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Anaphylaxis

Anaphylaxis *can* cause death and is therefore a medical emergency. **If you suspect someone is suffering anaphylaxis, you should call 999/112/911 for an ambulance.**

The main treatment is an injection of adrenaline (epinephrine). Some people who have had a severe allergic reaction or anaphylactic reaction in the past carry an adrenaline (epinephrine) pen. This can be self-injected or injected by a bystander, in the event of anaphylaxis.

What is anaphylaxis?

Anaphylaxis is the name given to an extreme form of allergic reaction. Typically, it occurs very suddenly and without warning. The symptoms affect many parts of the body. Anaphylaxis can cause swelling of the lips and tongue, breathing problems, collapse and loss of consciousness. The symptoms become rapidly worse and, without treatment, can cause death.

How common is anaphylaxis?

Available UK estimates suggest that approximately 3 in 4,000 people in England have experienced anaphylaxis at some point in their lives. There are approximately 20 deaths from anaphylaxis reported each year in the UK, with around half the deaths having no identifiable cause for anaphylaxis. In the UK it is estimated that:

- About half a million people in the UK have had an anaphylactic reaction to venom (bee or wasp stings).
- Almost a quarter of a million people under 44 years of age have had anaphylaxis due to nuts.

Who gets anaphylaxis?

People who have had a mild or moderate allergic reaction are at risk of anaphylaxis. Some people may be at higher risk, either because of an existing condition (eg, asthma) or because they are more likely to be exposed to the same allergen again (eg, reactions to specific food triggers).

Certain foods, insect venoms, some medications and latex are common triggers. However there may be no clear identifiable cause. Food is a particularly common trigger in children and medications are much more common triggers in adults.

What causes anaphylaxis?

Anaphylaxis can **potentially** be caused by any allergen. Most allergens are proteins, but some (such as medications) are not. Many cases of anaphylaxis have no known cause. This is referred to as idiopathic anaphylaxis.

Causes of anaphylaxis:

- Idiopathic (unknown).
- [Food allergies](#) - common examples include nuts (for example, peanut, Brazil), shellfish and eggs.
- Venom (for example, bee or wasp stings).
- Medicines - common examples include:
 - Antibiotics - for example, penicillin.
 - Painkillers - for example, opioids such as morphine or codeine, or non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin.

What happens in an anaphylactic reaction?

An allergy is a response by the body's immune system to something (called an allergen) that is not necessarily harmful in itself. Certain people are sensitive to this allergen and have a reaction when exposed to it.

During an allergic reaction, a complex series of events occurs within the body. These events are co-ordinated by the immune system. Sometimes the immune system 'goes into overdrive'. If this happens, the body can lose control of its vital functions, with catastrophic results. Such a severe reaction can cause death. This is anaphylaxis.

On a more detailed level, changes happen within the walls of capillaries, the smallest blood vessels in the body. The capillaries become leaky, and fluid leaks from the blood into the tissues (blood is comprised of blood cells as well as fluid called serum). So much fluid is lost from the blood (vascular) system, that blood pressure falls. As the blood pressure drops, there is a lack of blood to the major organs. This is known as shock - and in this case is anaphylactic shock.

[See the separate leaflet called Allergies for more details.](#)

Anaphylaxis symptoms

Classic early symptoms of anaphylaxis include:

- **Wheezing and hoarseness.** This happens as the airways narrow.
- **Swelling of the lips, tongue and throat.** It is known as [angio-oedema](#). The swelling involves the deeper layers of the skin. Whilst it can occur around the eyes, and in the hands and feet, it is more significant when it affects the lips, tongue and throat. Swelling here can completely block your airway, meaning air (and therefore oxygen) cannot be breathed into the lungs. Without emergency treatment, this results in suffocation (asphyxiation).
- **An itchy rash**, like nettle rash - commonly called hives. [Urticaria](#) is the medical term. The rash is raised and generally pale pink in colour. The raised areas are called wheals. Not everyone having an anaphylactic reaction gets this rash.

Other symptoms include:

- Feeling faint - due to dropping of your blood pressure.
- A sense of impending doom.

- A fast heart rate (tachycardia) or the sensation of a 'thumping' heart (palpitations) as your heart tries to pump faster to maintain your blood pressure.
- Symptoms involving the gut (gastrointestinal tract). These include feeling sick (nausea), being sick (vomiting) and tummy (abdominal) pain.

