowth.

Particular attention re the verification of supplier food safety systems should be applied to suppliers of 'minimally processed' and 'ready to eat products' e.g. salamis, pates, pepperonis, cooked meats, fresh fruit/salads etc. as well as e.g. specialist cheeses and/or other ready-to-eat dairy products manufactured with unpasteurised milk.

NSF-CMI delivers a wide range of third party inspection and certification schemes in collaboration with various organisations in the Agriculture, Processing, Manufacturing and Packaging sectors e.g. BRC, IFS, FSSC22000 etc. as well as conducting risk-based programmes of bespoke food safety audits for leading UK & international brands.

Verification/Audit/Inspection:

Food hygiene legislation requires food businesses to carry out regular validation, monitoring and verification of effectiveness of controls through a self-checking system.

Record keeping is important in demonstrating that the required systems of control are being followed at all times and these should be routinely checked by a designated member of staff.

It is important that the effectiveness of controls are assessed at all stages of food production, during both quiet and busy periods of food preparation and also following the introduction of new equipment, new menus and/or new ways of working.

Independent, expert third party audits (as provided by NSF-CMI), deliver a highly effective means of assessing the effectiveness of established monitoring and control procedures and can highlight system weaknesses and improvement areas; however, they must not be relied on, in isolation, or as a substitute for a food business' own daily self-checking and monitoring protocols.

Training/Coaching/Behavioural-Based Food Safety:

Food hygiene legislation requires that food handlers are supervised and instructed and/or trained to a level commensurate with the nature of their work. Field research conducted by both the FSA and NSF-CMi confirms the importance of the need for effective, targeted messages in influencing the positive, compliant behaviour of managers and food handlers.

The importance and role of management and supervisors in ensuring that control measures are followed at all times cannot be over-emphasised.

In conjunction with occupational psychologists and food safety expert consultants, NSF-CMi has developed new and innovative approaches towards assessing and predicting the likely behaviour of individual managers, supervisors and employees and the outputs from such assessments can be used to develop highly effective and targeted training/coaching and intervention/performance improvement programmes.

4. References

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We provide consulting, certification and technical services to clients throughout the global food and drink processing industry, advising companies on business strategy, developing and implementing quality systems, delivering bespoke training and providing certification to an extensive range of national and international standards.

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