

THE EQUINE TRANSPIRATOR™



**Drug-Free Therapy For Bleeding
And Other Respiratory Disorders**

INTRODUCTION

Based on over eight years of clinical experience with treatment of human obstructive airway disease, Transpirator Technologies, Inc. has developed the Equine Transpirator™. This device is designed to provide heated water vapor therapy to promote the clearance of airway mucous obstructions that can lead to exercise-induced pulmonary hemorrhage (EIPH) and poor racing performance.

The Transpirator filters and preconditions the horse's entire inhalation with heat and droplet-free water vapor which thins the mucous blanket, dissolves mucous plugs, and promotes mucociliary clearance. The resulting removal of airway obstructions reduces the potential for EIPH without drugs.

The soothing output from the Transpirator is delivered to the horse by muzzle mask. All breeds and all ages seem to enjoy the treatments — standing unattended for hours, even during hot, humid weather. Foals with pneumonia have voluntarily put their head in the mask.

EIPH STUDY

In cooperation with the University of Pennsylvania, New Bolton Center, Transpirator Technologies, Inc. has demonstrated the prevention of exercise-induced pulmonary hemorrhage (EIPH) with heated humidity therapy. The studies were conducted at six eastern thoroughbred and harness tracks.

Dr. Lawrence Soma and Dr. Corinne Sweeney of the University of Pennsylvania's New Bolton Center coordinated the EIPH Study. The Study consisted of scoping a horse after racing, and rating the severity of bleeding. The horse then received five two-hour Transpirator treatments, one each of the four days preceding the race and race day. The horse was scoped after that race and the severity of bleeding was again recorded. The results obtained from 33 known bleeders after 60 Transpirator-treated races are summarized in the following chart.

RESULTS OF BRONCHOSCOPIC EXAMINATIONS OF 33 KNOWN BLEEDERS AFTER 60 TRANSPIRATOR-TREATED RACES

	Number of Horses Studied	Stopped Bleeding	Less Severe Bleeding	Unchanged Bleeding
TRANSPIRATOR WITHOUT LASIX:				
Saratoga — Meadowlands — Garden State (Harness)	9	4	4	1
Blue Bonnets (Harness)	4	3	1	0
Saratoga (Thoroughbred)	12	7	3	2
Delaware Park (Thoroughbred)	2	0	2	0
TOTAL	27 100%	14 52%	10 37%	3 11%
TRANSPIRATOR WITH LASIX:				
Delaware Park (Thoroughbred)	6	2	2	2
	100%	33%	33%	33%

Of the 27 horses treated with the Transpirator without Lasix, 14 (52%) stopped bleeding, 10 (37%) bled less and only 3 (11%) showed no change. Of the six horses that were known to bleed through Lasix, 2 (33%) stopped bleeding, 2 (33%) bled less and 2 (33%) showed no change. Overall, 85% of the horses treated bled less and no adverse effects were observed.

RACING PERFORMANCE

Respiratory disease is second only to bone and muscle problems in limiting a race horse's ability to perform.

Improving a horse's pulmonary function by removing airway obstructions reduces the work of breathing and improves oxygenation; two major factors in allowing the equine athlete to race at his full potential.

Improving mucociliary clearance can lead to shorter recovery times for horses with respiratory complications, getting the animal back on the track faster for training and racing.

In our EIPH Study, each of the 19 trainers involved were asked to rate their horse's racing performance after Transpirator treatments: 65% of the races were rated as improved. Many trainers commented that the horse's recovery time after a race was markedly improved: less blowing, and back to feed and water in a shorter period of time. At least 9 of the 33 horses turned in the best performances of their careers.

Doctor Soma at the University of Pennsylvania, is in the process of statistical analysis of racing performance. In the interim, we can report the results in the following manner:

RACING RESULTS OF 33 KNOWN BLEEDERS BEFORE AND AFTER TRANSPIRATOR TREATMENTS

3 Races before Transpirator treatment:

Starts	Win	Place	Show	
96	10	10	8	
	10%	10%	8%	TOTAL 28%

Races after Transpirator treatment:

Starts	Win	Place	Show	
93	13	17	9	
	14%	18%	10%	TOTAL 42%

As you can see from the above chart, the win ratio for these 33 horses increased from 10 to 14% after Transpirator treatment and the Win, Place, Show average increased from 28% to a very respectable 42%. This is especially noteworthy considering that all 33 horses had exercise-induced pulmonary hemorrhage before treatment.

OBSTRUCTIVE CAUSES OF EIPH

Airway obstruction is now proven to be a major cause of exercise-induced pulmonary hemorrhage, more widely known as "bleeding". Horses have been observed bleeding from the nose for centuries. However, it was not until fiberoptic bronchoscope development in the early seventies, that the blood was found to originate from the lungs, not the nose.

Leading veterinary researchers postulate that there are two basic types of EIPH and they both occur during maximum inspiration.

