Food Toxins

Food poisoning can be caused by toxins although these are the least common cause. If this illness is caused by toxins then it is usually due to inadequate food preparation or poor choice of foods.

Note: when we say ‘poor choice of foods’ we are referring to wild mushrooms, berries etc. Many people enjoy foraging for these but if you considering doing this then make sure that you know which varieties to pick and which to leave well alone.
A toxin is defined as ‘a poisonous substance produced by a living organism’although it can also include ‘man-made’substances. Toxins are designed to cause harm to anyone or anything which comes into contact with them.

In regard to food poisoning: the types of toxins this guide deals with include:

- Mushroom toxins
- Red kidney bean toxins
- Shellfish toxins
- Pesticides

Many of the bacteria which cause food poisoning release toxins once they have penetrated cells within the human intestine. These toxins can spread within the gastrointestinal tract or travel to other parts of the body via the bloodstream.

Natural toxins

But as well as these toxins there are others, produced by certain types of foods, which are known to cause food poisoning. These foods contain ‘natural toxins’ which act as a form of protection for these foods against bacteria, strong sunlight and the weather.

In other cases, the toxin is a type of pesticide which helps to fight off insect attacks.

Foods which contain natural toxins include:

- Courgettes
- Red kidney beans
- Seeds within certain fruits, e.g. apples or peaches
- Rhubarb

- Sweet potatoes/potatoes

Another group of toxins found in fish are ‘marine toxins’.

Marine toxins

These toxins are found in fish such as tuna, mackerel, prawns and oysters and are responsible for several types of food poisoning which include scombroid poisoning, ciguatera poisoning and neurotoxic poisoning.
These toxins are found within various seaweeds and algae or occur when fish starts to decompose (or has ‘gone off’).

Pesticides

These are often sprayed over crops in fields to protect them from insects, bacteria, parasites etc. Examples of these include fruits and vegetables.

However, they have been linked with some forms of bacteria which are known to cause food poisoning. These include the e coli, salmonella and listeria bacteria which often multiply after contact with pesticides.
Children appear to be a greater risk of poisoning from pesticides than adults which may be due to their greater exposure, for example handling and playing with soil; or because they are more vulnerable to the effects.

Find out more in our children and food poisoning section.
Food poisoning caused by toxins tends to be rare but it is useful to know what the risks are and how these can be prevented. Find out more within this section of this guide.

Mushroom toxins

What are ‘mushroom toxins?’ This is the name given to a group of toxins which are found within various forms of fungi such as mushrooms and toadstools.

This occurs in wild mushrooms only. The mushrooms that you purchase within supermarkets are safe to eat.

Many types of wild mushrooms contain toxins which once eaten, cause a range of effects that include food poisoning. Most forms of mushroom poisoning are unpleasant but there are others which can be fatal.

Causes of mushroom poisoning

The main cause is that of picking mushrooms in the mistaken belief that they are safe to eat. Foraging for wild mushrooms is a popular activity but it is easy to confuse those mushrooms which are safe to eat with those which are deadly.

Many species of poisonous mushrooms are similar in appearance to those which can be eaten so it is easy to confuse the two.

Even experienced mushroom foragers can get this wrong so if you are thinking of doing this, you need to be absolutely sure that you know which mushrooms to choose and which to avoid.

Poisonous mushrooms

So which mushrooms (and toadstools) should you avoid?

These toxic versions include:

- Death cap mushrooms (this causes many fatal poisoning cases).
- Inocybe mushrooms
- Cortinarius mushrooms
- Magic mushrooms

Many of these poisonous mushrooms are only seen in rural areas. So, if you live in a town or city you are unlikely to be at risk.

The worst variety is the ‘death cap’ mushroom which can cause a severe gastrointestinal infection followed by liver or kidney failure. In some cases this can be fatal.

What is important to remember is that each species of poisonous mushroom will contain its own variety of toxins. So the effects of eating any of these will vary according to the type of toxin present within that mushroom.

Symptoms of mushroom poisoning

These are very similar to many types of food poisoning and include:

- Nausea

- Vomiting
- Diarrhoea (may be watery)
- Abdominal cramps/pains
- Fever

These symptoms are common to many types of mushroom poisoning. These are accompanied by a range of other symptoms which will vary according to the toxicity.

Examples of these include: dizziness, rapid heartbeat, hallucinations, flushes and headaches. These often appear after the gastrointestinal symptoms.

Be aware that several varieties of mushrooms contain a nerve toxin which causes symptoms such as chills, sweating, seizures and coma.

Those mushrooms with fewer toxins will cause a lesser form of poisoning than those with a higher degree of toxins. But eating any type of poisonous mushroom will cause you to become ill.

