PRACTICAL ACTION
Technology challenging poverty

FOOD POISONING AND ITS PREVENTION

technical brief

Categories of risk

Foods can be grouped according to the potential risk from food poisoning into three categories:

1. Those in which one or more ingredients are likely to be contaminated with food poisoning bacteria.
2. Those in which the processing stage is unlikely to destroy food poisoning bacteria.
3. Those in which food poisoning bacteria may grow after processing if the food is not properly packaged or handled.

Table 1: Risk of food poisoning from different types of food, and categorisation (according to the three categories above) as to what is most likely to be the cause:

Type of food	Risk category	Risk of food poisoning
Baked goods		
Bread	3	LOW
Cakes	1,3	LOW
Biscuits		LOW
Roasted food		
Meat and poultry	1,3	MEDIUM
Vegetables		LOW
Nuts	1	MEDIUM
Pickled food		
Vegetables	1	LOW
Fish	1	MEDIUM
Canned foods		
Fruits		LOW
Vegetables	1,3	LOW
Meat and fish	1,3	LOW
Dried foods		
Fruit		LOW
Vegetables	1,2,3	MEDIUM
Nuts	1	MEDIUM
Pluses, beans		LOW
Herbs and spices	1,2,3	HIGH
Sugar based foods		
Preserves		LOW
Confectionery		LOW
Honey		LOW
Type of Food	**Risk category**	**Risk of food poisoning**
Frozen foods		
Meat, fish and poultry	1,2,3	HIGH
Vegetables	1,2,3	MEDIUM
Dairy products	1,2,3	MEDIUM

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Snack foods		
Dried	3	LOW
Fried	3	MEDIUM
Fermented foods		
Alcoholic drinks	1	LOW
Yoghurt	1	LOW
Cheese		MEDIUM
Oils and fats		LOW
Fresh foods		
Fruits		LOW
Vegetables		LOW
Meat and fish	1	HIGH
Milk	1	MEDIUM
Eggs	1	MEDIUM
Root crops		LOW
Cereal grains		LOW
Prepared foods		
Sausages, beef burgers, fish cakes	1,2	HIGH
Desserts	1,2	MEDIUM
Ice cream	1,2	HIGH

The foods which are most at risk of causing food poisoning are low acid, moist foods such as meat (especially poultry), fish, sea-foods, vegetables, milk and eggs. This is especially so if the foods are not heated to high temperatures. Such foods include those that have been frozen, dried, chilled or fermented. Generally, the main risk comes from heated foods (those which have been baked, fried, canned or roasted) and dried foods, after the food has been processed. Usually the risk is associated with poor handling and storage procedures. The main exceptions to this are herbs, spices and some types of nuts (especially groundnuts) where contamination of the raw materials is a major problem. Any prepared food that contains these products as ingredients is a potential source of food poisoning. In general, acid foods such as fruit products are not a source of food poisoning.

Types of food poisoning

Staphylococcus aureus

This bacterium produces a poison in food which can withstand heating and is resistant to the levels of salt (sodium chloride) which are commonly present in such foods as pickles. High levels of salt can normally kill many other types of bacteria. *Staphylococcus aureus* can be carried by workers and transmitted into processed food when they handle it.

The symptoms of poisoning are nausea, vomiting, diarrhoea and stomach cramps. They appear within 1-4 hours of eating contaminated food and last for 10-12 hours. Poisoning is rarely fatal. The main sources of poisoning are dairy products, especially cheese, processed meats and pastries. The bacteria are carried by people, in the throat, and in infected cuts and other skin disorders. People should not therefore handle food if they have coughs or skin complaints. This type of poisoning is difficult to trace because the bacterium can produce the poison before the food is processed. Heating can kill the bacterium but leave the poison in the food.

Salmonella

Salmonella is the most common cause of food poisoning in many countries and these bacteria occur in foods that are not heated sufficiently or are contaminated after heating. The main sources are poultry, eggs and egg products but dairy products are also a potential risk. Particular care is needed to keep raw foods away from cooked foods, to carefully clean utensils and equipment, and to stop anyone with a stomach complaint from handling processed food. Personal hygiene of the food

handlers must be very high.

The symptoms of Salmonella poisoning are diarrhoea, vomiting and fever and occur 10-24 hours after eating the poisoned food and last for 48-96 hours. Salmonella poisoning may be fatal to the very old, very young or the infirm so particular care is needed when making infant foods or weaning foods.

Shigella

This is a bacterium associated with sewage. Poisoning is caused by direct contact of food with sewage or by indirect contact (for example by operators' hands, equipment or by contaminated water). Personal hygiene and correct water treatment are therefore essential to prevent poisoning. Shigella is found where poor hygiene exists.

The symptoms are diarrhoea, fever and nausea which appear from 7 hours to 7 days after eating contaminated food. They may last for a week but are rarely fatal. Any food that requires manual preparation is a potential source.

