



Effects of Salbutamol administered by inhalation in sport horses.



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Foreword

The physical activity or exercise, whatever kind, requires a great aerobic ability or oxygen consumption (VO_2) in order to obtain a good performance or accelerate the recovery cycle after the effort. This is the reason why many bronchodilator drugs are used. They differ in chemical composition, mechanism of action, dosage and form of administration, and they are used in sport horses with uneven (irregular?) results. Salbutamol is a drug for local use, which is free from side effects. This medicine stimulates the lung's β -adrenergic receptors, relaxing the bronchial muscles. It also inhibits the release of spasmogenic and inflammatory mediators, such as histamine, leukotriene and prostaglandin(?), from the pulmonary mast cells.

Objective

To evaluate the effects of Salbutamol* on the aerobic capacity in exercise conditions.

Materials and methods

Animals: 4 equines were tested, 2 females and 2 males; 1 was Arabian, 1 SPC and two Anglo-arabian, whose ages fluctuated between 2 and 7 years.

Equipment: to perform the tests a Karga treadmill model Mustang 2200 was used. The lactate measurement was obtained with an Accusport® portable analyzer (picture 1A), and the VO_2 was measured by a Meta Vet 1.0 Cortex Biophysik, Germany, ergospirometer

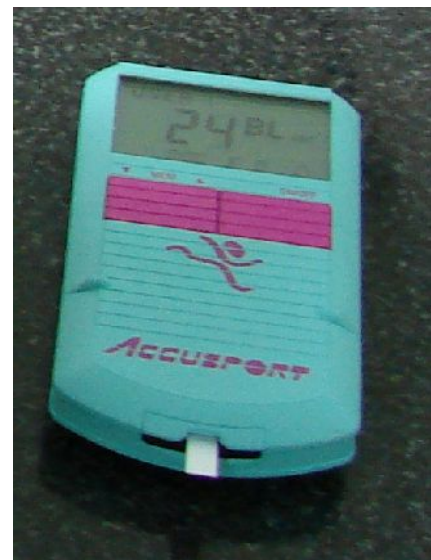


Photo 1A

Experimental design: a latin square was used. The first time, 2 animals were used as control while the other two were treated at a dose of 800 µgr (4 puffs of 200 µgr each) of Salbutamol 40 minutes before the exercise test. These tests were repeated seven days later, inverting the experimental groups. The Salbutamol was applied by inhalatory administration, directly in the pharynx, using a nasopharyngeal cannula (Photo 1B).



Exercise test

Lactate threshold test: it consists of consecutive stages of 5 minutes each with a 6% inclination. The first stage starts at 4m/s and the speed increases at a rate of 0,5m/s for each new stage. Between each stage, the animal walks for 1 minute; during which time the blood sample is taken to measure the lactate. The test ends when it reaches a lactate concentration equal or higher than 4mmol/L. The V4 is calculated by the straight line equation.

Photo 1B. The pharynx acts as an expansion chamber where the bigger drops are left, enabling the smaller than 3 microns, which are in suspension, to be carried to the lungs by the inspirational flow, where they accomplish their bronchodilatory function.

Maximal effort test: it starts with a 1 minute warm-up at 1,7m/s and 4 min at 4m/s, and continues with 1 minute stages with an increasing speed of 1m/s until fatigue is reached. All this is performed with a 6% inclination. The recovery cycle after the effort was similar to the warm-up, but inversely, in 4 minutes at 4m/s and 1 minute at 1,7m/s without inclination. This test was performed in only one equine for security(safety?) reasons, and in order to observe the VO_{2max} behavior (picture 2).



Photo 2. Ergoespirometry during the maximal effort test.

Statistical analysis: the results are expressed as the average of each stage \pm SD. The significance level was calculated using t-test for matching data. $P < 0,05$ was perceived as significant.

