

SEPTIC SHOCK

BASICS

OVERVIEW

- Shock associated with generalized bacterial infection (generalized bacterial infection known as “sepsis;” condition known as “septic shock”)
- Develops as a complication of overwhelming generalized (systemic) infection
- Septic shock is associated with low blood flow (known as “hypoperfusion”) or low blood pressure (known as “hypotension”) that may or may not respond to fluids or medical treatment to maintain arterial blood pressure

SIGNALMENT/DESCRIPTION of ANIMAL

Species

- Dogs and cats

SIGNS/OBSERVED CHANGES in the ANIMAL

- Possible history of known infection (such as urinary tract infection [UTI] or infection/inflammation of the prostate [known as “prostatitis”])
- Previous surgery possible
- Signs from other conditions or treatments that potentially decrease the immune response (known as “immunosuppressive” conditions or treatments), such as diabetes mellitus (“sugar diabetes”); increased levels of steroids produced by the adrenal glands (known as “hyperadrenocorticism” or “Cushing’s disease”), or chemotherapy regimens

Early or Compensatory Shock

- Rapid heart rate (known as “tachycardia”)
- Normal or high arterial blood pressure
- Bounding pulses
- Reddened moist tissues of the body (known as “hyperemic mucous membranes”)
- The pink or red color of the gums is very quick to return when the gums are blanched by finger pressure (known as “rapid capillary refill time”)
- Fever
- Rapid breathing (known as “tachypnea”)

Late or Decompensatory Shock

- Rapid heart rate (tachycardia) or slow heart rate (known as “bradycardia”)
- Poor pulses
- Pale gums or moist tissues of the body (known as “mucous membranes”)
- The pink color of the gums is slow to return when the gums are blanched by finger pressure (known as “poor capillary refill time”)
- Cool extremities
- Low body temperature (known as “hypothermia”)
- Mental depression or stupor
- Production of only small amounts of urine (known as “oliguria”)
- Difficulty breathing (known as “dyspnea”); rapid breathing (tachypnea)
- Small, pinpoint areas of bleeding (known as “petechia”) in the skin and moist tissues of the body (mucous membranes)
- Fluid build-up in the tissues, especially the legs and under the skin (known as “peripheral edema”)
- Gastrointestinal bleeding
- Extreme weakness

CAUSES

- Compromise of the lining of the gastrointestinal tract, resulting in bacteria moving from the intestinal tract into the body and causing bacterial toxins to accumulate in the blood (known as “endotoxemia”)
- Urinary tract infection
- Infection/inflammation of the prostate (prostatitis) and abscesses of the prostate
- Gastrointestinal rupture
- Bacterial infection of the lining of the abdomen (known as “septic peritonitis”)
- Pneumonia
- Bacterial infection of the lining of the heart (known as “bacterial endocarditis”)
- Bite wounds

RISK FACTORS

- Coexistent condition or treatment causing decrease in the immune response and increasing likelihood of development of generalized bacterial infection (sepsis); conditions include such diseases as diabetes mellitus (“sugar diabetes”); increased levels of steroids produced by the adrenal glands (hyperadrenocorticism or Cushing’s disease); and treatment with high-dosage steroids or chemotherapy

- Old or young age

TREATMENT

HEALTH CARE

- Inpatient because of circulatory collapse
- Vigorous fluid therapy is needed to increase effective circulating blood volume; crystalloids are fluids that contain electrolytes (chemical compounds, such as sodium, potassium, chloride) necessary for the body to function, crystalloids generally are similar to the fluid content (plasma) of the blood and move easily between the blood and body tissues, example is lactated Ringer's solution; colloids are fluids that contain larger molecules that stay within the circulating blood to help maintain circulating blood volume, examples are dextran and hetastarch
- Oxygen supplementation—as important as fluid replacement; administer by oxygen cage, mask, or nasal cannula

SURGERY

- Surgically remove any source of generalized bacterial infection (sepsis), such as an abscess; aggressive treatment and life support may be required

MEDICATIONS

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive.

- Septic shock that does not respond to medical treatment (known as “refractory septic shock”)—systemic blood pressure may be raised through the use of medications that improve heart muscle contraction (known as “positive inotropes,” such as dobutamine) or medications to constrict blood vessels to increase blood pressure (known as “vasopressors,” such as dopamine, vasopressin, phenylephrine or norepinephrine)
- Broad-spectrum antibiotics administered intravenously are essential; while awaiting results of blood, urine, or tissue bacterial cultures, treatment may include one of the following antibiotic combinations: ampicillin or cephalixin and gentamicin or enrofloxacin; metronidazole can be used with either of these combinations
- [Sodium bicarbonate](#) may be given intravenously to a patient with severe metabolic acidosis (a condition in which levels of acid are increased in the blood) to improve blood pH level

FOLLOW-UP CARE

PATIENT MONITORING

- Heart rate, pulse intensity, color of gums and moist tissues (mucous membrane), breathing rate, lung sounds, urine output, mental status; and rectal temperature during aggressive treatment with fluids or medications that improve heart muscle contraction (positive inotropes)
- Electrocardiogram (“ECG,” a recording of the electrical activity of the heart) and blood pressure measurement are useful; use blood-gas analysis (measurements of oxygen and carbon dioxide levels in arterial blood) and pulse oximetry (a means of measuring oxygen levels in blood), to monitor tissue oxygen levels
- Blood work (such as packed cell volume [“PCV,” a means of measuring the percentage volume of red-blood cells as compared to the fluid volume of blood]; serum total protein [a quick laboratory test that provides general information on the level of protein in the fluid portion of the blood]; serum electrolytes; liver enzymes; blood urea nitrogen; and serum creatinine)

POSSIBLE COMPLICATIONS

- Electrolyte and acid–base disturbances
- Irregular heart beats (known as “arrhythmias”)
- Fluid build-up in the lungs (known as “pulmonary edema”) or acute respiratory distress syndrome (“ARDS,” a group of lung abnormalities that develop secondary to various serious illnesses that cause sudden breathing difficulties)
- Blood clots to the lungs (known as “pulmonary thromboembolism”)
- Blood-clotting disorder (known as “disseminated intravascular coagulopathy” or “DIC”)
- Kidney dysfunction
- Liver dysfunction
- Reduced blood flow to part of the gastrointestinal tract, usually due to some type of blockage in a blood vessel, leading to decreased oxygen in the tissues (condition known as “gastrointestinal ischemia”) and movement of bacteria from the gastrointestinal tract into the body
- Fluid build-up in the brain (known as “cerebral edema”) and seizures
- Inflammation of the pancreas (known as “pancreatitis”)
- Inflammation of blood vessels (known as “vasculitis”)
- Fluid build-up in the tissues, especially the legs and under the skin (peripheral edema)
- Cardiac arrest

- Death

EXPECTED COURSE AND PROGNOSIS

- Depend on underlying cause
- Septic shock is a life-threatening condition

KEY POINTS

- Septic shock is a life-threatening condition
- Septic shock is associated with low blood flow (hypoperfusion) or low blood pressure (hypotension) that may or may not respond to fluids or medical treatment to maintain arterial blood pressure
- Vigorous fluid therapy is needed to increase effective circulating blood volume
- Oxygen supplementation—as important as fluid replacement
- Broad-spectrum antibiotics administered intravenously are essential
- Aggressive treatment and life support may be required

