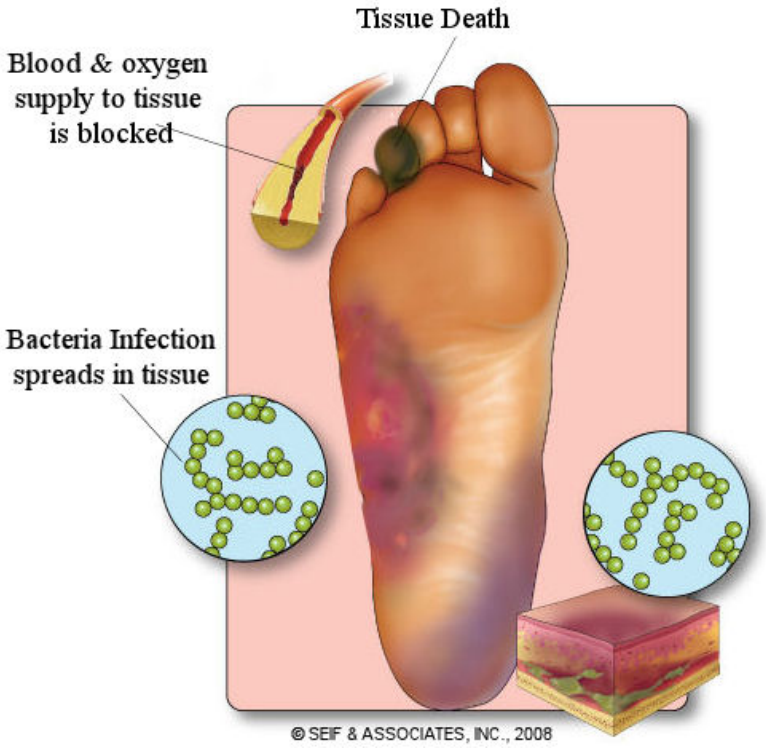
# Gangrene

Gangrene is the decay or death of an organ or tissue caused by loss of blood supply. It may be caused by infectious or inflammatory processes. Or it may be caused by degenerative changes in longstanding diseases such as diabetes. It may also occur following injuries or surgical procedures.




## TYPES OF GANGRENE

There are three major types of gangrene: dry, moist, and gas (a type of moist gangrene).

- **Dry gangrene** is a condition that results when one or more *arteries* become blocked. Arteries are muscular vessels which carry blood away from the heart and around the body. In this type of gangrene, the tissue slowly dies, due to loss of blood supply. But it does not become infected. The affected area becomes cold and black. It begins to dry out and wither. Eventually it drops off over a period of weeks or months. Dry gangrene is most common in people with advanced blockages of the arteries (*arteriosclerosis* or hardening of the arteries) resulting from diabetes.
- **Moist gangrene** occurs in the toes, feet, or legs after a crushing injury. Or it can be a result of some other problem that causes blood flow in an area to suddenly stop. When blood flow stops, bacteria begin to invade the muscle and grow. It multiplies quickly, without the body's immune system stopping it.
- **Gas gangrene** is also called muscle death (*myonecrosis*). It is a type of moist gangrene commonly caused by a germ (*bacterial*) infection. This is usually caused by a germ which can live in an area of little or no oxygen. Once present in tissue, these bacteria produce gasses and poisonous toxins as they grow. These germs are normally found in the gut, respiratory, and female urinary tract. They often infect thigh amputation wounds commonly in people who have lost control of their bowel functions *(incontinence)*. Gangrene, incontinence, and weakness often are found in patients with diabetes. It is in the amputation stump of diabetic patients that gas gangrene often happens. The most common germ to cause gas gangrene is Clostridia. Other germs which cause moist gangrene include various bacterial strains. These include Streptococcus and Staphylococcus. A serious, but rare form of infection with Group A Streptococcus can slow blood flow. If untreated, it can progress to gangrene. This is more commonly called *necrotizing fasciitis*. This is an infection of the skin and tissues directly beneath the skin. This is sometimes called the "flesh eating bacteria". It is called this because it can rapidly kill large areas of flesh in the body. It requires immediate surgical treatment or it will result in death.

## CAUSES

- Some illnesses can cause gangrene because the vessels carrying the blood are already diseased. Examples are:
  - Long standing illnesses, such as diabetes mellitus or arteriosclerosis.
  - Other diseases affecting the blood vessels, such as Buerger's disease or Raynaud's disease.

Other causes of gangrene include:

- Open bone breaks.
- Burns.
- Injections given under the skin or in a muscle.

- Gangrene may occur following surgery, particularly in individuals with diabetes or other long-term (*chronic*) disease.
- Gas gangrene can be also a complication of dry gangrene. Or it can happen suddenly along with an underlying cancer.

Moist gangrene and gas gangrene are different. Gas gangrene usually involves only the muscle. It does not involve the skin as much. In moist or gas gangrene, there is a feeling of heaviness in the affected area that is followed by severe pain. The pain is caused by swelling from fluid or gas accumulation in the tissues. This pain is the worst, on average, between one to four days following the injury. It can range from several hours to several weeks. The swollen skin may at first be blistered, red, and warm to the touch. Then it changes to a bronze, brown, or black color. In about 80% of cases, the affected and surrounding tissues may give off crackling sounds (*crepitus*). This is a result of gas bubbles accumulating under the skin. The gas may be felt beneath the skin. It feels and sounds like pushing on popcorn under a blanket of skin. In wet gangrene, the pus is foul-smelling. In gas gangrene, there is no true pus, just an almost "sweet" smelling watery discharge.

If the bacterial toxins spread to the bloodstream, the following may happen:

- A higher than normal temperature.
- Fast heart rate and breathing.
- Changed mental state.
- Loss of appetite.
- Diarrhea.
- Vomiting.
- Shock.

