

## Shock

Shock is a life-threatening condition that occurs when there is inadequate delivery of blood for body cells to use. There are several different reasons or causes of this. Shock results in such symptoms as rapid heart rate and rapid loss of blood pressure. If both short-term and long-term blood pressure regulation mechanisms fail to solve the problem, shock can result in death. In fact, circulatory shock is one of the most common causes of death. Shock can arise from hemorrhaging (bleeding), which is called **hemorrhagic shock**. It can also result from failure of the heart to pump blood normally (such as in the case of a heart attack, irregular heartbeat, or valve problems), which is called **cardiogenic shock**. It can occur with severe allergic reactions that cause vasodilation and is called **anaphylactic shock**. Sometimes bacterial toxins (infection) can trigger widespread vasodilation and increased capillary permeability and this is called **septic shock**.

Whatever the cause of the shock, there are three stages of shock that a person can go through. The first is called **compensated shock**. Compensated shock is the initial stage in which blood pressure mechanisms seek to bring circulation back into homeostasis. Short-term responses such as the baroreceptor reflex, the CNS ischemic response, and the chemoreceptor reflex accelerate the heart rate and stimulate vasoconstriction. Long-term responses further cause vasoconstriction and attempt to increase blood volume.

If these attempts fail, circulatory shock advances into a dangerous positive-feedback cycle where heart rate increases steadily without any improvement in blood flow. This is called **progressive shock**. In this stage, blood pressure becomes so low that the body tissues including the heart begin to die. This is due to hypoxia as well as from toxins released from dying cells. Vasodilation increases due to loss of sympathetic nervous function. Capillaries begin to degenerate and become more permeable. This causes a larger net movement of solutes and water into the tissues. Widespread tissue deterioration follows. In this stage, medical intervention may restore a person to homeostasis. Known as **replacement therapy**, this can consist of two types of intervention: introduction of fluids (such as blood transfusion, isotonic saline solutions, etc.) and administration of vasoconstriction drugs. However, once the brain, heart, blood vessels, and tissues have deteriorated to such a point that they can no longer regain normal function or respond to medical intervention, the person is in a stage known as **irreversible shock**. After this threshold has been passed, death is imminent.



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