Escherichia coli

This bacterium is also associated with sewage contamination of foods, water or poor personal hygiene. The bacteria themselves can cause food poisoning or they can produce a poison in the gut. The most common food source is red meat which is contaminated at slaughter. Meat products (for example sausages) as well as dairy products (especially cheese) are also potential sources of food poisoning. Other sources (for example pasteurised milk, ice cream, cooked meats) indicate contamination after processing and hence poor hygiene by the food handlers.

Campylobacter fetus

The most common sources of this bacterium are contaminated water and unpasteurised milk, although poultry and other meats are also important sources. Proper chlorination of water and heating of foods will destroy these bacteria. Illness occurs 2-5 days after eating contaminated food and symptoms are diarrhoea, muscle pain and headaches with vomiting. It is usually brief and not fatal.

Clostridium perfringens

The most frequent cause of this type of poisoning is slow and inadequate cooking of meats. The bacteria produce spores which rapidly germinate after eating and produce a poison in the gut. It can be prevented by good sanitation, by heating food adequately and keeping cooked food cool (below 10°C) or hot (above 60°C).

The symptoms are stomach cramps without vomiting and diarrhoea. They appear within 8-24 hours of eating contaminated food and last for 24 hours. The illness is not fatal.

Clostridium botulinum

Botulism is a rare but serious paralytic illness caused by a nerve toxin that is produced by the bacterium *Clostridium botulinum*. There are three main kinds of botulism:

- Food-borne botulism is caused by eating foods that contain the botulism toxin.
- Wound botulism is caused by toxin produced from a *Clostridium botulinum* -infected wound.
- Infant botulism is caused by consuming the spores of the botulinum bacteria which then grow in the intestines and release the toxin.

All forms of botulism can be fatal and are considered medical emergencies. This is a serious type of food poisoning that has many varied symptoms and is often fatal. In the United States, around 140 cases are reported each year. Of these, approximately 15% are foodborne, 65% are infant, and 20% are wound.

Symptoms are blurred or double vision, weakness, difficulty in swallowing and breathing and, if untreated, paralysis, unconsciousness and death. The symptoms appear with 18-36 hours of eating the poison and should be treated promptly with a botulin anti-toxin.

The poison is destroyed by heating food to 90°C for at least 15 minutes but the bacterial spores survive this processing and higher temperatures are required to destroy them. The most common sources are canned meat, fish and vegetables, preserved meats and fermented fish products. A high degree of technical knowledge and skill is needed when canning low acid foods or preparing fermented meat and fish products.

Bacillus cereus

This type of bacterium produces two types of poisoning. The first is relatively mild diarrhoea and stomach pains which occur 8-12 hours after eating contaminated food and last for about 12 hours. The second is more serious and causes vomiting and diarrhoea 1-5 hours after eating food. Both are caused by a poison produced by the bacteria and are not fatal. The first type may occur in a wide variety of foods including re-hydrated dried vegetables, soya bean sprouts and potato products. The second type is mostly associated with cooked rice. Poisoning can be prevented by good hygiene and by not holding cooked foods for long periods at room temperature.

Hepatitis A

This virus is transmitted from infected people to food. It is easily destroyed by heating and the main sources are therefore raw foods or foods which are contaminated after heat processing. It can be prevented by not allowing infected people to handle food.

Parasites

Trichinella spiralis is a common food poisoning parasite found in meat (especially pork). It can be destroyed by heating the food to at least 60°C. Hygiene and sanitation are not involved as causes of this illness. Other parasites include protozoa on vegetables, intestinal worms in meat and fish and numerous other parasites (e.g. giardia and amoeba) in contaminated water.

Mycotoxins

There are a large number of poisons produced by moulds, but relatively few are involved in food poisoning. Aflatoxin poisoning is, however, a significant problem associated with cereals and oilseeds, particularly groundnuts, cotton seed, wheat, sorghum, maize and rice. It is a poison produced by two moulds (*Aspergillus flavus* and *Aspergillus parasiticus*) when the cereals and nuts are not dried sufficiently quickly or to a low enough moisture level. This is a particular problem with unshelled groundnuts where the mould can grow on the nut, under the shell and contaminate the nut with poison. These nuts become discoloured and should be discarded. Poisoning can be prevented by not allowing the mould to grow – this means drying the food quickly to a sufficiently low moisture content.

References and further reading

Food Link: your complete guide to food safety. Food poisoning
http://www.foodlink.org.uk/factfile.asp?file=1

Downloadable PDF file available at:
http://www.foodlink.org.uk/factfile1.pdf

Food Poisoning: Medic8 family Health Guide
http://www.medic8.com/healthguide/articles/foodpoisoningoverview.html

Food Standards Agency, Eat well, be well – Food Poisoning
http://www.eatwell.gov.uk/healthissues/foodpoisoning/

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Making Safe Food: A guide to Safe Food Handling and Packaging for Small-scale Producers, P. Fellows, Practical Action, 1998

Quality Assurance for Small-scale Rural Food Industries: FAO Agricultural Services Bulletin 117, Food and Agriculture Organization, 1995

Starting a Small Food Processing Enterprise, P Fellows, Practical Action Publications/CTA, 1996

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