

FACTFILE: GCE NUTRITION & FOOD SCIENCE

MINIMISING THE RISK OF MICROBIAL CONTAMINATION



Minimising the risk of microbial contamination

Learning outcome

Outline how the risk of microbial contamination can be minimised by:

- primary producers;
- food manufacturers;
- establishments that serve food; and
- the consumer.

Food safety relies on the joint efforts of everyone involved along the food chain, from farmers and manufacturers to retailers, caterers and ultimately the consumer. Legislation and controls are in place to reduce the risk of contamination. The Food Standards Agency (FSA) provides guidance for all sections of the food chain on how to manage food hygiene and safety and encourages food safety management procedures based on Hazard Analysis Critical Control Point (HACCP) principles.

Primary Producers

Food Hygiene Regulations (NI) 2006 has a 'farm to fork' approach to ensure food safety throughout the food chain starting with primary production. All primary producers (farmers and growers) must comply with these regulations to control potential food hazards at farm level.

Farm Hygiene

Farms should be kept clean to prevent contamination of food arising from air, soil, water, feed, waste, animals, pests etc. Facilities, equipment and vehicles used to produce, prepare,

store and transport food and feed should be regularly disinfected to prevent contamination.

Feed Hygiene

Feed should be stored and handled in such a way as to: prevent animals, vermin and pests from causing contamination; prevent feed spoilage, for example, due to moulds or contact with animal waste; and keep pet food containing any meat product separate from other feed.

Cattle Diseases

Good animal husbandry involves looking after animals properly and monitoring them regularly for signs of illness which is the best ways of preventing disease, and controlling its spread if there is an outbreak. Farmers must now "tag" animals with details of their origin, slaughter and the traceability code of the abattoir, this ensures food safety is not compromised.

Record Keeping

Regulations require all primary producers to keep records relating to food and feed safety controls on their farm. These records can help to quickly identify the origin of a feed or food related problem and allow for swift action to be taken. Records include: traceability of inputs purchased and outputs sold (food, feed and food producing animals) and the occurrence of disease or pests that may affect food safety.

Quality Assurance Standards

These promote farming practices that contribute

to recommended policy and ensure food safety standards. British Lion eggs are produced under stringent controls resulting in the elimination of salmonella from egg production. The Northern Ireland Farm Quality Assurance Scheme (NIFQAS) - provides high standards for farmed meat in Northern Ireland. Red Tractor is a UK whole chain food assurance scheme which assures high standards of food safety and traceability from farm to pack. Farms with membership to an assurance scheme will be identified as lower risk resulting in a reduced inspection frequency.



Milk production

To reduce risk of contamination:

- All animals and lying areas should be kept clean and dry. Passageways should be free from slurry and mud.
- Before milking, teats, udders, hands and milking equipment must be cleaned. Animals showing signs of udder disease must not be used for milking.
- Milk must be cooled immediately (not more than 8°C) to minimise bacteria multiplication.
- Bulk tanks must be cleaned and disinfected after each milk collection.

Manure

Farm manure can contain pathogenic micro-organisms including: *E. coli* O157, salmonella, listeria and campylobacter. Storage and use of manure must therefore be managed to reduce the risk of contaminating crops. This is particularly important for ready-to-eat fruit and vegetables that will be eaten raw. The FSA provide guidance to farmers on how to reduce the risk of contamination of ready-to-eat crops when using manure:

- carefully select land on which ready-to-eat crops are grown.
- time applications of manure (including fresh manure from grazing animals) and slurry, in relation to production of ready-to-eat crops.

Cleaner cattle and sheep

The Clean Livestock Policy aims to minimise the risk of food poisoning caused by pathogenic bacteria (*E. coli* O157, campylobacter and salmonella) on dirty cattle and sheep. Excrement and mud on coats or fleeces - especially wet ones - can potentially contaminate meat when the coat or fleece is being removed at the abattoir.

Clean Cattle

- Pre-slaughter diet - attention to feed prior to slaughter can firm up or reduce the animals' faeces, helping to minimise the presence of faecal contamination of the hide.
- Providing adequate bedding on the farm, during transport and at the abattoir helps keep cattle clean.
- Wet cattle are a significant hazard - they get dirty more easily and wet coats mean more mobile bacteria.
- Transport factors can affect cattle cleanliness - journey time, lorry design and number of animals transported all impact on the cleanliness of cattle being delivered to slaughter.
- Bacteria survive well in livestock environments - the farm, the transport, the market and the holding areas should be kept as clean as possible.

Clean Sheep

Producing clean sheep for slaughter can be difficult, particularly in wet weather. As with cattle, sheep cleanliness is particularly affected by diet, housing, sheep health and weather conditions. Using the FSA Clean Sheep Guidance will assist in keeping sheep clean for slaughter, and the adoption of a HACCP type of approach toward sheep management can reduce the risk of contamination.