Treatment for mushroom poisoning

Some species of mushrooms cause mild forms of gastrointestinal illness which can be treated at home. However, others cause serious even life threatening illnesses which require hospital treatment.

Most forms of mushroom poisoning respond well to treatment. However, poisoning caused by mushroom such as the death cap has a high fatality rate even if it is treated right away.

The reason for that is that mushrooms such as the death cap contain a very high level of toxins which can cause serious damage. An example of this is organ failure (kidney or liver) which, in some cases, can be treated via a transplant but only if there are suitable donor organs.

The quicker someone with this type of poisoning is treated the greater their chance of survival.

Treatment is based upon intensive support which includes fluid replacement (inc. electrolyte therapy), charcoal and medication such as antibiotics.

All patients are closely monitored during their illness, usually every 4 hours or so and will undergo further tests to check liver and kidney function.

Most people recover well from mushroom poisoning but this is less so for those people who have consumed highly toxic mushrooms.

Prevention of mushroom poisoning

If you are uncertain as to what types of wild mushrooms to pick then avoid doing so. It is difficult to know which wild mushrooms are safe and which are not and even experts get it wrong.

If you want to be safe then avoid picking any wild mushrooms. Also prevent your children from doing so.

Red kidney bean toxins

Red kidney beans form part of the pulses family (which also includes peas and lentils) and are available in both dried and tinned versions. They are often used in recipes such as chilli con carne.

These and other types of beans are considered healthy and nutritious but there is a downside to this. The downside is that they are also capable of causing food poisoning.

Causes of red kidney bean poisoning

The main cause is a toxin called ‘phytohaemagglutinin’ or kidney bean lectin. This is a sugar based protein (glycoprotein) which is found in many types of beans which includes cannellini beans and broad beans.

But some of the highest concentrations of this toxin are found in red kidney beans.

This toxin is killed if red kidney beans are cooked at a high enough temperature and for the right length of time. It is also important that red kidney beans are prepared correctly before use which means soaking them for at least 8 hours before hand.

But if they are cooked for shorter periods of time or at lower temperatures such as those in slow cookers then this will be insufficient to kill this toxin.

Undercooked red kidney beans are more toxic than raw kidney beans.

Symptoms of red kidney bean poisoning

These symptoms appear around 2 to 3 hours after the kidney beans have been eaten. However, it only takes a few beans to cause the following symptoms:

- Nausea
- Vomiting
- Diarrhoea
- Abdominal pains

These symptoms appear soon after consumption but, they also disappear quickly as well.

How is this diagnosed?

A diagnosis will be made via a physical examination, these symptoms and the types of foods that have recently been eaten.

Treatment for red kidney bean poisoning

Most cases resolve themselves within a few hours. But there have been cases which have required admittance to hospital. This is usually been due to the quantity of beans consumed and dehydration.

Persistent vomiting or diarrhoea can result in a depletion of fluids, and electrolytes which need to be replaced. This can be done at home via an ‘oral re-hydration’powder which can be purchased at a local pharmacy.

But serious cases of dehydration will require fluid replacement via an intravenous drip.

Preventing red kidney bean poisoning

This type of food poisoning occurs as a result of consuming raw or undercooked kidney beans. So in order to prevent this from happening, take the following precautions:

- Soak the red kidney beans for up to 8 hours. This can be done overnight if you prefer.
- Drain and rinse these beans. Throw this water away
- Put these beans in a pan of cold water and bring to the boil
- Boil them for at least 10 minutes to destroy the toxins
- Simmer them for 45 minutes to an hour

If these beans are still hard in the centre then cook them for longer until they have softened.

Follow any cooking instructions carefully and do not be tempted to shorten the cooking time.

Shellfish toxins

Shellfish poisoning is a risk for anyone who enjoys travelling and especially to areas of the developing world. Many species of fish such as oysters, clams and mussels contain potent toxins – known as marine toxins, which can cause food poisoning.

These marine toxins are caused by bacteria and viruses which invade shellfish, and other types of fish via consumption of contaminated algae or marine organisms in the surrounding water.

Toxins are found within the head, liver and intestines of fish.

Types of fish/shellfish

These include herbivorous and carnivorous fish as well as shellfish.

Herbivorous fish are fish which feed upon vegetable matter within oceans and seas. This includes aquatic plants, plankton and algae (e.g. seaweeds). Examples of herbivorous fish include trout and red snapper.

Carnivorous fish eat meat or flesh of other animals which includes fish, seals and even humans. Examples of these include moray eels, sea bass, piranhas and sharks.

Shellfish are found in freshwater as well as sea water and include shrimps, prawns, oysters, cockles, clams and mussels. They are also known as ‘filter feeding molluscs’ which means that they use a filter process as they feed upon algae and plankton within the surrounding water.

