

The Relationship Between the Outcome of Pulmonary Function Tests in Horses and the Prognosis of Coughing – A Follow Up of Clinical Cases

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Introduction

In veterinary clinics, pulmonary function tests are part of the examination of horses suffering from respiratory diseases. The results of pulmonary function tests are one of the factors used in the whole procedure of making a diagnosis. Secondly, pulmonary function tests can be used to test therapeutic measures and drugs, not only in research, but also in clinical cases. In diseased horses for example, the effect of bronchodilators can be shown after a short period of time. In this way information can be obtained about the potential usefulness of prescribing bronchodilator drugs. Over the long term the owner can be requested to admit his horse to the clinic again in order to repeat the pulmonary function tests for reevaluation of the airway obstruction.

So pulmonary function tests are helpful not only in diagnosing obstructive airway disease but they also give the opportunity to evaluate therapy. But clinicians still have the problem of establishing a prognosis. In veterinary medicine prognosis is very important. The owner is more interested in the prognosis than he is in the diagnosis. And in coughing horses, especially horses suffering from COPD, it is extremely difficult to give a realistic prognosis.

Can pulmonary function tests be of any help for making a reliable prognosis? Theoretically the answer to this ques-

tion is no. Function tests establish functional disorders and do not give any information about irreversibility.

In human medicine however, some lung specialists argue that lung function tests can give prognostic information. They think loss of elastic fibers in the lung can cause decrease of elasticity.

Taking into account those parameters determining intrapleural pressure (Fig. 1), the intrapleural pressure, more precisely the intrapleural pressure during expiration, can give information about the prognosis. Positive values are caused by a decrease of elasticity more than by any obstructive alteration in the bronchi. Maximal intrapleural pressure changes are increased in horses with acute bronchitis, but predominantly by a very low pressure during inspiration. In those cases "closing pressure" is still normal, because there is no loss of elastic fibers or radial traction. Lung elasticity can follow a higher breathing frequency in spite of increased bronchial obstruction.

We were interested whether some pulmonary function tests could provide any prognostic information. We thought that chronicity of the respiratory disease might be of importance. The following division was used in the "Clinic of Large Animal Medicine".

Disease history of less than 6 weeks	good prognosis
Disease history of 6–12 weeks	guarded prognosis
Disease history of more than 3 months	poor prognosis

All sorts of additional conditions that could have any influence on the disease were taken into account.

Results and Discussion

In 1983, 162 horses suffering from respiratory disease were selected for this study. These cases had been treated in our clinic in 1981. These animals only suffered from coughing or obstructive disorders. Patients suffering from pleurisy, roaring or soft palate displacement were not included in this study.

An inquiry into the health of these horses was set up. Were the owners satisfied? Did the horse still cough? Was it more choked than it was before, or less? How was its endurance-ability?

114 Owners completed the form. The other 58 gave information by telephone. The horses were divided into 3 groups as shown in table 1.

Surprisingly enough there is no statistical difference between the groups. The problem of the clinician treating these horses is manifest as most cases are chronic. Group I consists of horses which did not improve ± 2 weeks after acute bronchitis.

There are two possible explanations for the results obtained:

- first: unreliability of the anamnesis
- secondly: the environment is more important than the character of the disease
- third: the above mentioned problem that real acute cases are rare.

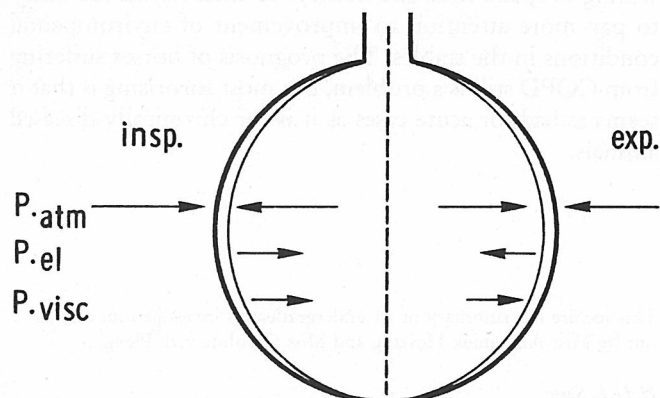


Fig. 1: Parameters determining the intrapleural pressure insp. = inspiration, exp. = expiration, P_{atm} = atmospheric pressure, P_{el} = pulmonary recoil pressure, P_{visc} = frictional pressure in the lung and airways.