Type I: Pressure Rupture Of Arterial Capillaries:

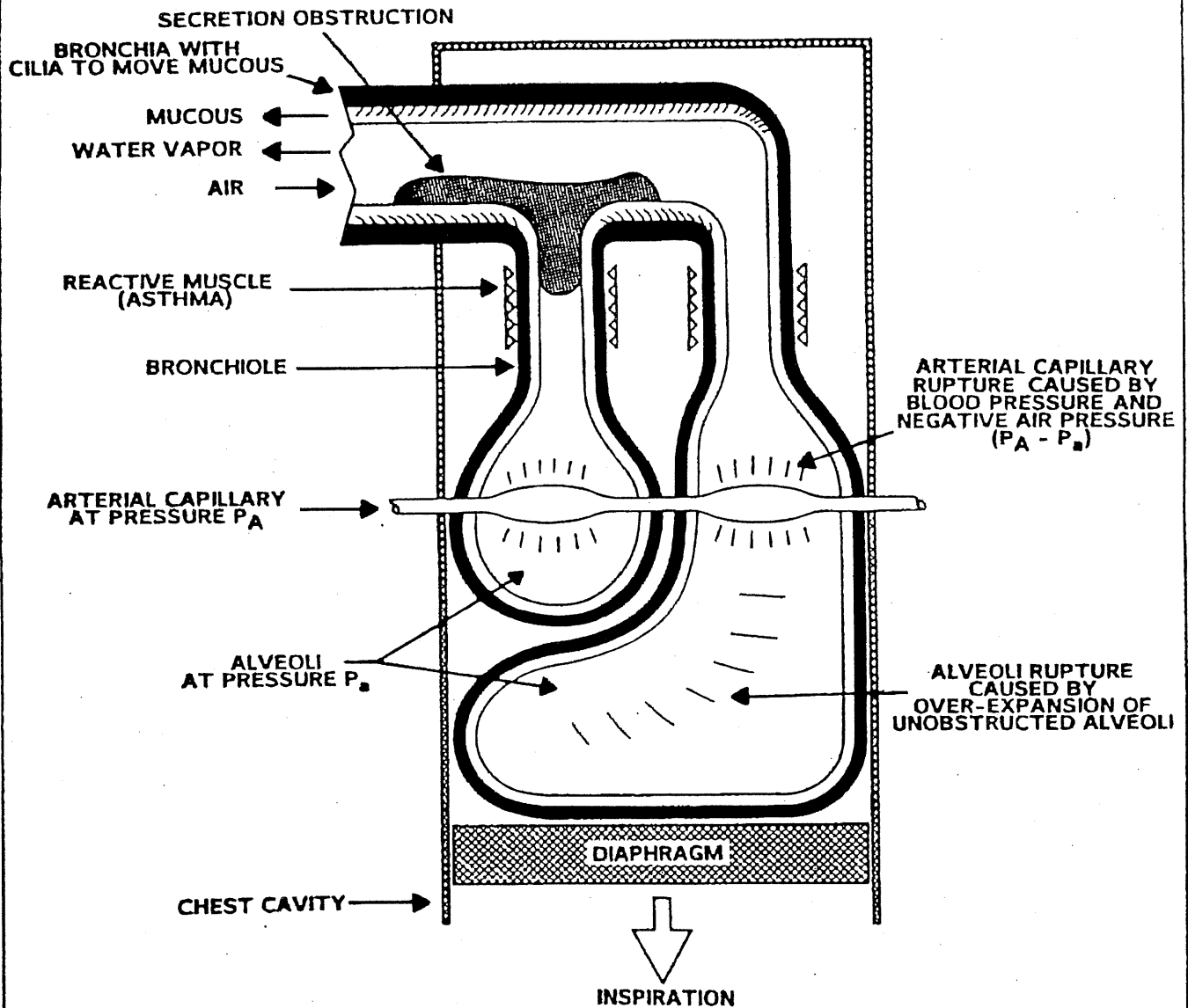
Excessive negative alveolar air pressure caused by airway obstructions, combined with the increased pulmonary arterial pressure during maximum exercise, can cause capillary walls to seep or hemorrhage. This type of EIPH may be relatively painless and bleeding will probably stop soon after exercise.

Type II: Overexpansion Rupture Of Unobstructed Alveoli:

If a number of alveoli become obstructed and cannot inflate during maximum inhalation, the surrounding unobstructed alveoli must overinflate to fill the expanded chest cavity. Tearing of alveolar walls by overexpansion may be painful and bleeding may be more severe and prolonged.

Relatively minor airway obstruction can increase alveolar vacuum and cause capillary hemorrhaging. Three major causes of airway obstruction are (a) secretions (dehydrated mucous and infection); (b) inflamed, swollen airways (bronchitis); and (c) reactive airways (asthma bronchospasm).

EXERCISE-INDUCED PULMONARY HEMORRHAGE



EIPH PREVENTION WITH WATER VAPOR

The Transpirator filters and preconditions the horse's entire inhalation with heat and droplet-free water vapor to just above body temperature saturation. This prevents airway water loss and upon cooling produces a thin film of condensation on the walls of the entire respiratory tract — from the nasal sinus to the alveoli. Retained and absorbed water thins the mucous blanket, dissolves mucous plugs, and promotes mucociliary clearance. The resulting removal of airway obstructions reduces the potential for EIPH.

