

## 7 Summary

### Echoangiographic examination of haemodynamic effects in the heart and in arterial vessels of horses with respiratory diseases

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In this study an sonographic examination of the heart and the carotid artery was performed on 33 resting horses. Group 1 (control group) was composed of 10 horses which were clinically free of any signs of respiratory or cardiovascular disease. 15 horses suffering from chronic obstructive pulmonary disease and 5 horses with chronic interstitial pulmonary disease were divided into two groups according to the degree of respiratory disease by a score system. The respiratory diseases of 10 horses (group 2) were classified as latent to low graded and 10 patients (group 3) as middle graded to high graded. Because of the characteristics of the echocardiographic findings (cor pulmonale) three case studies were described: one COPD with acute bronchiolitis, one acute purulent necrotic bronchopneumonia and one high graded eosinophilic pneumonia. The echocardiography contained standard image planes with the B-mode, measurement of the fractional shortening (FS%) with the M-mode and investigations with the doppler technique. On this occasion the closing ability of the heart valves was examined with the colour flow doppler and blood flow profiles were established with the pulsed wave doppler in 5 locations: in the right ventricular outflow tract, in the level of the pulmonic valve, in the pulmonary artery, in the aortic artery and in the carotid artery. The aim of the study was the determination of blood flow parameters which indicate the development of a cor pulmonale in a horse with respiratory problems.

The clinical investigation of the ill horses exhibited a set of significantly changed diagnosis of the respiration tract and an increase of the heart frequency. The echocardiography of the resting patients showed an obvious high demand on the heart and signs of the circulatory disturbance of the lung. The right caudal long axis view in the B-mode showed a clear volume overload of the right part of the heart recognizable from the dilated chambers, the downward curved interventricular septum and sometimes a hypertrophy of the heart walls. For the first time a delayed closing point of the mitral valve up to the S-point of the electrocardiogram has been demonstrated with horses with a clear marked dyspnoea. In the carotid artery a changed sequence of the blood flow waves was found caused by the intensified respiration. At the valves of the right heart a significant increase of flow backs was detected and the diameter of the pulmonary artery was significantly enlarged. The pulsed wave doppler investigation identified a number of partly obvious changed blood flow parameters for example the systolic time intervals (EMS, ET, PEP), the blood flow volume and the flow velocities (SPV, EDV, DPV) in horses with a respiratory disease. Here the influence of the regulation on the heart and circulation has to be considered. This

is individual according to the state of illness and the changing, for example, of the perfusion of the lung and the partial pressure of the air in the arterial blood.

The diagnosis of a cor pulmonale with the functional blood flow parameters is not possible because they don't cover the typical morphologic changes of the heart. The cor pulmonale can be impressively presented with the B-mode technique which shows the rounded heart form and the measurement of the heart chamber diameter. The insufficiencies of the heart valves are diagnosed with auscultation and colour flow doppler investigations.

The clear changes in the demand on the heart of horses with respiratory failure reported in this study lead to the conclusion that a echocardiographic examination is absolutely advisable. This is the only way to estimate the exercise tolerance of a horse with respiratory disease and taking animal rights into consideration. The recorded findings have a crucial importance for the further use and the future destiny of an inflicted horse.