Classic advancing symptoms of anaphylaxis include:

- **Stridor.** This is a noise created by trying to breathe in when the upper airways (namely the mouth, throat and upper windpipe (trachea)) are partially obstructed. This is due to swelling in these tissues.
- **Respiratory collapse.** This means that the breathing (respiratory) system of the body is failing. There might be fast, shallow breathing and the skin of the lips and tongue may become bluish (called cyanosis). If you cannot breathe air into the lungs, the blood cannot be oxygenated. Oxygenated blood is needed so that the cells in our body, and therefore the organs in our body, can work. It is vitally important that the brain should not be starved of oxygen. The heart muscle needs oxygen so it can pump the blood around the body. Once one major organ system of the body starts to falter, in turn the others become strained until they are unable to function too. Death is the result of such a catastrophic 'systems failure'.
- **Confusion,** agitation, anxiety and loss of consciousness. These symptoms soon follow. Low oxygen levels (hypoxia) can make you confused. If you are unable to breathe properly due to angio-oedema, you will feel restless and anxious – you are effectively suffocating. Eventually, loss of consciousness occurs.
- **Low blood pressure (hypotension)** and eventual circulatory collapse are the end events.

Do I need any tests for anaphylaxis?

Anaphylaxis is primarily a clinical diagnosis. This means that it is diagnosed based on the recognition of symptoms and the manner in which they occur – that is, quickly and rapidly worsening.

Anaphylaxis does need to be distinguished from other medical conditions that may have some similar symptoms. These include a [life-threatening asthma attack](#), or a [severe blood infection \(septic shock\)](#). There are also other conditions that are not life-threatening but that can initially seem similar to anaphylaxis. Examples include [panic attacks](#), [fainting \(vasovagal episode\)](#) or [idiopathic \(non-allergic\) urticaria](#) or [angio-oedema](#).

A blood test can be done to identify anaphylaxis and rule out other causes of the symptoms. The blood test measures mast cell tryptase. This is a chemical released by mast cells (a type of cell in the immune system) during a severe allergic reaction. Levels rise to a maximum within an hour of an anaphylactic reaction and stay higher than normal for up to six hours.

It is important to realise that the treatment for anaphylaxis is an emergency, so anyone with presumed anaphylaxis is treated as such. The blood test has no role in the immediate management of someone with a severe allergic reaction. After life-saving emergency treatment has been started and the situation is stable, this blood test can be taken. It is suggested to take one sample as soon as possible and another 1-2 hours after the anaphylactic reaction. A further sample can be taken once recovery is complete, or even at a follow-up appointment in an allergy clinic.

Anaphylaxis treatment

Anaphylaxis is a life-threatening emergency and needs to be treated in a hospital. **Call for an ambulance (999) immediately.**

First aid measures for anaphylaxis (out of hospital)

These include:

- Attempting to **remove the allergen** if this is possible (eg, swill mouth out to remove bits of the offending nut/food stuck between teeth, etc).
- Administration of an [adrenaline \(epinephrine\) auto-injector](#) (if there is one). This is a pre-filled syringe with a needle - sometimes referred to as an adrenaline (epinephrine) pen. The idea is that it can be injected by the person having the anaphylactic reaction (if there is time), or by a bystander who knows how to use it..

- **Cardiopulmonary resuscitation (CPR)** if the person is unresponsive and not breathing. If you are not medically trained or have not been taught how to perform CPR with rescue breaths, the new advice is to give hands-only CPR. This means you do not have to give mouth-to-mouth resuscitation (also called the kiss of life). If a person is found collapsed and is not breathing, after calling the emergency services, all you have to do is chest compressions. The idea behind this is simple - chest compressions are better than nothing, and many people are put off by the idea of mouth-to-mouth resuscitation. Hands-only CPR is unlikely to bring someone out of cardiac arrest (the heart has stopped). However, it will pump some blood around the body, and importantly the brain will get some oxygen from the blood it receives. (See below under 'Further Reading and References' for details of hands-only CPR.)

Hospital treatment

- People with presumed anaphylaxis are treated in the resuscitation room of an emergency department (ED).
- The main treatment is still adrenaline (epinephrine), usually given by injection into the muscle of the thigh (called an intramuscular (IM) injection).
- Resuscitation of someone having an anaphylactic reaction follows an ordered sequence - ABC:
 - **A stands for Airway.** An airway is essential to life - so that we can breathe. A swollen tongue from angio-oedema can block the airway. People with anaphylaxis are nursed lying flat. Sometimes a tube is needed to help keep the airway open.
 - **B stands for Breathing.** Oxygen is given with a face mask, or, if the patient has a tube for breathing, down that.
 - **C stands for Circulation.** Intravenous (IV) access - a 'drip' is needed for fluids and other medicines. Fluids may help to keep up the blood pressure and maintain blood circulation around the body.

