Cool ideas for a hot topic

Methods can vary for treatment of tendons and ligaments in legs after exercise

by Kenneth L. Marcella, D.V.M.

THE long, hot days of August are here, and staying cool is just about everyone's goal.

The equestrian portion of the Olympics was held in Hong Kong this month, and 90° temperatures and more than 80% humidity of that region were concerns for competitors and organizers alike. Thus, keeping horses cool is a hot topic.

Recent research has provided a new look at cooling, specifically cooling of tendons and ligaments after exercise. Over the last few years, many cooling products, leg-soaking systems, and cold-application technologies have become available for this purpose, but research had not yet fully evaluated these options.

Owners and trainers could not be sure if cold-hosing or ice buckets were still on a par with new circulating cooling machines and high-tech wraps and boots. A review of the benefits of the ancient idea of applying cold to tendons and ligaments and a look at emerging research on how best to do this will provide horsemen with the both the "old" and the "new" on this hot topic.

Tried and true

The idea of applying cold (cold water, ice, snow) as a means of controlling pain and inflammation has been around for a very long time. Greek and Roman physicians discussed cold therapy or cryotherapy as early as the 4th century B.C. There are numerous early reports of applying cold compounds such as ice or cold mud to the legs of horses suffering from tendon and ligament inflammation and of standing horses with various inflammatory conditions of the feet (abscesses, arthritis, and laminitis) in a cold stream or pond. Science has since confirmed that cryotherapy is a very beneficial method of treatment.

The primary benefit of cold application is in reducing inflammation. This effect is thought to occur through local vasoconstriction. This reduction in size of blood vessels helps to reduce fluid leakage into tissue, which results in hemorrhage or edema.

Normal hard exercise can stress and strain tendons and ligaments, causing some mild inflammation and swelling, and any abnormal conditions leading to sprains, tissue disruption, or more extensive damage (tears) will certainly be associated with more substantial inflammation and swelling. Reducing whatever swelling or edema occurs following exercise in working tendons and ligaments is important in that this reduction also decreases the amount of destructive cellular components released from stressed tissue. These prostaglandins and histamines irritate other cells and further increase inflammation. Cold application immediately after exercise goes a long way to reducing this cascade of tissue damage.

Lesley Ward photo

PROVEN METHOD

The basic application of cold, whether standing a horse in ice buckets or hosing a horse's legs, as a means of controlling pain or reducing inflammation dates back to the ancient Greek and Roman times

Along with vasoconstriction, cold therapy promotes other anti-inflammatory effects. Cold reduces the activity of histamines, neutrophils, and many other tissue irritants.

Cold also slows tissue metabolism—as much as 50% when the temperature is lowered by 10°. Reduced metabolism reduces the cell's demand for oxygen and can lessen the amount and severity of tissue damage in the immediate post-injury period.

Cold also decreases the activity of muscle fibers and can reduce muscle spasms and keep muscle damage to a minimum following strenuous exercise or competition.

Cold has also been shown to slow nerve conduction velocity. Since nerve impulses travel more slowly, tissue becomes less sensitive, and this is considered the most important factor in the analgesic, or pain-lessening, effect of cold application.

Cold application

There is a period of reflex vasodilatation (opening of blood vessels) that follows the initial vasoconstriction after cold is applied to a body part. This dilation allows blood to flow into the specific part and is thought to be a protective body mechanism designed to maintain the health of tissue at low temperatures by forcing periodic tissue reperfusion. Without this reperfusion, humans and animals in cold environments would be at risk of prolonged low tissue temperatures and frostbite.

The secondary dilation of blood vessels has been the determining factor for how long a horse's legs are cold-hosed or soaked in ice.

Most cold application is done for 30 minutes at a time with at least an hour between sessions. The general thinking was that if cold was applied for longer than 30 minutes, the vessels would reflexly dilate and flood the area of concern with more blood, thus leading to inflammation and swelling, which is exactly what cold application was designed to prevent.

The majority of cold-therapy studies have been done on humans, though, and, as veterinary research has caught up, it has become apparent that horses do not respond similarly.

Horses, for example, did not show reflex vasodilatation after 30 minutes of cold application at approximately 39°.

Sonya Nightingale, a physiotherapist at the Highworth Physiotherapy Clinic in Ireland, has investigated the comparative effects of topical cooling agents in horses and sees the large body of human cold therapy data as potentially confusing when applied to horses.

"Most research into the use of cold has been done in the human field in application over muscle tissue," Nightingale wrote in a study. Since most cold application in the horse is done on the lower legs over tendon, ligament, and bone with vastly different vascular support and thicker, hair-covered skin, Nightingale concluded that "the results of human [cold therapy] research are therefore not transferable to the equine field and may result in inappropriate treatment."

When to use

Cold therapy should be started as soon as possible after exercise and certainly should be applied immediately following trauma. Studies show that a difference in only one day in the initiation of cold therapy is associated with a longer course of treatment and a slower resolution of problems.

In sound, healthy horses, immediate post-exercise cold therapy helps in the cooling-out process, and its rapid use may reduce potential stiffness or swelling.

Research at the Royal Veterinary College in the United Kingdom has shown that as little as seven minutes of strenuous exercise can produce temperatures of up to 113° in tendons and ligaments. The rapid cooling of these tissues becomes very important in the long-term health of these structures, and information on the best methods of cooling in the horse is necessary for owners and trainers.

Current methods of cooling a horse's tendons and ligaments vary from the simple to the complex.

Southern California-based trainer Eoin Harty, a fourth-generation horseman who was instrumental in the development of eventual Dubai World Cup (UAE-G1) winner Street Cry (Ire) and champion Tempera and current conditioner of Grade 1 winner Colonel John, said "old school is still the way to go."

Harty stands his runners in buckets of water and crushed ice for an hour post-race.

"It takes time and patience to get some of them to accept it," Harty said.

Kentucky-based trainer Ken McPeek, trainer of 2002 Belmont Stakes (G1) winner Sarava, also prefers a simple approach.

McPeek uses cold water bandages and ice boots with crushed ice immediately after a race. He times his application sessions for 30 minutes and follows up with cold poultices later.

Scientific proof

While these cooling approaches certainly represent currently accepted practices, what does science have to say about the different methods of cold application and the newer products on the market?

There is very little convincing research on the pros and cons of various methods of equine cold application.

"No matter what the method of application, there appears to be little information available as to the effects, efficacy, length of therapy, and best method of application in the horse," said California-based practitioner David Ramey, D.V.M.

Recognizing this lack of equine-specific information has prompted a number of researchers to begin testing some of the available cold therapies.

Researchers at the School of Veterinary Medicine at the University of California-Davis investigated the degree and rate of cooling of tendons using a commercial compression splint/wrap with circulating coolant. These systems involve wrapping the horse's legs with a splint material that is connected by tubes to a central machine. The material provides compression and circulating coolant.

Melinda McDonald, D.V.M., Ph.D., of the University of California research team found that the temperature of the superficial digital flexor tendon (SDFT) was significantly lowered through the use of this machine and that, surprisingly, the SDFT temperature was actually lower than that of the surrounding skin. This is a potential problem in that there is no way for the trainer to tell how cold the internal structures are simply by feeling the leg, and the potential exists for these units to cause damage if they are used for too long at too low a temperature.

This was the first such test of its kind, and McDonald would like to see all cooling methods subjected to similar investigation.

"Everyone wants an easy answer," McDonald said, "but it's going to take some looking to see what does and doesn't work."

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