

# Sick Sinus Syndrome

## (Type of Irregular Heartbeat)

### 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 sinus or 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)
- “Sick sinus syndrome” is a disorder of electrical impulse formation within, and conduction out of, the sinus node; it may be accompanied by disorders of the specialized electrical conduction system of the top two chambers of the heart (atria), the AV node, and the bottom two chambers of the heart (ventricles)
- An electrocardiogram (ECG) is a recording of the electrical impulse activity of the heart; the normal ECG is a tracing with P, QRS, and T waves; the P waves are the first upward deflection of the ECG tracing that look like a “bump” in the tracing; the P waves are a measure of the electrical activity of the atria; the QRS looks like an exaggerated “W” with the Q wave being a short, downward deflection, the R being a tall, spiked upward deflection, and the S being another short, downward deflection; the QRS is a measure of the electrical activity of the ventricles; finally the T wave may be an upward or downward deflection of the ECG tracing; the T wave is a measure of ventricular recovery prior to the next contraction
- Irregular heartbeats (known as “arrhythmias”) noted with sick sinus syndrome include any or all of the following: inappropriate slow heart rate (known as “sinus bradycardia”); disorder in which the sinoatrial node does not generate an electrical impulse or the impulse does not leave the sinus node (known as “sinus arrest”), which causes a pause in the heart beats; condition in which the electrical impulse from the sinoatrial node is blocked from causing the atria to contract (known as a “sinoatrial exit block”); slow atrial rhythm when another part of the atrium acts as the “pacemaker” (known as a “slow ectopic atrial rhythm”); or alternating periods of slow heart rate (sinus bradycardia) and rapid heart rate (caused by electrical impulses that originate from a site



other than the sinoatrial node, such as the muscle of the atria or the atrioventricular [AV] node; condition known as “supraventricular tachycardia”)

- Prolonged periods of lack of sinus node activity and often lack of atrioventricular node activity as well, leading to slow heart rate (bradycardia) may alternate with sudden onset of very fast heart rate originating in the ventricles, causing the heart to beat ineffectively (known as “paroxysmal ventricular tachycardia”), producing “bradycardia–tachycardia syndrome,” a variant of sick sinus syndrome
- P waves and QRS complexes are usually normal
- P waves may be abnormal or absent in some cases

## GENETICS

- May be inherited in miniature schnauzers and West Highland white terriers

## SIGNALMENT/DESCRIPTION OF PET

### Species

- Dogs

### Breed Predilections

- Miniature schnauzers
- Noted commonly in cocker spaniels, dachshunds, and West Highland white terriers

### Mean Age and Range

- Most affected dogs are greater than 6 years of age

### Predominant Sex

- Female

## SIGNS/OBSERVED CHANGES IN THE PET

- Clinical signs vary from no clinical signs (that is, being “asymptomatic”) to weakness, fainting (known as “syncope”), collapse, and/or seizures
- Sudden death is infrequent
- Heart rate may be abnormally slow (bradycardia) or abnormally rapid (tachycardia)
- Pauses between heart beats may be noted
- Some affected pets appear normal

## CAUSES

- Unknown cause (so-called “idiopathic disease”)
- Familial (runs in certain families or lines of animals) in miniature schnauzers
- Spread of cancer (known as “metastatic disease”)
- Disease characterized by reduced blood flow to the heart, usually due to some type of blockage in a blood vessel, leading to decreased oxygen in the tissues (known as “ischemic disease”)

## Treatment

### HEALTH CARE

- Hospitalization rarely necessary, except for electrophysiologic testing of the electrical conduction system of the heart or pacemaker implantation
- Treatment is not necessary for pets that have no clinical signs (asymptomatic pets)

### ACTIVITY

- Avoid vigorous exercise and stressful situations

### DIET

- Modifications unnecessary

### SURGERY

- Permanent artificial pacemaker necessary for dogs failing to respond to medical treatment and those exhibiting unacceptable medication side effects
- Permanent artificial pacemaker usually required for dogs with slow heart rate-rapid heart rate syndrome

(bradycardia-tachycardia syndrome)

- Placement of a pacemaker in the right (atrium or auricle) may control the pauses

## 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.

- Symptomatic dogs are grouped into those showing primarily slow heart rate (bradycardia), those in which the sinoatrial node does not generate an electrical impulse or the impulse does not leave the sinus node (sinus arrest), those in which the electrical impulse from the sinoatrial node is blocked from causing the atria to contract (sinoatrial exit block) and those with a rapid heart rate (caused by electrical impulses that originate from a site other than the sinoatrial node, such as the muscle of the atria or the atrioventricular node (supraventricular tachycardia) followed by sinus arrest
- Atropine-responsive symptomatic dogs with slow heart rates (bradycardia) or in which the sinoatrial node does not generate an electrical impulse or the impulse does not leave the sinus node (sinus arrest)—medications to increase the heart rate (known as “anticholinergic drugs”), such as propantheline or hyoscyamine
- Dogs with slow heart rates (bradycardia) and in which the sinoatrial node does not generate an electrical impulse or the impulse does not leave the sinus node (sinus arrest)—theophylline, terbutaline, or hydralazine, if medications to increase the heart rate (anticholinergic drugs) are ineffective
- Dogs with slow heart rate-rapid heart rate (bradycardia-tachycardia) that have clinical signs due to rapid heart rate (tachycardia) or rapid heart rate (tachycardia)-induced sinus arrest, in which the sinoatrial node does not generate an electrical impulse or the impulse does not leave the sinus node—can give heart medications (digoxin or atenolol) in attempt to suppress the rapid heart rate (supraventricular tachycardia); the pet will be monitored closely for worsening of slow heart rate (bradycardia)

## Follow-Up Care

### PATIENT MONITORING

- Electrocardiogram (a recording of the electrical activity of the heart) in pets that have no clinical signs (asymptomatic pets)—to detect progression of disease
- ECG in pets treated medically or with a pacemaker implantation

### POSSIBLE COMPLICATIONS

- Rarely, reduced blood flow to the brain or kidneys results in long-term (chronic) brain damage or kidney dysfunction, respectively

### EXPECTED COURSE AND PROGNOSIS

- Good prognosis following pacemaker implantation in pets without 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
- Medical management—often ineffective; initial beneficial effects often not sustained

## Key Points

- Medical management often is ineffective
- Permanent artificial pacemaker frequently is necessary to treat a dog with sick sinus syndrome
- Prognosis is good for affected dogs following pacemaker implantation, if the dog does not have signs of 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