

Liner Notes:

# Heart Sounds

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*The Normal Heart Sound*

## band 1

The thorax is auscultated systematically by valve area. With the dog standing on 4 legs, the mitral valve region is just dorsal to the left caudal sternal border from intercostal spaces 5 to 6. The pulmonic valve region is located by moving the stethoscope cranially along the left sternal border to the third to fourth intercostal space. The aortic valve is just dorsal to and slightly caudal to the pulmonic valve at the middle third of the thorax. The tricuspid valve sound is best heard at the junction of the middle and lower thirds of the right thorax near the fourth intercostal space.

Normally, only the first and second heart sounds are auscultated in the dog. The first heard sound, which coincides with closure of the mitral and tricuspid atrioventricular valves, is heard best over the mitral and tricuspid valve regions. The second heart sound coincides with closure of the aortic and pulmonic valves, when the pulmonary arterial and aortic pressures exceed the corresponding ventricular pressures. The second heart sound is clearest and loudest over the aortic and pulmonic values.

Sinus arrhythmia, a normal variation in cardiac rate, is related to respiration in dogs. It is heard over the mitral valve region near the left fifth intercostal space at the sternal border.

## band 2

Note the lower frequency of the first heart sound as compared with the second sound. Now listen to the sounds of another normal dog recorded over the mitral valve location.

## band 3

The second heart sound is shorter and of higher frequency than the first sound. It is best heard over the pulmonic valve. Listen to a normal dog's heart sounds recorded over the pulmonic valve.

## band 4

Murmurs and variations of the heart sounds may indicate the pathologic condition affecting the heart. A description of the sound is beneficial when making a diagnosis. First note whether the abnormal sound is present during systole, diastole, or both; then determine how long the abnormal sound persists during that phase of the cardiac cycle. While the murmur may be described as occurring early or late, it may also persist throughout the entire systole or diastole, and is then referred to as holosystolic or holodiastolic. The intensity of the sound is made by grading it numerically from 1 to 6 or by describing it as soft, moderate, or loud. Notice whether the frequency of the entire sound is high, low, or a mixture of the two. The valve region over which the sound is best heard is another helpful clue.

*Acquired Murmurs*

## band 5

The sound just played represents the mixed frequency murmur of mitral insufficiency that is auscultated at the left caudal sternal border. The murmur which begins early in systole, increases in duration as the condition progresses. The intensity also increases with the severity of the condition and is often so loud that it is accompanied by a palpable precordial vibration or thrill.

Listen to another recording of mitral insufficiency. The holosystolic murmur is so loud and prolonged that the second heart sound is obliterated, giving the impression of only one prolonged sound.

## band 6

In heart failure the ventricle fails to eject its full complement of blood. When atrial blood flows into an overfilled failing ventricle, the normally inaudible third heart sound is intensified and becomes audible. The second heart sound may be muffled by the loud murmur and the third sound is intense enough to be confused with the second heart sound. Listen to the next recording of a dog in heart failure. The third heart sound is a low frequency sound that gives the impression of a thud after the murmur.

## band 7

The loud murmur of mitral insufficiency may radiate dorsally along the left thoracic wall. In severe cases of valvular insufficiency, the murmur of mitral insufficiency radiates to the right thoracic wall, simulating or intensifying the murmur of tricuspid valve insufficiency. The murmur of tricuspid insufficiency mimics that of mitral insufficiency except for location.

The systolic whoop or sea gull murmur is a variation of the holosystolic murmur heard with atrioventricular valvular insufficiency. Notice the high frequency and music quality of the systolic whoop.

## band 8

The musical whoop varies in frequency and may alternate with the more common mixed holosystolic murmur of mitral insufficiency. Listen to another variation of the systolic whoop.

## band 9

A systolic murmur often confused with that of mitral insufficiency is caused by anemia. The diminished viscosity of the blood results in increased turbulence producing a systolic murmur. This murmur is of higher frequency than that of mitral insufficiency and is usually limited to early and mid systole. The first and second heart sounds are clearly heard. The anemic murmur is loudest at the mitral position and, unlike that of mitral insufficiency, rarely radiates to other portions of the thorax.

## band 10

The murmur of aortic insufficiency is uncommon. The first and second heart sounds occur normally, but a high frequency diastolic murmur begins with the second heart sound. The murmur characteristically diminishes in intensity after its onset and is called a decrescendo diastolic murmur. Notice how the normal heart sound pattern is disrupted by this high frequency diastolic murmur. Listen to the murmur of aortic insufficiency placed at slow speed and then increased to a normal rate.

### *Variations in Heart Sounds and Murmurs*

## band 11

Asynchronous closure of the left and right atrioventricular valves may produce a first heart sound that is split into two audible components. This occurs normally in the larger breeds of dogs. Note the low frequency split first heart sound of a normal large dog.