**Gas gangrene can be a life-threatening condition and should receive prompt medical attention.**

## SYMPTOMS

- Areas of either dry or moist gangrene are first noticed as a red line on the skin that marks the border of the affected tissues.
- As tissues begin to die, dry gangrene may cause pain in the early stages. Or it may go unnoticed.
  - This happens especially in the elderly or in individuals with decreased ability to feel pain.
- At first, the area becomes cold, numb, and pale. Later its color changes to brown, then black. This dead tissue will gradually separate from the healthy tissue and fall off.

## DIAGNOSIS

Learning what is wrong (*diagnosis*) of gangrene is based on:

- Patient history.
- Physical examination.
- Results of blood and other lab tests.

A caregiver will look for a history of:

- Recent damage caused by an accident (*trauma*).
- Surgery.
- Cancer.
- Chronic disease.

- Blood tests can be used to find out if infection is present and find how much it has spread.
- Drainage from a wound, or a tissue sample obtained through surgical exploration, may be cultured to:
  - Identify the germ causing the infection.
  - Help in figuring out which medicine (*antibiotic*) will be most effective.
- Gas accumulation and muscle death *(myonecrosis)* may not be visible. So X ray studies and more sophisticated imaging techniques may be helpful in making a diagnosis. They include:
  - Computed tomography scans (CT scans).
  - Magnetic resonance imaging (MRI).
  - These techniques are not sufficient alone to provide an accurate diagnosis of gangrene, though.
- Precise diagnosis of gas gangrene often requires surgical exploration of the wound.
  - During such a procedure, the exposed muscle may appear pale, beefy-red. In the most advanced stages, it may be black. If infected, the muscle will fail to contract with stimulation, and the cut surface will not bleed.

## TREATMENT

**Gas gangrene is a medical emergency. It requires immediate surgery and antibiotics. If the infection spreads to the bloodstream and infects vital organs, it can rapidly result in death.**

- Areas of dry gangrene that remain free from infection *(aseptic)* in the arms/hands and legs/feet ( *extremities*) are often left to wither and fall off. Treatments applied to the wound on the surface are generally not effective without enough blood supply to support wound healing.
- Evaluation by a vascular surgeon, along with x-rays to determine blood supply and circulation to the affected area, can help figure out if surgery would be helpful.
- Once the cause of infection is found, moist gangrene requires immediate intravenous, intramuscular, and/or topical broad-spectrum antibiotic therapy. Also, the infected tissue must be removed surgically. Amputation of the affected limb may be needed. Pain medications *(analgesics)* are prescribed for pain. Fluids injected into the veins (*intravenous fluids*) and, occasionally, blood transfusions are used to treat shock and replenish red blood cells and electrolytes. Plenty of water and healthy foods are needed for wound healing.
- Some cases of gangrene are treated by giving oxygen under pressure greater than that of the atmosphere *(hyperbaric)* to the patient. This happens in a specially designed chamber. The idea behind using hyperbaric oxygen is that more oxygen will become dissolved in the patient's bloodstream. So more oxygen will be delivered to the gangrenous areas. By providing the right amount of oxygenation, the body's ability to fight off the bacterial infection is believed to be improved. There is a direct harmful effect on the bacteria that thrive in an oxygen-free environment. Some studies have shown that the use of hyperbaric oxygen relieves pain, reduces the number of amputations required, and reduces the extent of surgical debridement (removal of dead or damaged tissue). Patients receiving hyperbaric oxygen treatments must be watched closely for evidence of oxygen toxicity. Signs of this toxicity include:
  - Slow heart rate.
  - Sweating.
  - Ringing in the ears.
  - Shortness of breath.
  - Nausea and vomiting.
  - Twitching of the lips/cheeks/eyelids/nose.
  - Convulsions.

There is not complete agreement among health care workers, whether this method of treatment has any value.

- The emotional needs of the patient must also be met. The individual with gangrene should be offered moral support, along with an opportunity to share questions and concerns. In addition, particularly in cases where amputation was required, physical, vocational, and rehabilitation therapy will also be required.

Except in cases where the infection has spread to the blood stream, the result of treated gangrene is usually favorable. Anaerobic wound infection (an infection with a germ that does not require oxygen to grow) can progress quickly from initial injury to gas gangrene within one to two days. About one fourth to one fifth of sufferers will die as the infection enters the blood stream. If recognized and treated early, about 80% of those with gas gangrene will survive, and only 15-20% will require amputation. Often the patient with dry gangrene has many other health problems. These complicate recovery. It is often those other system failures that can prove fatal.

## PREVENTION

Patients with diabetes or severe arteriosclerosis should take special care of their hands and feet. This is due to the risk of infection associated with even minor injuries. Education about good foot care is important. Poor blood flow as a result diseased blood vessels will lessen the body's defenses against invading germs (*bacteria*). Your caregiver will take steps to improve circulation whenever possible. **All injuries to skin or tissue should be cared for immediately.** Dying or infected skin should be removed immediately. This will prevent the spread of bacteria. Wounds into the belly should be surgically treated and damage repaired early. This should be followed up with antibiotic treatment. Patients undergoing non-emergency (*elective*) intestinal surgery may receive preventive antibiotic therapy. Use of antibiotics prior to and directly following surgery has been shown to significantly reduce the rate of infection.

## SEEK IMMEDIATE MEDICAL CARE IF:

- You show signs of gas gangrene.

**MAKE SURE YOU:**

- Understand these instructions.
- Will watch your condition.
- Will get help right away if you are not doing well or get worse.

Document Released: 10/19/2005 Document Re-Released: 03/16/2010
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