

PART 7 OF 7

Zoonotic food-borne diseases

Zoonotic food-borne diseases are caused by eating food, or drinking water or milk contaminated by pathogenic microorganisms. According to **Dr Jan H du Preez**, a veterinary specialist in public health, the problem requires prevention and control throughout the food chain.

A zoonotic food-borne disease is an infection or intoxication that results from eating food of animal origin contaminated with live microorganisms or their toxins. Zoonotic food-borne intoxication (poisoning) is a form of food-borne disease caused by ingestion of a preformed toxin. Food poisoning is a specific disease condition arising soon after eating solid or liquid food.

Certain bacteria produce biological poisons or toxins under specific circumstances during rapid multiplication. Animals that excrete these organisms in their milk or faeces are important sources of infection.

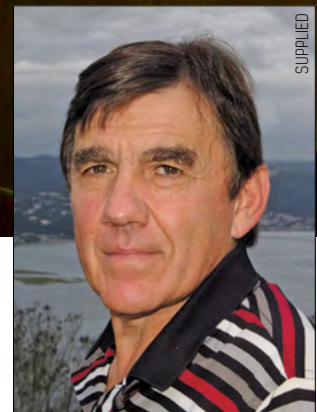
Food can become contaminated at various stages of the food chain; this can happen on the farm, during slaughtering, during further processing, or in the kitchen.

Zoonotic food-borne diseases are a significant and widespread public health threat. More than 320 000 human cases are confirmed in the EU each year, but the actual number is likely to be far higher. In many countries, bacterial food-borne zoonotic infections are the most common causes of human intestinal disease.



Salmonella and *Campylobacter* account for over 90% of reported cases of bacteria-related food poisoning worldwide. Poultry and its products have been incriminated in the majority of traceable food-borne illnesses caused by these bacteria, although all domestic livestock are reservoirs of infection. The US-based Centers for Disease Control estimates that 48 million cases of food-borne illness occur in that country annually, and many of these are zoonotic. This leads to about 3 000 human deaths a year in the US.

ABOVE: Food can become contaminated at several stages of the food chain, for example during animal slaughtering. PHOTOS: DR JAN H DU PREEZ



DR JAN H DU PREEZ

STAPHYLOCOCCUS AUREUS

Staphylococcal food-borne intoxication, or enterotoxigenic (a gastrointestinal illness), is a classic example of food poisoning resulting from bacterial contamination. Some strains of *Staphylococcus aureus* produce enterotoxins resistant to heat that elicit specific symptoms in

humans when ingested, such as severe nausea, retching, vomiting, stomach cramps, diarrhoea and abdominal pain. These symptoms have a rapid onset and usually appear one to six hours after eating food, such as chicken pie, in which the staphylococci have actively multiplied and already excreted the toxin. The illness cannot be passed to other people and it typically lasts for one day, but can last up to three days.

Dairy cows frequently suffer from mastitis, a form of inflammation of the udder caused by staphylococci, which is not readily detectable. The milk of cows with subclinical (inconspicuous) mastitis is quite frequently contaminated with staphylococci. If such milk is not properly cooled but maintained at a temperature above 20°C, the bacteria multiply extremely rapidly, and there is a danger that food poisoning may result from the consumption of the milk itself or from dairy products or food, such as puddings, prepared from it. Although the bacteria are killed off by heating processes, the enterotoxin is not inactivated by heat or gastric juices. To make matters worse, food containing toxins may not smell bad or appear spoiled.

SALMONELLA

Another zoonotic food-borne illness, salmonella food poisoning or salmonellosis, is caused by *Salmonella enterica*, *S. bongori* (several subspecies and serovars) and other species. It follows after ingestion of food containing very large numbers of *Salmonella* bacteria that have multiplied from a relatively small number of bacteria. This rapid increase in the intestine overwhelms the host's defensive capabilities and produces the symptoms of illness. Salmonella also produces toxins such as enterotoxin.

The more bacteria ingested, the more rapid the onset and more severe the symptoms. These occur six to 36 hours after ingestion (the faecal-oral route



TOP: Poultry and poultry products have been incriminated in the majority of traceable food-borne illnesses caused by *salmonella* and *campylobacter* bacteria.

ABOVE: Because the shells of duck and hen eggs may be contaminated, the use of cracked eggs is a potential health hazard.

is important) of contaminated food. Acute diarrhoea and moderate abdominal cramps are symptomatic, and nausea, vomiting, fever and headaches also occur. Symptoms may persist for up to a week.

Prolonged diarrhoea can be dangerous, especially in individuals with weakened immune systems or people with HIV. Salmonella is one of four key global causes of diarrhoeal diseases.

Almost any animal can be a carrier of *Salmonella* bacteria, although it may show no signs of the disease. Cattle, sheep, horses,

pigs, goats, poultry, birds, dogs, rodents, fish, reptiles and game are the major carriers, although reptiles, birds, mammals and even insects may be infected. Carriers usually shed the bacteria in their excreta; this can lead to contamination of water, which in turn may contaminate food.