## band 12

Compare the split first heart sound heard in the previous band to that of a normal dog without a split first sound.

## band 13

The systolic click is a high frequency sound commonly heard over the mitral valve region. It is not heard with every beat if it moves close to and then away from the first sound. This sound, unlike the split heart sounds, may occur singly or in multiples. In the dog, systolic clicks may antedate mitral insufficiency.

## band 14

Splitting of the second heart sound occurs when closure of one semilunar valve is delayed. Chronic lung disease and heartworm disease may produce splitting of the second heart sound if pulmonary hypertension develops and delays pulmonic valve closure. The split sound is most prominent over the pulmonic valve region along the cranial left thorax. The sound resembles that of a lub-d-rup rhythm. The split sounds are close together and higher in frequency than the first sound. This split second sound was recorded from a dog with heartworms.

## band 15

Atrial fibrillation is a sequel to mitral valvular insufficiency and other cardiac diseases. It is most often found in male dogs and is characterized by a rapid, irregular cardiac rate, usually over 180/min. Murmurs when present and the first and second heart sounds are variable in intensity because of the variable degree of ventricular filling. An important diagnostic clue is the presence of a pulse deficit; that is, when the auscultated heart rate is more rapid than the palpable peripheral pulse rate. Notice the irregular rate and variable intensity of heart sounds of a dog in atrial fibrillation.

## band 16

Ectopic contraction may arise from the atria or ventricles as single or multiple beats. The prevailing cardiac rhythm is disrupted by premature contractions. Because of incomplete ventricular filling and early contraction, the first heart sound occurs prematurely and is different from the normal sound. The second heart sound may be absent if ventricular pressures generated by the ectopic beat failed to open the aortic and pulmonic valves. Astute auscultation may differentiate atrial from ventricular premature systoles, but the electrocardiogram provides a more definitive diagnosis. In the next recording, the two normal beats are followed by a premature ventricular contraction giving the impression of a lub-dup; lub-dup, dup rhythm.

## band 17

Bursts of atrial or ventricular tachycardia suggest an advanced cardiac lesion. Although the electrocardiogram provides definitive diagnostic data, the abnormal heart condition is first suspected during cardiac auscultation. A sudden rapid burst of heart beats of similar intensity, duration, and frequency is heard. The normal, slower rhythm is abolished during the burst of rapid heart sounds. The next sound demonstrates paroxysmal ventricular tachycardia interspersed with a slower, normal rhythm.

## band 18

Heart block, except that resulting from digitalis intoxication, is an infrequent condition in the dog. Incomplete heart block is suggested by the regular omission of a ventricular contraction. During the pause a low-pitched atrial sound may be heard. In complete heart block, two independent rhythms occur: a louder but slower ventricular rate predominates while a faster but lower frequency atrial rhythm is heard over the mitral valve area. Listen carefully for the lower frequency atrial sound occurring between the louder but slower ventricular contractions of complete heart block.

### *Congenital Heart Murmurs*

## band 19

The four most common congenital cardiac defects in the dog may be differentiated by auscultation and electrocardiography.

The patent ductus arteriosus, seen most frequently in the female, represents a patent fetal connection between the pulmonary circulation and the aorta. The murmur, distinctive of an arteriovenous connection, is referred to as a machinery murmur because of its likeness to a noisy machine sho. The murmur occurs continuously throughout systole and diastole. Because the flow through the patent ductus varies with the comparative pressures in the left and right heart,

the murmur is accentuated during late systole. This distinctive continuous murmur is best heard over the mitral and tricuspid valves. Listen to the continuous machinery murmur of a patent ductus recorded at the cranial thoracic wall of a dog.

### band 20

The murmur associated with pulmonic stenosis is a musical sound that builds in intensity until late systole and then diminishes. For this reason it has been called a crescendo-decrescendo or diamond-shaped murmur. It is a high frequency sound, heard most distinctly along the cranial left ventral thorax. Notice how the loud, intense sound heard with pulmonic stenosis may obscure other heart sounds.

### band 21

The crescendo-decrescendo murmur of aortic stenosis is often confused with the murmur of pulmonic stenosis. This murmur is heard over the aortic valve region and radiates to the cervical vessels and the cranial right thorax. The murmur may not interfere with the audible components of the first and second heart sounds.

### band 22

A defect in the ventricular septum permits blood to flow from the left to the right ventricle during ventricular systole. This produces a palpable thrill along the right midthoracic wall and a loud holosystolic murmur over the mitral and tricuspid valve regions. There is little radiation to the aortic and pulmonic valve positions. Note that the murmur of the ventricular septal defect is a harsh holosystolic sound not unlike that of mitral valvular insufficiency.

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