- The specifics of treatment do depend on how well or unwell the person with anaphylaxis is. There is a great deal of difference between treating someone who is unconscious and in cardiac arrest (so needs resuscitation) and someone who is in the early stages of anaphylaxis. However, the point is that anaphylaxis progresses rapidly. ABC still needs to be considered before deterioration occurs.
- Other medicines used to treat anaphylaxis include antihistamines and a type of steroid (hydrocortisone). Sometimes a nebuliser is used. This is often a type of treatment given to people having an asthma attack. A medicine called salbutamol is inhaled like a fine mist, through a mask. It helps to open up (bronchodilate) tight airways in the lungs.
- Whilst treatment is ongoing, a person with anaphylaxis will be closely monitored. This involves (amongst other things) blood pressure monitoring, heart monitoring and a heart tracing (electrocardiogram, or ECG) and measurement of the oxygen levels in the blood (using a pulse oximeter to measure oxygen saturation - sats).
- If you have had an anaphylactic reaction, you will be kept in hospital for a minimum of 6–8 hours, to monitor your condition. Such a short admission is only appropriate if you recovered quickly and without complication. In other cases, admission and monitoring will continue longer. Children with anaphylaxis would normally be admitted to a children's (paediatric) ward and kept in hospital for a bit longer. There is a small risk of a problem called a biphasic reaction. This occurs where there is a delayed anaphylactic reaction, some 4–10 hours later.

What should I do if I think someone is having an anaphylactic reaction?

Anaphylaxis is likely when:

- There is a sudden onset of symptoms.
- Symptoms get rapidly much worse.
- There are life-threatening airway and/or breathing problems and/or circulation problems.

- There are skin changes such as swelling of the lips and tongue (angio-oedema), hives (urticaria) and flushing.

The person may have had a severe allergic reaction or anaphylaxis in the past. However, this may be the first time.

A person having difficulty breathing may prefer to sit up in a chair. It is best for a person feeling faint, to lie down.

- Look to see if the person is wearing a medical emergency bracelet or necklace. Are they carrying an **adrenaline (epinephrine) pen**? These are also called adrenaline (epinephrine) auto-injectors. Brands include EpiPen®, Emerade® and Jext®. If they are, you could save their life by administering it. Techniques for injection vary slightly, according to the device prescribed (see below). Each device is designed to be used only once - you cannot repeat the procedure with a used auto-injector.
- **Call 999/112/911 for an ambulance - act quickly as anaphylaxis is a medical emergency.**

Should I carry an adrenaline (epinephrine) pen just in case?

If you have had an anaphylactic reaction, you should be prescribed an adrenaline (epinephrine) auto-injector and taught how to use it. If for any reason you would be unable to use such a device (for example, young children, and those with some physical disabilities or a learning difficulty), parents or carers should be instructed.

One of the most important things is that you carry the auto-injector with you at all times - in your bag or about your person. Current best practice guidelines suggest that there should be immediate access available to two adrenaline (epinephrine) pens at any given time, and that schools, workplaces, family and friends are aware of the location of other adrenaline (epinephrine) pens so they can be found in an emergency. It is important these are always kept up to date and new pens should be prescribed shortly before existing ones reach their expiry date.

However, it is still vitally important to carry a device personally. There is no point in it being locked in a medicine box and being in the medical bay and inaccessible if anaphylaxis happens in the classroom or workplace.

Sensible measures should be taken – for very young children, it may be appropriate for the teacher to have the auto-injector. Teachers of children with a history of anaphylaxis should also be trained in how to administer adrenaline (epinephrine) auto-injectors.

How many adrenaline (epinephrine) pens do I need?

The British Society for Allergy and Clinical Immunology (BSACI) guidelines recommend that in most cases one pen should be sufficient for adults, whilst children should be prescribed two – one for school and one for home.

Adults who may require two include those who are obese, who live in remote areas or who have had a previous life-threatening reaction requiring two doses.

BSACI recommends that the ultimate decision about how many pens to prescribe should be a matter of discussion between the doctor and the patient.

The BSACI recommendations have not met with universal approval and a petition has been started to encourage BSACI to change its guidance. The petition points out that the guidance contradicts that of the Medicines and Healthcare products Regulatory Agency (MRHA) which recommends the prescription of two pens.

If you have had an anaphylactic reaction in the past you should ensure you do not become complacent about it. If you are prescribed an adrenaline (epinephrine) auto-injector, you should carry it with you at all times.