The same applies to human carriers of salmonella. Food usually becomes contaminated during production, handling or preparation. Because the shells of duck and hen eggs may be contaminated, the use of cracked or broken eggs is a potential health hazard, as the contents of such an egg may be contaminated. Even the handling and breaking of whole eggs may lead to the contamination of food.

RECONTAMINATION: AN ADDED RISK

Milk and meat may become contaminated with salmonella during production, handling and storage from carriers such as dairy cows, slaughter stock, rodents or humans. When work surfaces, hands and kitchen utensils become contaminated from, for example, a chicken carcass, the salmonella may be transferred to other food items. Fortunately, the bacteria are fairly easily destroyed by cooking, so that cooked food is safe unless it becomes recontaminated after cooking.

Because of the ample opportunity for contamination of food of animal origin, it is wise to assume that all such food is contaminated. For this reason, it should be consumed shortly after adequate cooking.

HISTAMINE FISH POISONING

Histamine fish poisoning is among the most common toxicities related to fish ingestion. It resembles an allergic reaction, but in reality is caused by bacterially-generated toxins in the fish tissue. The problem occurs in more than 100 fish species. Spoilt fish of the families Scombridae and Scomberesocidae, which



include tuna, mackerel, marlin, bonito, kahawai and butterfly kingfish, for example, are commonly implicated in incidents of histamine fish poisoning, leading to the term scombroid fish poisoning to describe this illness. Scombroid fish contain an amino acid called histidine.

However, certain non-scombroid fish, most notably mahi-mahi, bluefish and sardines, when spoiled, are also commonly implicated in histamine fish poisoning.

Symptoms of this intoxication include nausea, vomiting, diarrhoea, an oral burning sensation or peppery taste, hives, facial swelling, headaches, dizziness, sweating, abdominal pain, pulmonary oedema, paralysis, itching, red rash and hypotension.

Despite its name, histamine fish poisoning can also occur in certain types of cheese.

The onset of the symptoms usually occurs within a few minutes after ingestion of the food, and the duration of



symptoms ranges from a few hours to 24 hours. Antihistamine can be used effectively to treat this intoxication.

PREVENTION AND CONTROL

- Healthy animals, hygienic production and handling of food by healthy workers at all stages will prevent or limit contamination.
- Food should be chilled to below 4°C and maintained at that temperature until it is processed or used.
- Wash hands, food preparation surfaces and utensils thoroughly before and after handling raw foods to prevent recontamination of cooked foods.

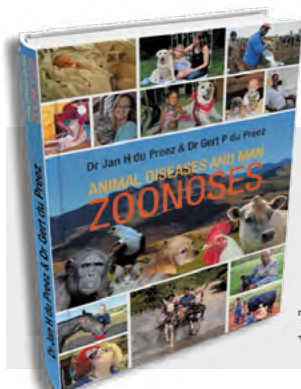
TOP LEFT: This pig has contaminated the water. Pigs, cattle, sheep, horses, goats, poultry, birds, dogs, rodents, fish, reptiles, game and other animals may carry *salmonella*, although they usually show no signs of the disease.

TOP RIGHT: Because food of animal origin can readily become contaminated, it is best to assume that all such foods are problematic. For this reason, food should be eaten soon after it has been cooked.

ABOVE: Milk of cows with inconspicuous mastitis is quite frequently contaminated with *staphylococci* bacteria that can produce toxins.

- Subject all food of animal origin to adequate heating (pasteurisation, sterilisation, boiling or UHT treatment of milk, and preservation by canning or cooking of other food) before consumption.
- Serve hot foods immediately or keep them heated above 60°C.
- Food poisoning tends to occur between 4°C and 60°C; bear this in mind when preparing food.
- Heat canned foods thoroughly before eating.
- Prevent contamination of raw vegetables with animal or human faeces.
- Be aware of the danger of consuming undercooked meat, fish, molluscs, raw aquatic plants such as watercress, raw leafy vegetables, and unwashed or unpeeled fruit.
- When in doubt, throw away.
- Bear in mind Bouley's dictum regarding food: "All that smells does not kill, but all that kills does not smell."

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 – Taylor, SL, Stratton JE & Nordlee JA. 1989. 'Histamine Poisoning (Scombroid Fish Poisoning): An Allergy-Like Intoxication.' *Journal of Toxicology: Clinical Toxicology*. 27: 225-240. Retrieved from doi.org/10.3109/15563658908994420.
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This seven-part series on zoonoses, written for *Farmer's Weekly* by veterinary specialist in public health Dr Jan H du Preez, features excerpts from his book, *Zoonoses: Animal Diseases and Man* (Malan Media), co-authored with Dr Gert P du Preez.

To order a copy of the book, visit zoonoses.co.za.