Shellfish Controls

Oysters, mussels, scallops, etc. are filter feeders and so are susceptible to bacteriological contaminants from their environment. To reduce the risk, they must be commercially harvested from classified production areas that are monitored. There are treatments that shellfish must undergo to reduce the level of microbiological contamination and ensure they are safe for placing on the market.

Establishments That Serve Food

Register as a food business

A new food business must register with the local council/authority. Once registered, they will be inspected and given a food hygiene rating under the Food Hygiene Rating Scheme. This will encourage the establishment to have high standards of food safety.

To comply with food hygiene regulations, the FSA in Northern Ireland has developed a Safe Catering guide. Similar guidance materials have also been developed i.e. Safer Food Better Business in England and CookSafe in Scotland.



Stock Control

Carry out regular stock checks and throw away any food that has passed its use-by date. Follow the 'first in, first out' system of stock rotation, so that older stock is used first to avoid waste.

Suppliers and Traceability

The starting point for making food safely is the raw ingredients, make sure that the food has been handled safely and choose suppliers carefully. It is essential to record details of all suppliers in order to comply with legislation regarding traceability.

Delivery/Receipt

Conduct regular delivery time, temperature and quality spot checks to ensure that food is being supplied at the correct temperature and in good condition.

Storage

Follow the food manufacturer's instructions, including how long it is safe to store food once opened. Cook-chill foods should not be stored for more than 5 days; listeria bacteria can grow at temperatures as low as -1.5°C . Fridges must not be over-stocked to allow cold air to circulate. Check the temperature of the chilled display equipment and fridges at least once per day. Frozen food should be placed in the freezer as soon as it is delivered. Raw and ready-to-eat food should be wrapped and separated within the freezer to

avoid cross-contamination. Date codes should be checked regularly and stock rotated.

Chilled food must be kept at 8°C or below. To achieve this, it is recommended that fridges and chilled display equipment should be set at 5°C or below. Freezers should operate at a temperature of at least -18°C .

Room Temperature Storage

Dry foods such as flour and rice should be stored in rooms which are clean, dry and well ventilated. Food should be kept off the floor and placed in covered food-grade containers. Throw away any punctured vacuum packs, swollen packs or badly dented cans.

Preventing Cross-contamination

Raw food and ready-to-eat food should be separated during delivery, handling, storage, preparation, cooking and serving. This may be done by designating a room or work area for ready-to-eat food only, known as the 'clean area'. Colour-coding equipment in this area ensures staff can easily identify them. Separate staff should be provided for working in the clean area. If this is not possible, the movement of staff from a raw area into a clean area should be kept to an absolute minimum.

Cross-contamination - storage

Separating raw and ready-to-eat food is essential to prevent food poisoning bacteria. Separate fridges should be used for storing raw and ready-to-eat food, if the same fridge is used; raw meat/poultry/fish should always be stored below ready-to-eat food in a clearly distinguishable part of the fridge and in covered containers. Staff should also take extra care when placing food into fridges and freezers to ensure clothing and hands do not become contaminated by raw food. Unwashed fruit and vegetables can be a source of E.coli O157 and these must also be stored separately from ready-to-eat food.

If ready-to-eat food has not been kept separate from raw meat/poultry/fish, eggs or unprepared fruit/vegetables during storage, throw away the food.

Cooking

Cooking food at the right temperature and for the correct length of time will ensure that any harmful bacteria are killed. Use a temperature probe by inserting the tip into the centre of the food or the thickest part. Safe Catering FSA recommends 75°C or hotter to thoroughly kill food poisoning bacteria.

Cooling Hot Foods

Cooked food that will not be served immediately should be cooled quickly and then put in the fridge/freezer within two hours. Do not put foods that are not sufficiently cooled into the fridge as this may raise the temperature of the fridge. A blast chiller is specially designed to chill down hot foods quickly and safely. If food has not been cooled down safely throw it away.

Reheating

Reheating means cooking again, not just warming up. Always reheat food until it is piping hot (75°C) all the way through (only do this once). Food in hot holding must be kept above 63°C using suitable hot holding equipment. It is difficult to hold food at a consistent, safe temperature without suitable equipment. Food must be cooked/reheated thoroughly and piping hot before hot holding begins.

Cleaning

Cleaning and disinfection of food premises is important to prevent food poisoning by reducing bacteria to a safe level and minimising the risk of cross-contamination.

This includes: work surfaces, chopping boards, utensils, sinks and items that people touch frequently such as fridge door handles, cash registers, etc, which may present a cross-contamination risk. Food waste bins and waste storage areas should be cleaned regularly.

Stage 1: General cleaning using a detergent

The first stage is a general clean using a detergent to remove visible dirt, food particles, grease and debris followed by thorough rinsing to remove of all residues.