Results

Lactate threshold test. Each equine which received Salbutamol increased its V4 in 0,1m/s regarding the control measure (Figure 1)

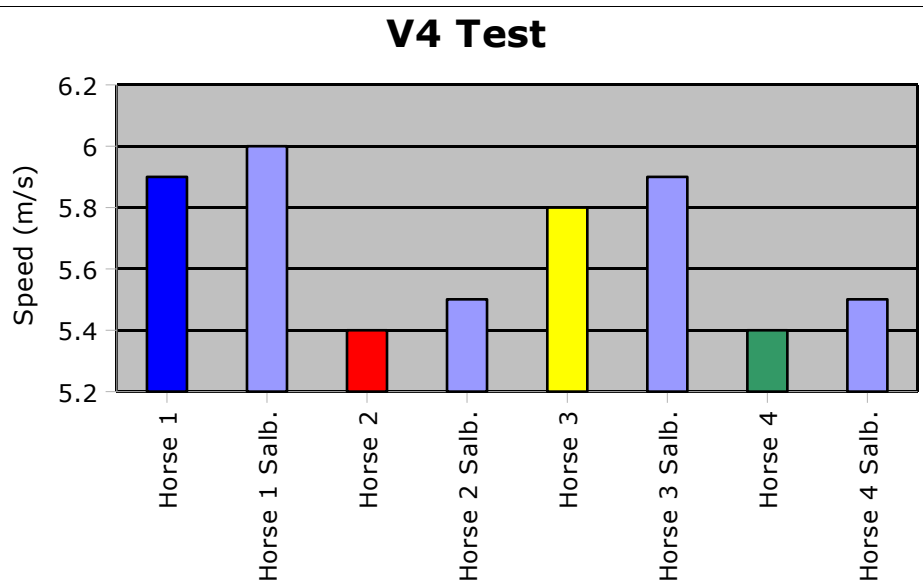


Figure. 1. horses with and without Salbutamol.
P value = 0,6

Maximal effort test; during observations, the VO_2 peak reached 100,99 ml/Kg./min. when the horse received Salbutamol, while when it did not receive the medication, the VO_2 peak was at 99,00 ml/Kg./min. (Figure 2). During the recovery cycle after the effort, the VO_2 level was lower when Salbutamol was used (42 ml/Kg./min.) being 56 ml/Kg./min. in the control case. Independently of these results, the fatigue point was the same for both cases (12 seconds at 12 m/s).

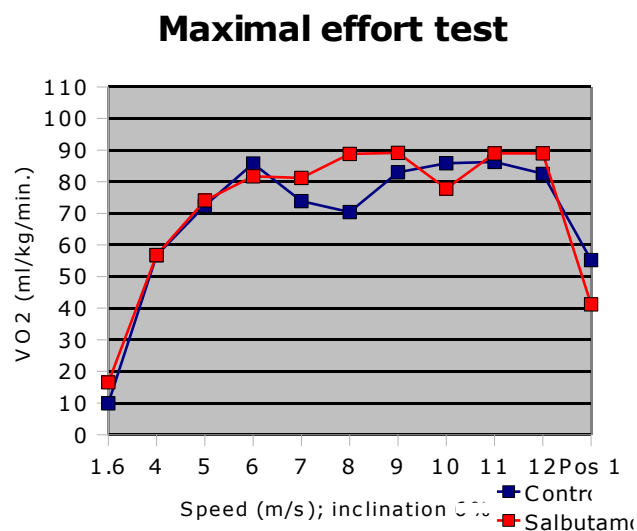


Figure. 2. The VO_2 peak was reached in both cases at 11 m/s.

Discussion and conclusions

In the lactate threshold test, an improvement in the aerobic capacity was observed when Salbutamol was used. It was demonstrated by an increase in the V_4 measurements of 0,1m/s (Figure 1). As an example, and to make it clearer, we can say that horse 1, which had had a V_4 of 6 and 5,9m/s with and without medication, developed a threshold speed of 21,6 and 21,2 Km/h respectively. These speed differences, at their threshold point, in an endurance race of 120 Km, are equivalent to 6'40" (2400 meters) between one case and the other.

The highest VO_2 peak was observed during the maximal exercise and the lower VO_2 was obtained in the recovery period (oxygen debt), when the horse was receiving Salbutamol, which showed us that the physical effort required a lower compromise involvement of the anaerobic metabolism, in comparison to the control horse.

In conclusion, under these test conditions, it appears that there is an improvement in the aerobic capacity in horses when Salbutamol is applied by inhalatory administration, regardless of the fatigue point, which did not vary between the horse under treatment and the control. Likewise, it would be convenient to increment the n in order to obtain more conclusive results.

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