PULMONARY AND CARDIAC CAUSES OF POOR PERFORMANCE
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Key Points
- Pulmonary and cardiac causes are uncommon causes of poor performance.
- Affected horses have few to no obvious resting abnormalities.
- Testing before, during, and after exercise enhances accurate diagnosis.

Horses are extreme athletes requiring peak performance of all body systems. Any physical dysfunction can affect their ability to perform especially during strenuous activity. The poorly performing horse is a significant problem and poses a considerable diagnostic challenge, particularly when many abnormalities are only manifested during maximal exercise effort. The most common causes of poor performance are musculoskeletal diseases and upper respiratory obstructions. Pulmonary and cardiac dysfunctions are infrequent but can have significant impact on exercise tolerance. Exercise testing and testing immediately pre or post exercise can enhance accurate diagnosis.

Pulmonary causes of poor performance
Pulmonary gas exchange is the limiting factor to performance in all horses. During racing conditions, horses exercise at or above maximal aerobic capacity. In this situation, a relatively mild degree of pulmonary disease can significantly impair gas exchange resulting in decreased performance. In athletic horses, exercise induced pulmonary hemorrhage (EIPH) and inflammatory airway disease (IAD) are the most common diseases of the lower airway. Clinical signs are often nonspecific, subclinical, or only apparent under maximal exertion.

EIPH occurs in most, if not all racehorses. Coughing and/or prolonged recovery from exercise may be noted but often horses have no obvious clinical signs. Rarely horses have post racing epistaxis. More commonly, blood is observed in the trachea during post exercising endoscopic examination. Erythrocytes or hemosiderophages in tracheal or bronchoalveolar (BAL) confirms the diagnosis.

Signs of IAD include cough, excessive mucous, nasal discharge, poor performance or prolonged recovery from exercise. The effect of IAD is dependent on the level of exercise and the severity of disease. However at maximal exercise effort, a relatively mild degree of IAD may result in exercise intolerance. To evaluate pulmonary gas exchange, serial arterial blood gas sampling can be obtained. During exercise, physiologic exercise-induced hypoxemia worsens with increased speed. Horses with IAD often have more pronounced exercise-induced hypoxemia (lower PaO₂) at maximal effort. Other lung function testing includes flowmetric plethysmography and histamine bronchoprovocation.

Despite the recognized importance of IAD in limiting performance, definitive criteria for diagnosis are variable. Diagnosis begins with endoscopic evaluation of the respiratory tract. Affected horses have increased amounts of mucopurulent discharge in the tracheobronchial tree. Cytological examination of lower airway secretions confirms the diagnosis. Using the current...
American College of Veterinary Internal Medicine recommendations, IAD in horses is diagnosed when the percentage of BAL cells is >2% mast cells, >5% neutrophils, or >1% eosinophils.

Cardiac causes of poor performance

Cardiac abnormalities negatively affect performance by reducing the cardiac output. It can be difficult to determine the cardiovascular contribution to exercise intolerance since horses frequently have no, or very subtle abnormalities at rest, while displaying significant abnormalities near maximal effort. Conversely, a normal horse can have a both murmurs and dysrhythmias which may be physiological, disappear with exercise, and not contribute to reduced performance. Cardiovascular causes of exercise intolerance include cardiac arrhythmias, valvular regurgitation, congenital cardiac defects, and myocardial dysfunction.

Dysrhythmia are the most common cardiovascular cause of poor performance but the incidence is quite low, 1-3%. Atrial fibrillation is the most common cardiac arrhythmia. At rest, when cardiac demands are low, atrial dysrhythmia has little clinic effect. However, at exercise the effect is obvious. Other arrhythmias such as supraventricular and ventricular dysrhythmias can also decreased cardiac output during strenuous work. Mitral and tricuspid regurgitation are diagnosed in as many as 50% of racehorses; however, their effect on exercise is negligible unless the amount of regurgitation is severe. Mitral insufficiency is the most likely murmur to cause poor performance due to resultant left atrial enlargement and increased pulmonary arterial pressure. Myocardial dysfunction and ventricular septal defects are exceedingly uncommon.

Cardiac testing includes echocardiography and electrocardiogram (ECG). Resting echocardiography is critical to insure the horse does not have overt cardiac disease. Doppler examination should be included in horses with murmurs. Immediate post-exercise stress echocardiography can be used to indentify exercise-induced myocardial ischemia. Left ventricular wall thickening is a normal response to the demand for increase cardiac output. Myocardial dysfunction can result in decreased fractional shortening left ventricular wall.

If no rhythm disturbances are present at rest, ECG during and after exercise can be performed. Normal ECG findings during exercise include regular sinus rhythm with no ectopic beats. Maximal heart rate is up to 220-240 bpm. Heart rate should drop to below 100 bpm within 4-5 minutes post exercise. Premature depolarisations are clinically important if >2 isolated premature depolarisations are detected during peak exercise or if multiple (>5) pairs or paroxysms of premature depolarisations are detected in the immediate recovery period.