

Elixir of

Life

When horses sweat they lose precious nutrients by the cupful that can hinder their abilities on the track. The development of a new machine that will allow trainers to measure the hydration levels of individual horses and take appropriate action could mean the difference between winning and losing.

BY HEATHER PEDEN

Dehydration just may be a racehorse's worst enemy. Not only could it mean the difference between a win photo and no cheque at all in a race, it can also lead to more serious problems. A dehydrated horse is lacking in the nutrients needed to keep the body functioning in

top form, including its ability to regulate body temperature which could eventually lead to heat exhaustion or heat stroke. Dehydration is also accused of being a culprit of muscle soreness and even tying up.

So how do you know the horse is getting enough to sufficiently

rehydrate and recover completely from a physical exertion? How do you know at which point during training or recovery a horse could benefit most from a chance to replenish lost fluids through sweat, which is made up of water and electrolytes?

Research conducted by Mike Lindinger, PhD, at the University

of Guelph, ON has led to the development of a machine that is usable in the field for measuring the hydration levels of a horse at various stages of training and competing.

With the use of a process called bioelectrical impedance analysis

→ page 14



CLAUS ANDERSEN

Mike Lindinger demonstrates how the Equistat works, sending a harmless electrical current through the horse via electrodes on velcro straps to get a reading of hydration levels throughout the body.



(BIA), the hydration status of a horse can rapidly and non-invasively be measured and monitored.

"Right now the only way to try to estimate hydration status in horses is to take blood samples and measured things like plasma protein concentration and that's pretty crude. It's not giving you a really good idea," said Lindinger.

The machine, called an Equistat, which was developed in conjunction with the company Bodystat, not only measures the total body water in a horse but can also tell the lean body mass, fat mass, plasma volume, extracellular fluid volume (fluid outside the cells) and intracellular fluid volume (fluid inside the cells).

"Up until now we haven't had a good idea of hydration in horses during exercise and recovery," said Lindinger, whose research has spanned eight years. "That's why I'm really interested in the basic science of how that's going to improve horse health and performance."

A comparative animal physiologist, Lindinger did most of his work with humans and rats until about 12 years ago when he helped Gayle Ecker, PhD, of the University's Equine Research Centre (ERC) with a study that resulted in the development of a type of equine Gatorade.

During his research, Lindinger has come to appreciate the honesty of horses. "I think I like work-

ing with horses in general better than people because they don't talk back," he said, then added with a laugh, "some of them do, they try to kick you."

The initial BIA research phase was conducted on a group of seven horses at the ERC. In order to validate the results, Lindinger began working with a group of standard-breds in training at Tom Rankin's stable, based in St. Catharines, ON.

Trained by Pat Hunt, the 13 horses have given Lindinger a more practical basis for his research. "The neat thing is using it on real racehorses," said Lindinger of the BIA machine. "The original group are like couch potatoes in comparison to the elite athletes, racehorses that are exercising all the time."

Hunt agrees that dehydration in horses can be a big problem and can lead to muscle soreness and tying up. But, as each horse is an individual and reacts differently to physical stresses, it's hard to know just what each horse is lacking. Hunt mostly relies on trial and error.

"We'll give electrolytes to a horse maybe twice a week and maybe load them up the day before and if the horse goes out and races well then we do the same for the other horses, that's our research," he said.

Besides becoming hampered in their athletic abilities, dehydrated horses are "much more likely to colic, more likely to not eat, their

immune system becomes depressed and less able to fight infection, and behaviourally they can be sour," said Lindinger. "It's very important for all aspects. You can't maintain good energetics and healthy immune system if chronically dehydrated, or continually getting dehydrated."

A horse loses the majority of its fluid through sweating. Sweat is made up of water and electrolytes, the main ones present in sweat being sodium, potassium, chlo-

human sweat glands have a function that allows the reabsorption of some of the electrolytes flushed from the body due to sweating, horses do not.

"They have a very different sweat gland that doesn't allow the reabsorption of electrolytes, yet they can produce very high sweat rates. They sweat buckets of water, and cups of salt," said Lindinger.

Equine athletes can lose up to 10-15 litres of water an hour during intense training or competition,

Equine athletes can lose up to 10-15 litres of water an hour during intense training or competition, which adds up to a lot of lost electrolytes. That can lead to poor performance and long recovery times if left unattended.

ride, magnesium and calcium.

Electrolytes moderate many of the body's functions including the firing of nerves and contracting of muscles. By means of an electrical charge, electrolytes regulate the transfer of water through cell membranes, ensuring nutrients are going in and waste products are going out. When electrolytes are out of balance in the body, these functions become impaired.

Horses lose about 10 times more salt in their sweat than humans, explained Lindinger. And, while

which adds up to a lot of lost electrolytes. That can lead to poor performance and long recovery times if left unattended.