TRANSPIRATOR VS. NEBULIZER

The Transpirator is not a nebulizer. Nebulizers are designed to break down medications and water into small airborne droplets for treatment of the upper airways. The upper airways remove airborne particles, including nebulized water droplets, to protect the small lower airways and alveoli in the lung. As a result, nebulized water is of no value in preventing EIPH.

The Transpirator in contrast heats and humidifies the horses inhalation in much the same manner as the horses upper respiratory tract. This heated humidity can penetrate the lungs all the way to the bronchioles and alveoli. It is in the small airways where obstructions are most prevalent. The resulting hydration and removal of mucous airway obstruction reduces the potential for EIPH.

LASIX TREATMENT OF EIPH

A previous EIPH study¹ conducted by Drs. Soma and Sweeney at New Bolton Center, revealed that up to 75 percent of racing horses suffer from exercise-induced pulmonary hemorrhage. Currently, the only approved race day treatment for bleeders is injection of the diuretic furosemide. Right now, 10 of 16 states with harness racing allow the use of furosemide. In thoroughbred racing, 20 of 23 states permit its use.

Our demonstration that airway mucous clearance reduces EIPH, supports the edema-reduction theory for the efficacy of Lasix. Airway obstruction, caused by inflammation and swelling of mucosal membranes, causes similar air flow restriction to secretion obstructions. If Lasix reduces the swelling through diuretic dehydration, then airway resistance and negative inspiratory air pressure should be reduced. However, there are increasing doubts about the efficacy of Lasix. Dr. Pascoe of the University of California at Davis is quoted in an article on Lasix in the July 1985 issue of *The Bloodhorse*: "Based on the evidence we have . . . furosemide seems to reduce the amount of hemorrhage, but it does not stop it."

Our own experience is limited to only eight horses that were on Lasix. However, we found that six were bleeding through. According to their trainers, most of these horses had been on Lasix for more than one year. Unfortunately, none of them were scoped after initial Lasix injections, so it is not known whether any of them ever stopped bleeding. We bronchoscoped these eight Lasix horses after racing. The six that were bleeding through were left on Lasix and included in our Transpirator treatment program: two stopped bleeding, two bled less and two showed no change. Although the sample is small, it appears that mucous clearance helps Lasix bleeders as well as it helps untreated bleeders.

¹ Raphel C.F., Soma L.R., Exercise-Induced Pulmonary Hemorrhage in Thoroughbreds After Racing and Breeding. *American Journal of Veterinary Research* July 1982 pp. 1123-1127.

OTHER APPLICATIONS

Clinical evaluation of Transpirator treatment has been primarily focused on EIPH, however, there has also been success in treating equine bronchitis, sinus infections, allergies, and foal pneumonia. The dramatic early results with foal pneumonia has accelerated plans for controlled clinical studies of this most serious breeding farm problem.

Mucous clearance by cilia motion and coughing are the primary mechanisms for removing airway obstructions. Prevention of airway water loss by administration of warm air saturated with water vapor is a natural, drug-free method for promoting mucous clearance. Improved mucous clearance reduces residence time of bacteria and allergens, minimizes bronchitis and helps maintain the natural humidification function of the upper airways. Improved natural humidification, in turn, reduces the potential for dry-air-induced bronchospasm.

TRANSPIRATOR TECHNOLOGIES, INC.

The Company was founded in July 1985 as a marketing subsidiary for Oxygen Enrichment Company Ltd.'s new line of heated humidity respiratory therapy products. The Equine Transpirator was developed at the suggestion of investors from the Saratoga Standardbred breeding farm in Ballston Spa, New York.

Oxygen Enrichment, a spin-off of General Electric Company's Medical Ventures Division, has been involved in the development, clinical testing, and manufacturing of oxygen and water vapor therapies for the treatment of human respiratory disease for over eight years.

During the November 1985 meeting of the American College of Chest Physicians, Drs. Peter Scott, Howard Eigen, and John Stevens of the Riley Children's Hospital in Indianapolis presented the results of almost two years of clinical study on the effects of inspired water vapor on pulmonary function in cystic fibrosis. The device used to treat these patients was the OECO High-Humidity Respiratory Therapy System. They concluded that, "Large airway function in cystic fibrosis patients appears to improve as the inspired water vapor content is increased. This relationship is most pronounced in patients with mild airway obstruction." Ongoing studies now under the direction of Transpirator Technologies are being conducted at several medical research centers around the country.

EQUINE TRANSPIRATOR ET-1000 SPECIFICATIONS

SIZE	22" x 17" x 10"
WEIGHT	40 Pounds
POWER	115V, 60Hz, 1500W
AMBIENT TEMPERATURE	20 - 95F
DELIVERY TUBE LENGTH	12 Ft.
DELIVERY DEVICE	Muzzle Mask
MAIN POWER	15A Circuit Breaker