



Abb. 12 : Vergleich der  $PaO_2$ -Mittelwerte bei Fütterung von nassem (A) und trockenem Heu (B)

Höchste Staubkonzentrationen von  $40 \text{ mg/m}^3$  (Box 2) und  $18 \text{ mg/m}^3$  (Box 3) wurden zum Zeitpunkt des Einstreuens gefunden. Demgegenüber liegen die Gesamtstaubkonzentrationen bei der Kraftfutter- und Heufütterung mit  $1 - 3 \text{ mg/m}^3$  deutlich niedriger. Obwohl die Gesamtstaubbelastung in der Außenbox (Box 3) mit  $0,279 \text{ mg/m}^3$  signifikant niedriger ist als in der Innenbox (Box 2) mit  $0,428 \text{ mg/m}^3$  ( $p \leq 0,05$ ), fällt auf, daß der alveolengängige Anteil am Gesamtstaub in der Außenbox mit  $18,3 \%$  ( $0,049 \text{ mg/m}^3$ ) verhältnismäßig höher ist, als in der Innenbox mit  $14,6 \%$  ( $0,061 \text{ mg/m}^3$ ).

Der Pilzkeimgehalt (Hefen und Schimmelpilze) liegt im Sedimentationsstaub bei naß verfüttertem Heu mit  $74 \times 10^6 \text{ KbE/g} \pm 36,55$  signifikant niedriger als bei trocken verfüttertem Heu mit  $155,7 \times 10^6 \text{ KbE/g} \pm 54,49$  ( $p \leq 0,05$ ). Im verfütterten Heu wurde *Thermoactinomyces vulgaris* in einer Konzentration von  $1 \times 10^4$  je g nachgewiesen.

Die Ammoniakkonzentration in der Mehrraum-Auslaufbox liegt mit durchschnittlich  $1,68 \text{ ppm}$  hochsignifikant unter denen der Innenboxen mit  $3,35 \text{ ppm}$  und  $3,10 \text{ ppm}$  ( $p \leq 0,01$ ).

Bei der klinischen Untersuchung fällt bei vier Pferden ein mehr oder weniger ausgeprägter Hustenreiz zum Zeitpunkt der Fütterung von trockenem Heu und Einstreuen mit Stroh auf. Der arterielle Sauerstoffpartialdruck  $\text{PaO}_2$  liegt in den Phasen mit naß verfüttertem Heu tendenziell höher als in den Phasen mit Fütterung von trockenem Heu. Bei acht der 17 Pferde ist der individuelle  $\text{PaO}_2$  - Mittelwert bei naß gegenüber trocken verfüttertem Heu hochsignifikant ( $p \leq 0,01$ ) und bei fünf Pferden signifikant ( $p \leq 0,05$ ) höher.

## VI. Summary

Ute Jaggy:

The influence of stable conditions, especially of hay-dust, on the state of health of horses lungs  
- a field study -

For the development and in the course of subclinical and chronic equine respiratory diseases (COPD) factors of the stable conditions such as dust, microorganismes and gases play a decisive role. In a fieldstudy carried out in a riding stable, the above mentioned contaminants were measured under varying keeping and feeding conditions, which were related to clinical examinations including blood-gas analysis of horses.

Quantity and quality of stable dust were measured with methods of filtration, sedimentation and impaction in two inside-boxes (*box 1* and *2*) and one open box with a paddock (*box 3*) regularly during a period of four months in winter. At the same time, the concentration of ammonia (NH<sub>3</sub>) and carbon dioxide (CO<sub>2</sub>) as well as the temperature and relative air humidity in the boxes were recorded. Sedimentation dust and samples of hay, straw and fodder were examined for their content of fungi, bacteria, *Escherichia coli* and endotoxins. Moreover, a new sampler (Respicon TM) was employed, one that renders a combined gravimetric-optical on-line-sampling with particle size distribution in three fractions (inhalable, thoracal, respirable). The Respicon TM seems to be a suitable sampler for use in horse stables and delivers quick results on the dust situation in a stable. Filters employed in this sampling can be further used for a microbiological examination of the dust. Parallel to the air hygiene, clinical examinations and blood-gas analysis from 17 horses are carried out. In two out of four experimentation phases soaked hay is fed. The concentrations of inhalable dust in the three boxes were measured during twelve days, each time for 8 h, including the daily morning activities in the stable with common filter samplers and the mean out of n = 12 in *box 1* is 2,06 mg/m<sup>3</sup> (s = 0,60), in *box 2* : 1,91 mg/m<sup>3</sup> (s = 0,72) and in *box 3* lower at 0,75 mg/m<sup>3</sup> (s = 0,43). There is no significant difference between the phases of soaked and dry hay concerning

the concentration of inhalable dust. The Respicon TM was employed 20 h a day for a period of eight days and simultaneously the various activities in the boxes were protocolled. The highest dust concentrations of  $40 \text{ mg/m}^3$  (box 2) and  $18 \text{ mg/m}^3$  (box 3) were noticed at the moment of bringing out the straw bedding. On the other hand, the concentration of inhalable dust at the moment of feeding fodder and hay was at  $1\text{-}3 \text{ mg/m}^3$  much lower. Although the inhalable dust burden in box 3 at  $0,279 \text{ mg/m}^3$  is significantly lower than that in box 2 at  $0,428 \text{ mg/m}^3$  ( $p \leq 0,05$ ), the respirable part of the inhalable dust in box 3 with  $18,3 \%$  ( $0,049 \text{ mg/m}^3$ ) is relatively higher than that in box 2 with  $14,6 \%$  ( $0,061 \text{ mg/m}^3$ ).

The fungi content (yeasts and moulds) in sedimentation dust is significantly lower when feeding soaked hay with  $74 \times 10^6 \text{ KbE/g} \pm 36,55$ , than when feeding dry hay with  $155,7 \times 10^6 \text{ KbE/g} \pm 54,49$  ( $p \leq 0,05$ ). Within the hay sample used, the concentration of  $1 \times 10^4$  *Thermoactinomyces vulgaris* was found.

The ammonia ( $\text{NH}_3$ ) levels in box 3 with  $1,68 \text{ ppm}$  were on average highly significantly lower than in box 1 with  $3,35 \text{ ppm}$  and box 2 with  $3,10 \text{ ppm}$  ( $p \leq 0,01$ ).

During the clinical examinations it was noticed on four horses that coughing was more apparent, when feeding dry hay and using straw bedding. Eight out of 17 horses had a highly significantly ( $p \leq 0,01$ ) and five a significantly ( $p \leq 0,05$ ) higher individual median  $\text{PaO}_2$  -value when using soaked hay compared to using dry hay.