Many people think that having one in multiple places is safer, but actually the reverse is true. Some doctors will not prescribe multiple auto-injector devices. This is because it is better to have two and look after them carefully. You don't want to be in the one place you haven't kept a device when you have an anaphylactic reaction.

Adrenaline (epinephrine) auto-injector use

Note: the following is a **guide**. It is not intended as a substitution for proper training and instruction. Dummy devices exist that can be practised with (they do not contain any adrenaline (epinephrine) or have a needle).

To use Emerade®

- Remove the cap protecting the needle.
- Hold Emerade® against the outer side of your thigh and press it against your leg. You will hear a click when the adrenaline (epinephrine) is injected.
- Keep holding the pen against your leg for about 5 seconds. This allows the full dose of adrenaline (epinephrine) to be injected.
- Massage the area for 10 seconds. This helps the adrenaline (epinephrine) to work more quickly.
- Make sure you tell the paramedics that you have used an adrenaline (epinephrine) pen.

For more information on how to give Emerade®, see www.emerade-bausch.co.uk.

NB: in April 2020, the MHRA) advised that all batches of Emerade® 150 microgram, 300 microgram, and 500 microgram auto-injector pens be recalled from patients due to an error in one component of the auto-injector, believed to cause the failure of some pens to activate. See Further Reading below for more information.

To use EpiPen®

- Pull off the blue safety release cap at the end.
- Hold the pen firmly and swing your arm from about 10 cm (4 inches) away, pushing the orange tip against your outer thigh.
- The adrenaline (epinephrine) will be released automatically into your thigh muscle.
- Hold the pen in place for 10 seconds.
- As soon as you release pressure, a protective cover will extend over the needle tip.

- Massage the area for 10 seconds.
- Make sure you tell the paramedics that you have used an adrenaline (epinephrine) pen.

For more information on how to give EpiPen®, see www.epipen.com.

To use Jext®

- Grasp the pen in your writing hand, with your thumb closest to the yellow cap.
- Pull off the yellow cap.
- Push the black tip firmly against your outer thigh. You will hear a click which means the injection has started.
- Hold the injector in place against your thigh for 10 seconds; then remove it.
- The needle shield will automatically cover the needle when you remove the pen.
- Massage the area for 10 seconds.
- Make sure you tell the paramedics that you have used an adrenaline (epinephrine) pen.

For more information on how to give Juxta®, see www.jext.co.uk.

What is the outlook (prognosis) for anaphylaxis?

If you have had a confirmed anaphylactic reaction, you should be referred to an allergy specialist. Generally you would be seen in a hospital outpatient clinic by a consultant immunologist.

As an outpatient, further blood tests and other tests for allergies **may** be done. An example would be skin prick testing. [See the separate leaflet called Skin Prick Allergy Test for more details.](#)

The most important thing is to identify and avoid trigger factors. The allergy specialist will go through this with you. There are many cases where careful allergen avoidance will prevent the need to have treatment for an anaphylactic reaction in the first place.

It is also very likely that you would be prescribed an adrenaline (epinephrine) auto-injector device, such as those described below. You would be taught how to use one and be provided with written information on what to do in the event of a further anaphylactic reaction. Adrenaline devices should only be prescribed after proper testing and diagnosis. The BSACI has found that many people walking around with adrenaline (epinephrine) devices should not have been prescribed one in the first place.

It is a good idea to have a medical emergency identification bracelet or equivalent if you have a history of anaphylaxis. Any medically trained person, including paramedics, will check to see if a collapsed patient is wearing such an item.

Further reading

- [Emergency treatment of anaphylactic reactions – guidelines for healthcare providers](#); Resuscitation Council (UK) Guidelines (2008)
- [Anaphylaxis](#); NICE Clinical Guideline (December 2011 – last updated August 2020)
- [British National Formulary \(BNF\)](#); NICE Evidence Services (UK access only)
- [Simons FE, Arduzzo LR, Bilo MB, et al](#); International consensus on (ICON) anaphylaxis. *World Allergy Organ J.* 2014 May 30;7(1):9. doi: 10.1186/1939-4551-7-9. eCollection 2014.
- [Ewan P et al](#); BSACI guideline: prescribing an adrenaline auto-injector, 2016
- [Angio-oedema and anaphylaxis](#); NICE CKS, November 2018 (UK access only)
- [Nwaru BI, Dhimi S, Sheikh A](#); Idiopathic Anaphylaxis. *Curr Treat Options Allergy.* 2017;4(3):312–319. doi: 10.1007/s40521-017-0136-2. Epub 2017 Jun 3.
- [MHRA](#); Class 2 Medicines Recall: Emerade 150 micrograms solution for injection in pre-filled syringe. April 2020.

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