Types of shellfish poisoning

All of these fish contain toxins which are responsible for the following types of food poisoning:

- Ciguatera poisoning
- Scombroid poisoning
- Shellfish poisoning

Ciguatera poisoning

A good example of this is ciguatera poisoning which occurs when fish such as sea bass consume small marine organisms known as ‘dinoflagellates’ which are found in or near coral reefs.

These dinoflagellates contain toxins, e.g. ciguatoxin, which is consumed by fish and increases in strength and concentration as they move up the food chain. These toxins are highly potent by the time they reach the human food chain.

Once consumed by humans they cause ciguatera food poisoning – an unpleasant gastrointestinal illness which is followed by neurological symptoms such as depression and fatigue.

Ciguatera poisoning is discussed in more detail within our fish food poisoning section.

Scombroid poisoning

Scombroid poisoning occurs when fish has decayed or become ‘spoiled’ due to inadequate storage, i.e. has not been stored at the correct temperature within a fridge.

As the fish decays the bacteria within it produce toxins such as histamines which cause symptoms very similar to an allergic reaction. These symptoms include nausea, vomiting and diarrhoea as well as flushing, blurred vision and a severe headache.

These symptoms usually clear up by themselves although serious cases will require hospital treatment.

Scombroid poisoning is discussed further in our fish food poisoning section.

Shellfish poisoning

There is more than one type of food (or fish) poisoning caused by these molluscs which include:

- Paralytic poisoning
- Neurotoxic poisoning
- Diarrhoeic poisoning
- Amnesic poisoning

These are all caused by shellfish feeding on contaminated algae or plankton (dinoflagellates) which contain a variety of toxins such as saxitoxin or brevetoxins.

If you eat shellfish which contain these toxins then expect to develop one of the following forms of fish poisoning.

Paralytic poisoning

This is the most common type of shellfish poisoning. It is caused by the consumption of shellfish which contain a number of chemicals that are derived from saxitoxin.

Saxitoxin is a neurotoxin which when consumed, attacks the nervous system within humans as well as causing gastrointestinal illness.

Symptoms of paralytic poisoning include:

- Tingling
- Burning
- Drowsiness
- Lack of co-ordination/clumsiness
- Slurred speech
- Dry mouth

- Choking feeling in throat

This also includes the usual symptoms of food poisoning, for example nausea, vomiting and diarrhoea.

These symptoms appear 30 minutes to an hour after consumption and can cause serious damage such as muscle paralysis and respiratory failure which can be fatal. This poisoning is particularly serious in children.

Neurotoxic poisoning

Another type of poisoning which occurs following consumption of infected shellfish. In this case, the shellfish contain a type of toxin called ‘brevetoxins’which cause symptoms very similar to those of paralytic poisoning or ciguatera poisoning.

Symptoms of neurotoxic poisoning include:

- Numbness/tingling in the mouth, arms and legs
- Dry mouth
- Poor co-ordination
- Slurring of the speech
- Drowsiness
- Nausea
- Vomiting
- Diarrhoea

This also causes both neurological and gastrointestinal symptoms.

Recovery takes 2 to 3 days from neurotoxic poisoning.

Diarrhoeic poisoning

Diarrhoea is the main symptom - hence the name but it also includes other symptoms such as nausea, vomiting, chills and abdominal pains.

This type of poisoning is caused by a variety of toxins which includes okadaic acid and yessotoxin. Okadaic acid is the toxin which is directly responsible for causing persistent diarrhoea.

These symptoms develop very quickly, usually within an hour after eating contaminated shellfish. They last for a day or so and tend to resolve themselves without the need for treatment.

The one exception to this is if someone experiences severe diarrhoea which leads to dehydration. In this case they will require fluid replacement therapy via an intravenous drip.

Depletion of fluids caused by diarrhoea and/or vomiting can be dealt with at home if it is not severe. This means drinking plenty of fluids such as water and adding electrolytes to them to replace those lost through this illness.

These electrolytes are essential minerals such as sodium (salt) and potassium which come in powder form and can be added to a glass of water. They can be purchased over the counter at a local pharmacy.

Amnesic poisoning

This is a very rare form of poisoning which occurs as a result of eating infected shellfish. These shellfish will have consumed this when feeding upon a type of algae called ‘diatoms’ or brown algae which produces the toxin domoic acid.

This toxin is found in sardines and anchovies as well as shellfish.

This neurotoxin causes a range of symptoms which include:

- Vomiting
- Abdominal pain
- Diarrhoea

These symptoms of gastrointestinal illness appear within 24 hours of eating infected shellfish.

These are then followed by neurological symptoms which include:

- Headache
- Mental confusion
- Dizziness/disorientation
- Memory loss
- Visual disturbances
- Seizures

In severe cases, paralysis and even death may occur.