Stage 2: Disinfection

Ensures any bacteria present are reduced to an acceptable level. The disinfectant used should comply with the BS EN standards.

Dishwashers wash items thoroughly at a high temperature so this is one of the most reliable ways to clean equipment and kill harmful bacteria such as E.coli O157.

Cloths can be one of the main causes of cross-contamination in the kitchen. Use disposable single use cloths whenever possible.

Pest Control

Pests can carry food poisoning bacteria e.g. rodents, flies, ants, cockroaches and birds.

The building must be in good condition and repair in order to restrict pest access and prevent potential breeding sites. Management must take immediate and appropriate action to control any infestation of pests identified on their premises.

Personal Hygiene

It is vital for staff to follow good personal hygiene practices to help prevent bacteria from spreading to food. The law requires that every person working in a food handling area maintains a high degree of personal cleanliness.

- Staff must always wash their hands before preparing food as it is one of the best ways to prevent food poisoning bacteria from spreading. They should be trained in effective hand washing technique.
- All staff must wear clean work clothes when working with food and where necessary, protective clothing.
- It is good practice for staff to keep hair tied back and wear a hat or hairnet when preparing food.

Fitness to Work

Any member of staff who has diarrhoea and/or vomiting must by law report it to their manager immediately. They should not return to work until they have had no symptoms for 48 hours.

Training/Supervision

Staff must be adequately supervised or trained in food hygiene to allow them to do their job safely. Some businesses may send their staff to formal Level 2 Award in Food Safety in Catering courses.

Food safety in establishments that serve food can also be managed by:

- Hazard Analysis Critical Control Point (HACCP).
- Food hygiene rating schemes.
- Food law inspections.

Food Manufacturers

The most important preventative measures for food manufacturers is effective cleaning of food contact surfaces, utensils and equipment. Soiled surfaces can act as a reservoir for microbial contamination and allow the buildup of complex biofilms, which protect micro-organisms from cleaning and sanitising agents which can be extremely difficult to remove once established.

The measures carried out by food manufacturers are similar to those for establishments that serve

food. In addition, manufacturers can minimise risk by undertaking the following measures.

Premises

The premises must comply with the necessary regulations and allow for safe food preparation.

Hand washing: enough washbasins for staff to wash their hands with hot and cold running water and materials for drying them hygienically.

Changing facilities: provide adequate facilities for staff to change their clothes, where necessary.

Other requirements: premises must also have adequate ventilation, lighting and drainage.

Food Preparation Areas

The following rules apply to rooms where food is prepared or manufactured.

Floors and walls must be:

- maintained in a good condition;
- easy to clean;
- disinfected; and
- smooth, hard-wearing, washable and in a good state of repair.

Ceilings should be:

- in good condition;
- easy to clean to prevent dirt from building up;
- free from condensation and mould; and
- free from flaking paint or plaster.

Windows and doors: must be constructed in a way that prevents dirt from building up. If they open to the outside, they must be fitted with insect-proof screens.

Surfaces: must be maintained in a good condition, easy to clean and disinfected.

Cleaning Equipment

Premises must have adequate facilities for cleaning, disinfecting and storing equipment, including equipment with an adequate supply of hot and cold water.

Detergents

Detergents clean the surface and remove grease, but they do not kill bacteria.

Disinfectants

Disinfectants kill bacteria and should be used on clean surfaces. They do not work effectively if the surface is covered in grease or visible dirt.

Sanitisers

Sanitisers can be used to both clean and disinfect as part of a two-stage approach. First use the sanitiser to clean the surface then re-apply to the clean surface and leave for the required time to disinfect the surface.

Washing Food

Separate sinks must be provided, where necessary, for washing food and cleaning equipment in food preparation areas. Every sink must have an adequate supply of hot and cold water for washing food and be of drinking quality (potable). These facilities must be kept clean and be disinfected.

Equipment

Must be kept in good order, repair and condition. Cleaned effectively and be disinfected frequently.

Food waste

Adequate facilities for storing and disposing of food waste as quickly as possible to avoid it building up and attracting pests.

Managing food safety

There must be a written food safety management procedure which shows compliance with food hygiene requirements. Local authorities can inspect a manufacturer at any point in the food production process.



Transporting food

It is especially important to make sure that:

- Food is transported in packaging or containers that protect it from contamination.
- Chilled and frozen foods are kept at the right temperature (refrigerated vans).
- Raw and ready-to-eat foods are kept apart.

Staff training

By law, manufacturers must ensure that food handlers receive the appropriate supervision and

training in food hygiene, which is in-line with the area they work in and will enable them to handle food in the safest way.

Training and supervision

- By law food workers must receive adequate supervision instruction/or training in good food hygiene for work they do.
- Those responsible for HACCP should also receive adequate training.

Guides to good management procedures also recommend that:

- Training should be refreshed annually and certificates renewed every 3 years.
- Training records should be kept as evidence that staff have been trained properly.

