

Treadmills *Revolutionize* Equine Research

BY LYNDSEY WHITE

From a slow-moving machine only capable of producing speeds great enough for the horse to walk and trot, the equine treadmill has been refined and developed into a high-speed, technologically advanced training and research tool. First used primarily for exercise physiology research, the equine treadmill is becoming increasingly popular with training centers and private equine practices alike. The treadmill has been more recently utilized for developing high levels of fitness in racehorses, predicting and optimizing future performance potential, evaluating poor performance (e.g. exercise intolerance due to airway disturbances), and rehabilitating horses following injury (particularly orthopedic injury).

In the early 1960s, Sune Persson of the Swedish University of Agricultural Sciences utilized a treadmill to study exercise physiology of Standardbreds. By measuring heart rate, it was possible to determine the cardiovascular fitness or work capacity of the horse. Such early studies provided valuable scientific data and, as a direct result, there has been a rapid increase in the number of research facilities throughout the world that now use treadmills. Indeed, the treadmill has greatly helped advance the study of the still relatively new branch of physiology termed "equine sports medicine." This branch includes the following areas of research:

- Biomechanics, gait, and conformation
- Energetics and performance
- Hematology and biochemistry
- Respiratory, cardiovascular, and muscular system anatomy, physiology, and adaptations to exercise and training
- Thermoregulation
- Nutrition and the athletic horse

While a racetrack is the obvious place to train a horse to race, the track is not as suitable a location to study exercise physiology. Disadvantages associated with testing a horse in an uncontrolled environment include the limited range of measurements that can be collected (before and after exercise but not during); the influence of different environmental conditions and riders; training restrictions due to inclement weather; the inability of a rider to determine exact speeds at which a horse must travel; and variations of the track surface. These disadvantages can be overcome by the use of a high-speed treadmill. The treadmill may be used in all weather conditions and

provides a controlled laboratory setting in terms of environment and work surface. The treadmill is linked to a computer that precisely controls the speeds at which the horse is traveling, allowing a consistent training regime or standardized exercise test (SET) to be followed and enabling fitness to be monitored through computer recording of heart rate. To enable simulation of real workouts and to lower the speed at which maximum capacity can be assessed, the treadmill can be set at various inclines (between 0 and 10°). For example, most horses will reach maximum oxygen uptake at 10-12 meters per second (m/s) on a 6° incline, as compared with 14-15 m/s on the flat. Measurements of blood lactate and glucose concentrations, free fatty acids, and packed cell volume can be taken throughout the SET, not just before and after exercise as would be the case on the track. One of the most important benefits of the treadmill is the high level of reproducibility of trials, which is essential in



Photo by Jeff Rogers