How Do They Do It?

Technological Advances Transform Research Methods

BY ROBIN STANBACK

Technological advances have burst open vaults of knowledge that even the most innovative scientific minds could not have imagined 50 years ago. Researchers have used these to reap a myriad of benefits that can be seen in every field from human neurology to equine physiology. The knowledge gained in equine sciences has grown exponentially, largely because of the dedication of researchers who have stepped outside conventional scientific structures to develop new methods for studying equine reproduction, growth, maintenance, performance, and aging. Some of the new methods, like the use of high-speed treadmills, have brought what would formerly have been considered field trial studies into the controlled atmosphere of the laboratory. In other cases, equipment once thought to be of use only in the laboratory has been modified for field utilization. These breakthroughs have dramatically changed the face of modern equine research.

"Technology has so expanded research capabilities that we now have the opportunity to answer questions we would not have considered years ago."

Straight laboratory research, well-defined studies performed with tightly controlled parameters, provides very specific information. With today's technology, these studies can impart even more information. Treadmills designed for equine exercise research have become more affordable and available in recent years, but it was not so long ago that such research depended upon tracks that were subject to weather and surface variables. Heart monitors that relied upon large machinery too cumbersome to be utilized in the field have become so small and affordable that researchers and competitors alike can easily use them.

Dr. Joe Pagan, president of Kentucky Equine Research (KER), stated, "Technology has so expanded research capabilities that we now have the opportunity to answer questions we would not have considered years ago. We can also more completely investigate earlier research findings. A good example would be research done in the early 1970s to determine the advantages of feeding fat to endurance horses. A drawback of that research was that blood samples could only be pulled post exercise. Today, modern technology makes it possible for us to mimic endurance work on a treadmill. Using stable isotopes, calorimetry units, and blood chemistries drawn from the horses as they exercise, we can provide more complete answers to even more complex questions."

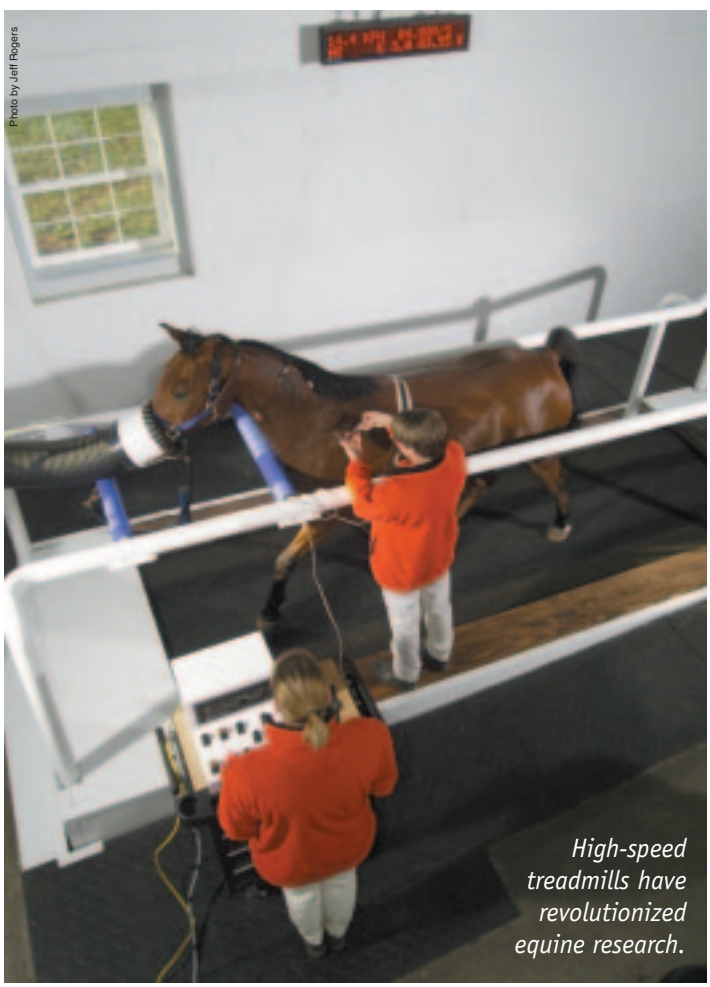
Dr. Pagan continued, "Ideally, research should travel full circle. Field studies ought to indicate what specific questions need to be answered. Researchers can then use the laboratory to carefully control variables, and use devices that can provide precise numbers and measurements to answer those questions. Then the research should return to the field to validate the laboratory findings. We have been able to do just that with our endurance studies at KER. We knew from earlier research and from questions raised in the field that specific types of fat supplementation should help endurance horses maintain their condition and remain competitive. We designed a research protocol to determine the most effective type of supplementation for these horses. Our findings were taken back to the field and validated by high-level endurance horses. The successful outcome of this research will influence the health and competitive edge of these equine athletes."

