

# Rapid Heart Rate

## Supraventricular Tachycardia

### Basics

#### OVERVIEW

- The heart of the dog or cat is composed of four chambers; the top two chambers are the right and left atria and the bottom two chambers are the right and left ventricles; heart valves are located between the right atrium and the right ventricle (tricuspid valve); between the left atrium and the left ventricle (mitral valve); from the right ventricle to the main pulmonary (lung) artery (pulmonary valve); and from the left ventricle to the aorta (the main artery of the body; valve is the aortic valve)
- In order to pump blood to the lungs and body, the heart must work in a coordinated fashion; the normal control or “pacemaker” of the heart is the sinoatrial (SA) node, which starts the electrical impulse to begin the coordinated contraction of the heart muscles—the electrical impulse causes the atria to contract, pumping blood into the ventricles; the electrical impulse moves through the atrioventricular (AV) node and into the ventricles, causing the ventricles to contract and to pump blood to the lungs (right ventricle) and the body (left ventricle)
- The normal heart rate for dogs varies based on the size of the dog; however, the general range is 60–120 beats per minute (with smaller dogs having faster normal heart rates)
- The general range for normal heart rates in cats is 120–240 beats per minute
- “Supraventricular” refers to “above the ventricles,” and usually is used to indicate a heart rhythm that is started in tissues above the ventricles; “tachycardia” is a fast or rapid heart rate
- “Supraventricular tachycardia” is a rapid heart rate caused by electrical impulses that originate from a site other than the SA node, such as the muscle of the atria (known as “atrial myocardium”) or the AV node



#### SIGNALMENT/DESCRIPTION OF PET

##### Species

- Dogs
- Cats—rare

#### SIGNS/OBSERVED CHANGES IN THE PET

- Clinical signs may relate to the underlying cause
- Some dogs may exhibit no clinical signs; rapid heart rate detected on physical examination
- Dogs with fast supraventricular tachycardia (heart rate usually greater than 300 beats per minute) generally exhibit episodic weakness or fainting (known as “syncope”)
- Coughing or breathing abnormalities in dogs with congestive heart failure (CHF); “congestive heart failure” is a condition in which the heart cannot pump an adequate volume of blood to meet the body's needs

- Rapid, usually regular heart rate
- May have evidence of poor circulation—pale gums and 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 “prolonged capillary refill time”); and weak pulses
- Underlying heart condition (such as a heart murmur)

## CAUSES

- Long-term (chronic) disease of the heart valves
- Disease of the heart muscle (known as “cardiomyopathy”)
- Congenital (present at birth) heart disease
- Heart tumors or cancer
- Generalized (systemic) disorders
- Condition in which a pathway (known as an “accessory pathway”) to transmit the electrical impulse from the atria to the ventricles bypasses the atrioventricular node, and allows the impulse to reach the ventricles too quickly (known as “ventricular preexcitation”)
- Electrolyte imbalances
- Digoxin toxicity; digoxin is a heart medication
- Unknown cause (so-called “idiopathic disease”)

## RISK FACTORS

- Heart disease

# Treatment

## HEALTH CARE

- Pets without clinical signs can be managed on an outpatient basis
- Pets with sustained, rapid heart rates (supraventricular tachycardia) or signs of congestive heart failure will be hospitalized until stable; CHF signs include cough; difficulty breathing (dyspnea); bluish discoloration of the skin and moist tissues (mucous membranes) of the body caused by inadequate oxygen levels in the red blood cells (known as “cyanosis”); congestive heart failure is a condition in which the heart cannot pump an adequate volume of blood to meet the body's needs
- Rapid heart rate (supraventricular tachycardia) is a medical emergency in dogs that exhibit weakness and collapse—vagal maneuvers and precordial thump are techniques a veterinarian may elect to try to reverse a sustained tachycardia
- Electrical shock to the heart (known as “cardioversion”) or a pacemaker may be considered in extreme cases
- Treat congestive heart failure and correct any underlying electrolyte or acid–base disturbances (abnormalities in blood pH levels)

## ACTIVITY

- Restrict until the rapid heart rate (supraventricular tachycardia) has been controlled
- Owners should observe closely for weakness or collapse

## DIET

- Mild-to-moderate sodium restriction if the pet is in congestive heart failure

## SURGERY

- The veterinarian may consider procedure (known as “transvenous catheter ablation”) for pets with accessory pathways (pathways of electrical conduction between the upper chambers (atria) and lower chambers (ventricles) of the heart that bypass the normal conduction pathways)

# 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

## EMERGENCY TREATMENT

- The veterinarian will administer one of the following drugs: calcium channel blocker (verapamil or diltiazem) or  $\beta$ -adrenergic blocker (esmolol)
- Intravenous (IV) adenosine (adenosine is very expensive and has a short duration of action); propranolol (propranolol has a longer duration of action after IV administration and generally is not recommended, unless no other alternative is available)
- Electroconversion or pacing methods in extreme cases

## LONG-TERM TREATMENT

- Digoxin—a heart medication
- $\beta$ -adrenergic blocker—atenolol can be administered as long as the pet does not have underlying moderate-to-severe heart muscle failure (known as “myocardial failure”)
- Diltiazem is the calcium channel blocker of choice for long-term control of rapid heart rate (supraventricular tachycardia)
- Medications to control irregular heartbeats (known as “antiarrhythmic agents,” such as quinidine and procainamide) can be tried in certain circumstances or when the above drugs are not effective

## Follow-Up Care

### PATIENT MONITORING

- Serial recordings of an electrocardiogram (ECG, a recording of the electrical activity of the heart) or Holter monitoring (where the pet wears a “vest” in which a continuous, mobile battery-powered ECG monitor has been placed; the ECG recording is performed over several hours, giving a better overall picture of the heart rate and rhythm)

### POSSIBLE COMPLICATIONS

- Fainting (syncope)
- Congestive heart failure; congestive heart failure is a condition in which the heart cannot pump an adequate volume of blood to meet the body's needs

### EXPECTED COURSE AND PROGNOSIS

- Most affected pets are controlled effectively with medication

## Key Points

- Observe pets closely for signs of low blood volume being pumped by the heart (known as “low cardiac output”), such as weakness and collapse
- Rapid heart rate (supraventricular tachycardia) is a medical emergency in dogs that exhibit weakness and collapse