Lindinger points out that most people working with horses are aware of the importance of keeping the athlete hydrated, especially among endurance riders. "The people that are doing well, know with a specific horse how often to give how much electrolytes and how much water. If you can

Elixir of Life

← page 14

complete a 100 mile ride and the horse is not dehydrated, it's just amazing, and they're the winners, usually in the top two."

Knowing the signs of dehydration is important too, but Lindinger cautions, "By the time you see skin tenting and slow capillary refills, the horse is already dehydrated by at least two per cent, most likely three per cent or four per cent, so you're already starting to get into problems."

And it's not just physical exertion that can cause a horse to lose fluids, any kind of stress on the body can be a culprit. One of the main ones is trailering. That becomes a problem most in the summer when horses are being transported long distances to different tracks in hot weather. Horses arriving at the track after a long haul are already dehydrated before they even get out and start warming up for the races.

The BIA machine would allow trainers to check dehydration levels before, during and after shipping, and then take the necessary actions to replenish any lost fluids.

The machine is about the size

of a laptop computer and is connected, via a pair of wires, to a strap that is velcroed around the leg of the horse. Attached to each strap is two electrodes, a sender and receiver. An electrical current is sent, at various frequencies, from the machine through the sender electrode. It travels through the entire body before returning to the receiver electrode. At low frequencies, between five and 15 kilohertz, the current flows around the cells in the body and won't penetrate cell membranes. This takes a measurement of the body's extracellular fluid. "If you lose water from that extracellular compartment, that concentrates the electrolytes in that solution and will reduce the impedance. The current will flow more easily because the electrolytes are more concentrated," said Lindinger.

The current at higher frequencies does penetrate the cells, measuring the total body water. The difference between the two readings then gives the measurement of intracellular fluid. The information is then communicated as a percentage and displayed as a computerized print out.



CLAUS ANDERSEN

What they did discover during their research was horses lose most of their fluids through sweat from the extracellular compartment. "That was a huge surprise to us, we thought it would be a balance of what was lost from inside the cells and outside the cells." Similar studies done in humans and rats showed a balance between intracellular and extracellular losses, Lindinger said. "I think the big difference between the human studies and horse studies is that when a human exercises they use the lower legs. When a horse exercises they use their front legs and back legs and all their muscle mass to drive locomotion, there's a lot more going on and I think that paints a different picture of water and electrolytes."

Where the horse loses fluid from is important to knowing what is needed to rehydrate the horse, explained Lindinger. With the majority of fluid loss coming from outside the cell, "we can rehydrate primarily using the electrolyte solution, sodium chloride," he said. "If there was more of a loss from inside the cell, then you would have to replenish with potassium."

Once it is determined by what degree a horse is dehydrated, action can then be taken to replenish the fluids. But it's not good enough to just give the horse water. "The reason for that," explained Lindinger, "is, if you just give them water it dilutes the electrolytes that are in the blood and the kidneys don't like that and will try to get rid of the extra water. They can't get rid of just water, so they'll produce a dilute urine but that will still


contain electrolytes and you end up losing more electrolytes and become more dehydrated, so it's critical that they have electrolytes with their water."

While Lindinger explains it's not possible to give an exercising horse an overdose of electrolytes, it does matter in what manner it is administered.

"What does become a problem is sometimes people will give a concentrated salt solution, electrolyte pastes and slurries they'll syringe in," Lindinger explained. "The problem with those is they're very concentrated and unless the horse also drinks water on top of that you have this concentrated paste in your gi tract that's going to pull water in from the fluid compartments into the gut and make the horse more dehydrated before they can actually reabsorb that."

Balance is the key when it comes to the fine-tuning of the sport horse, and right now, as Hunt explained, a lot of it is a guessing game. Hunt says it is obvious that each horse is an individual, but right now, "We envelope our whole stable, if one horse is on electrolytes, they all are."

He seems to be confident that an apparatus like the Equistat could be useful in the field and adds Lindinger's research hammers home the necessity of electrolytes in any athlete.

Both men agree that dehydration is definitely a problem in sport horses, but with a better understanding of the processes going on in individual animals, we are likely to see an improvement in overall health and performance. 

8th Annual
**STEVE CONDREN
GOLF TOURNAMENT**

for
The Ontario Standardbred Adoption Society

WEDNESDAY, JULY 14, 2004
Crosswinds Golf Club, Milton, Ontario

ENTRY FEE of \$200 includes
Golf, Electric Cart, Lunch, Buffet Dinner, Souvenir, Prize Table,
Putting Contest and Elimination Draw.

HOLE IN ONE COMPETITION
Win a golf vacation for two, including airfare (Selected Gateways),
3 nights accommodations and golf for two sponsored by

**AMERICAN EXPRESS TRAVEL SERVICES
TRAVEL CHOICE MILTON, ONTARIO**




Corporate Sponsors ~




Golf Entries To: **OSAS**
2150 Meadowvale Blvd., Suite 2
Mississauga, Ontario L5N 5S3
Tel.: (905) 812-7408 • Fax: (905) 812-7597
ontbred@lefca.com