Dr. Tracy Turner of the College of Veterinary Medicine at the University of Minnesota has done a series of field research projects using a thermographic unit that affords a noninvasive pictorial representation of surface temperature and is useful in the detection of inflammation. It can also reflect alterations in the circulation of deeper tissues. Dr. Turner undertook the challenge of using a thermograph in the field to establish its usefulness as a diagnostic tool. In one 10-week study, Dr. Turner used this device to monitor 45 horses from the stables of seven trainers. He was able to identify areas of suspicious heat in 60% of the horses, which correlated with the trainers' concerns about their horses in 88% of the cases. There was also a similarity between the conclusions of the horses' veterinarians and those drawn from the information gathered by the thermogram. Dr. Turner found that a thermographic examination could be useful in determining lamenesses in horses, and that it could successfully predict significant injuries two weeks before they were a clinical problem.

"The advantage in testing the thermograph at the racetrack is that you have the opportunity to see how

reliable it is when faced with a number of variables. In the laboratory we can control almost everything. The reality is that veterinarians, trainers, and owners cannot control all the variables in their horses' lives. If a tool is to be useful, it has to hold up in the field," Dr. Turner explained.

Another example of the connection between field and laboratory research was work begun by the Animal Health Trust (AHT) in Newmarket, England that led to valuable changes in the care provided to three-day event horses. This work also highlighted the international nature of research and how a project that began in one country can ignite the interest of researchers in another. In field trials done on the speed and endurance day at the Burghley**** Three-Day Event, researchers from the AHT were able to determine that the equine athletes experienced stresses that could be detrimental to them in warmer and more humid climates. Questions raised by the work done at Burghley led to laboratory treadmill studies and the determination of protocols that would mimic the physiological and metabolic changes that occur in these horses during the cross-country phase of competition. The resulting tests allowed the researchers to evaluate the effects heat and humidity would have on the horses. Using this information, researchers at KER were able to develop specially formulated electrolyte supplements and feeding programs that were used to help the horses competing in the Atlanta Summer Olympic Games in 1996. Even as the horses took to the field on cross-country day in Atlanta, the research continued as the veterinarians caring for the horses provided feedback to help researchers determine the efficacy of the treatments that had been developed. The results of the work done in the laboratory and in the field at both Burghley and Atlanta were used and evaluated yet again in Sydney at the Summer Olympics in 2000.



High-speed treadmills have revolutionized equine research.

The use of modern technology and the ability to carefully emulate field work in a laboratory setting is evidenced by a study being done at Massey University in New Zealand. In a protocol designed to determine bone mineral density changes in growing and training Thoroughbreds, Dr. Elwyn Firth and a staff of researchers have employed a number of controls that would be impossible to implement by studying horses in the field. The number of horses they were able to use and the ability to control so many aspects of their upbringing and care have allowed the research team to develop a protocol that closely simulates field work. The horses were bred at the university, raised there, and treated similarly. The exercise programs were designed by a licensed trainer and controlled by the research team, with every aspect of the training regime monitored and recorded. The horses were weighed on a regular basis and fed on a specific program. Paddock exercise was excluded to eliminate variables that might have presented. The test results were carefully examined and compared with similar studies done on horses confined in normal stables.

Dr. Firth found considerable differences between his research horses and the random source New Zealand Thoroughbreds studied. He concluded, "Being able to measure these differences gave us the opportunity to offer the hope that management practices could help horses with bone density problems. Helping horses is the driving force for all of us."

While Dr. Firth's research was a controlled large group study, KER has been involved in a groundbreaking research protocol that further blurs the line between field and laboratory research and uses the latest technology to determine results. Drawing from research done on osteochondritis dissecans (OCD) from Rutgers University and using a test patented by that university, KER worked with six central Kentucky horse farms to study OCD lesions and their possible connection with glycemic response in 218 Thoroughbred weanlings. The sheer number of horses used in the study sets it apart from many research projects, as does the length of time the young horses were followed – from less than a year in age to 16 to 20 months. The information gained from the study may change the way people feed young horses and may result in stronger, healthier animals.