There is no known antidote so anyone with these symptoms requires hospital treatment as soon as possible.

Diagnosing shellfish poisoning

This usually involves a discussion about the symptoms, a physical examination and questions about the type of shellfish eaten.

If there any samples available of the infected shellfish or leftovers then these can be tested for signs of toxins via laboratory analysis.

Treatment for shellfish poisoning

This often depends upon the species of shellfish and the type of toxin (or toxins). But it is important to remember that there are no specific treatments for these toxins.

As all of these forms of poisoning cause vomiting and diarrhoea then fluids will need to be replaced which have become depleted as a result of these. This involves drinking fluids which contain electrolytes to restore essential vitamins and minerals.

Some cases will require hospital treatment especially those which involve children or people with a medical condition or a weakened immune system. This treatment will be supportive and involve fluid replacement and medication.

Mannitol is prescribed in cases of ciguatera poisoning and is given intravenously.

Preventing shellfish poisoning

If shellfish is cooked thoroughly and at the correct temperature then it should not result in food poisoning. Many species of shellfish contain bacteria such as e coli and viruses which include norovirusbut these are destroyed during cooking.
One exception to this is oysters which many people enjoy eating raw. If this applies to you then be aware that there will always be a risk with this and any other type of raw fish.

This unfortunately, doesn't apply to toxins such as those found in algae and marine organisms. This also includes ciguatera poisoning as these toxins are impervious to cooking, freezing, salting and pickling.

So, what measures can you take to protect yourself against shellfish poisoning?

Keep any fresh fish, e.g. tuna or mackerel in the fridge which will prevent them from decomposing and producing histamines which cause food poisoning.

Avoid eating any shellfish (or fish in general) if you are travelling in developing countries. Unless you are certain that these are free from contamination it is a good idea to avoid any of these due to the risk of bacterial or viral food poisoning.

Do not assume that cooking infected fish will kill these toxins because it doesn't. Cooking these fish at high temperatures or conversely, freezing them does not destroy their toxins.

If you are not sure about any fish, and this includes shellfish then do not eat them.

Pesticides

Many people do not associate pesticides with food poisoning but these do contain toxins which can cause a range of health problems which include food poisoning.

What are pesticides?

Pesticides are substances, for example chemicals which are used to kill or repel pests. These pests include insects, birds, mammals, weeds, roundworms and microbes.

Most people think of pesticides in conjunction with food such as those which are sprayed onto fields of crops to protect them against harm by insects, birds and other potential threats.

But pesticides can be used in a variety of other ways which include:

- Herbicides: to kill/control weeds and other harmful plants
- Rodenticides: to kill/control rodents such as mice and rats
- Fungicides: to kill/control fungi (e.g. mushrooms)
- Avicides: to kill/control birds

These are just a few of the many forms of pesticides.

There are many advantages of using pesticides but unfortunately, there are several disadvantages as well. One of these is the negative effect they have on our health.

Pesticide poisoning

Pesticides are often used on foods such as fruit and vegetables but consuming these is likely to cause health problems especially for people who handle these foods.

But consuming these foods is as equally as bad.

Causes of pesticide poisoning

It has been claimed that some pesticides cause several types of food poisoning bacteria to thrive and spread this illness. Certain bacteria such as e coli or salmonella respond to these pesticides by multiplying which increases the risk of food poisoning.

This debate still goes on.

Symptoms of pesticide poisoning

Eating fruit or vegetables which have been sprayed with pesticides can cause the following symptoms:

- Abdominal cramps
- Vomiting
- Nausea
- Diarrhoea

- Headache
- Blurred vision
- Feeling weak and shaky
- Twitchy muscles
- Extreme tiredness

These symptoms often appear within minutes of exposure to a pesticide although in some cases they may take longer to develop.

Children and pesticide poisoning

Children often face a greater risk of pesticide poisoning which is due to the following reasons:

- They are more likely to be exposed to the pesticide, for example, playing with infected soil.
- They are more likely to be unaware of the risks of eating unwashed fruit or vegetables which have been sprayed with pesticides.
- They are more susceptible to pesticide poisoning than adults

This poisoning can occur if they drink infected water or eat infected food. These pesticides can invade their bodies through their mouths but can also gain access through their skin or respiratory systems.

Babies are also at risk. Pesticides can infect even the unborn baby as they pass from the mother to the baby via the placenta. If the mother has consumed or been exposed to pesticides then she will pass these onto her unborn baby.

Breastfeeding is also a problem. A newborn baby can also be at risk as these pesticides may pass from the mother through her breast milk to the new baby.

These risks are greater for babies and children in developing countries.

Treatment for pesticide poisoning

It is important to seek treatment for pesticide poisoning even if you are unsure as to whether you have been infected or not. Contact your GP or obtain urgent medical advice if you have been exposed.