Table 1 and 2: Results of a follow up inquiry into the health of horses treated for respiratory disease with or without Ventipulmin® grouped according to the duration of disease (Table 1) and the maximal intrapleural pressure changes (Table 2). Column I shows the percentage of horses within a group. Column II shows the percentage of horses in column I treated with Ventipulmin® (clenbuterol) Boehringer Ingelheim.

Table 1

Group	1 (n=24)		2 (n=18)		3 (n=104)	
	I	II	I	II	I	II
healthy	21 (n=5)	80 (n=4)	11 (n=2)	50 (n=1)	13 (n=14)	36 (n=5)
improved	38 (n=9)	100 (n=9)	39 (n=7)	43 (n=3)	45 (n=46)	61 (n=28)
unchanged	12 (n=3)	33 (n=1)	11 (n=2)	0	17 (n=18)	44 (n=8)
worsened*	29 (n=7)	14 (n=1)	14 (n=7)	43 (n=3)	25 (n=26)	19 (n=5)
response: positive	58 (n=14)	93 (n=13)	50 (n=9)	44 (n=4)	58 (n=60)	55 (n=33)
negative	42 (n=10)	20 (n=2)	50 (n=9)	33 (n=3)	42 (n=44)	30 (n=13)

group 1: history less than 6 weeks, group 2: history 6 – 12 weeks, group 3: history more than 3 months (a fourth group "incomplete anamnesis/information" is not listed).

Table 2

Group	A (n=48)		B (n=9)		C (n=14)		D (n=75)	
	I	II	I	II	I	II	I	II
healthy	48 (n=23)	65 (n=15)	22 (n=2)	50 (n=1)	21 (n=3)	66 (n=2)	11 (n=8)	75 (n=6)
improved	17 (n=8)	62 (n=5)	22 (n=2)	50 (n=1)	44 (n=6)	83 (n=5)	39 (n=29)	52 (n=15)
unchanged	14 (n=7)	14 (n=1)	22 (n=2)	0	21 (n=3)	0	24 (n=18)	17 (n=3)
worsend*	21 (n=10)	10 (n=1)	34 (n=3)	0	14 (n=2)	0	26 (n=20)	25 (n=5)
response: positive	65 (n=31)	63 (n=20)	44 (n=4)	50 (n=2)	64 (n=9)	77 (n=7)	49 (n=37)	57 (n=21)
negative	35 (n=17)	6 (n=2)	56 (n=5)	0	36 (n=5)	0	51 (n=38)	21 (n=8)

group A: max. $\Delta P_{pl} < 15$ cm H₂O and max. $P_{pl} > -2$ cm H₂O

group B: max. $\Delta P_{pl} < 15$ cm H₂O and max. $P_{pl} > -2$ cm H₂O

group C: max. $\Delta P_{pl} < 15$ cm H₂O and max. $P_{pl} > -2$ cm H₂O

group D: max. $\Delta P_{pl} < 15$ cm H₂O and max. $P_{pl} > -2$ cm H₂O

*including death due to COPD

In 1981 we started to prescribe a bronchodilator (Ventipulmin®) for treatment at home. Ventipulmin® was prescribed for those horses demonstrating a decrease of the maximal intrapleural pressure change half an hour after intravenous injection of 0.8 micrograms clenbuterol per kg bodyweight. The owner was told to continue this therapy for at least 6 weeks. Presently Ventipulmin® is often prescribed without prior diagnostic administration. Treatment with Ventipulmin® was associated with a higher number of positive cases in all groups. Sixty-eight horses were treated and 50 of them (47%) showed a positive response. Seventy-eight horses were not treated with Ventipulmin® and of these horses only 33 (42%) showed a positive response. Another division of the animals was made as shown in table 2. The prognosis seems to be better in the groups A and C, but it should be mentioned the groups B and C were very small. Student's t-tests have not yet been carried out because more material is needed. The same inquiry will be held for the years 1982 and 1983. The only provisional conclusion that can be drawn from the results is that the maxi-

imum intrapleural pressure during expiration might be of importance in making a prognosis. The influence of therapeutics is obvious, but one can imagine that those owners willing to spend time and money for their horses are likely to pay more attention to improvement of environmental conditions in the stables. The prognosis of horses suffering from COPD still is a problem, but most surprising is that it seems as bad for acute cases as it is for chronically diseased animals.

This lecture is a summary of an undergraduate's investigation, carried out by Miss Annemiek Huizing and Miss Caroline v.d. Ploeg.

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