Due Diligence

A food business must be able to demonstrate that it has done everything within its power to safeguard consumer health.

Meat Industry Guide (MIG)

The guide sets out the legal obligations that apply to food businesses in the meat sector. It also provides advice on how these obligations can be met. It is aimed at businesses involved in the slaughter, cutting and processing of fresh meat. Further advice can also be found on the Food Standards Agency website.

Food manufacturers can also ensure safe food production by using the following quality assurance systems: Good Manufacturing Practice (GMP); quality assurance standards and food traceability.

Consumer

Cooking

Cooking food at the correct temperature and for a sufficient length of time will ensure that any harmful bacteria are killed. Always follow the cooking instructions provided on packaging.

Meat

Poultry and minced meat products such as kebabs, sausages and burgers should be steaming hot and cooked all the way through. Cut into the thickest part of the meat, check that it is not pink and juices run clear. In a whole bird this is the area between the leg and the breast.

When roasting a whole bird such as chicken or turkey, cook the stuffing separately, not inside the

bird as stuffed birds will take longer to cook and may not be thoroughly cooked.

A meat thermometer measures the internal temperature of cooked meat, poultry and casseroles to ensure that a safe temperature has been reached.

Standard advice is to cook food until it has reached 70°C and stayed at that temperature for 2 minutes or 75°C instantaneously (the immediate temperature reading).

Chilling

- Store any food with a use-by date, along with cooked dishes, salads and dairy products, in the fridge.
- Keep chilled food out of the fridge for the shortest time possible during preparation.
- Cool cooked food quickly at room temperature and then place in the fridge within one to two hours. Putting hot food in the fridge raises the temperature of the fridge.
- Dividing food into smaller portions and putting it in a shallow dish can help to make it cool more quickly.
- When cooling a turkey or other large bird, removing the legs will help it cool more quickly.
- Leftover cooked rice should be quickly cooled and then refrigerated as *Bacillus cereus* spores can produce bacteria.
- Don't overfill the fridge, leaving space allows air to circulate and maintain the set temperature.
- Check fridge is cold enough using a fridge thermometer. The coldest part of the fridge should be below 5°C as some bacteria can grow at temperatures lower than 8°C.

Freezing

Food should be frozen as soon as possible; freezer should be at -18°C.

Defrosting

- Don't defrost food at room temperature, defrost fully in the fridge. Allow at least 24 hours for every 2-2.5 kg.
- When defrosting a whole bird, ensure there are no ice crystals in the cavity. If poultry is still partially frozen, it will cook more slowly and might not reach a high enough temperature to kill harmful bacteria.
- Defrosted food should be cooked or eaten within 24 hours. Don't refreeze.
- Don't defrost food in the microwave unless it will be cooked straight away. Food defrosted in the microwave can get warm enough to allow bacteria to grow.

Cleaning

Hands

Wash hands before preparing food with warm soapy water. If it's not possible to wash hands use hand sanitising wipes or gels to disinfect them.

Dish cloths

Wash or change dish cloths and tea towels regularly and let them dry before using again. Dirty, damp cloths allow bacteria to breed.

Utensils and serving dishes

Use different utensils, plates and chopping boards for ready-to-eat foods and raw foods that require cooking, or wash them thoroughly between tasks.

Raw meat

Don't wash raw meat as it splashes bacteria onto hands, clothes, utensils and worktops.

To kill the bacteria requires temperatures above 70°C which is too hot for hands – dishwashers can achieve this.



Avoiding cross-contamination

Bacterial cross-contamination is most likely to happen when raw food touches or drips onto ready-to-eat food, utensils or surfaces.

Avoid it by:

Preparing food hygienically:

- Use different utensils, plates and chopping boards for raw and cooked food and wash thoroughly between tasks.

- Wash hands after touching raw food and before handling ready-to-eat food.

Storing food effectively:

- Cover raw meat, poultry, fish and shellfish and store on the bottom shelf of the fridge keeping it separate from ready-to-eat food.

Shopping safely:

- Using shopping bags safely.
- Keep raw and ready to eat foods separate in shopping trolley.
- Pack raw and ready-to-eat food separately, label or colour code bags to show their intended use.
- Check bags for spillages after every use and discard if there has been spillage or soiling.
- Use cool bags for highly perishable food and place in fridge as soon as possible.

Suggested Activities

1. Research current cases of microbial contamination that have occurred involving:
 - primary producers
 - food manufacturers
 - establishments that serve food
2. Conduct a HACCP for:
 - primary producers
 - food manufacturers
 - establishments that serve food
 - consumers
 Use 'My HACCP' on the FSA website for food manufacturers.
3. Examine the FSA guide 'Safe Catering'. Use the guidance for a food business that you have recently opened to ensure good hygiene standards are met.

