'Invisible,' restricted horse racing therapy may leave a trail

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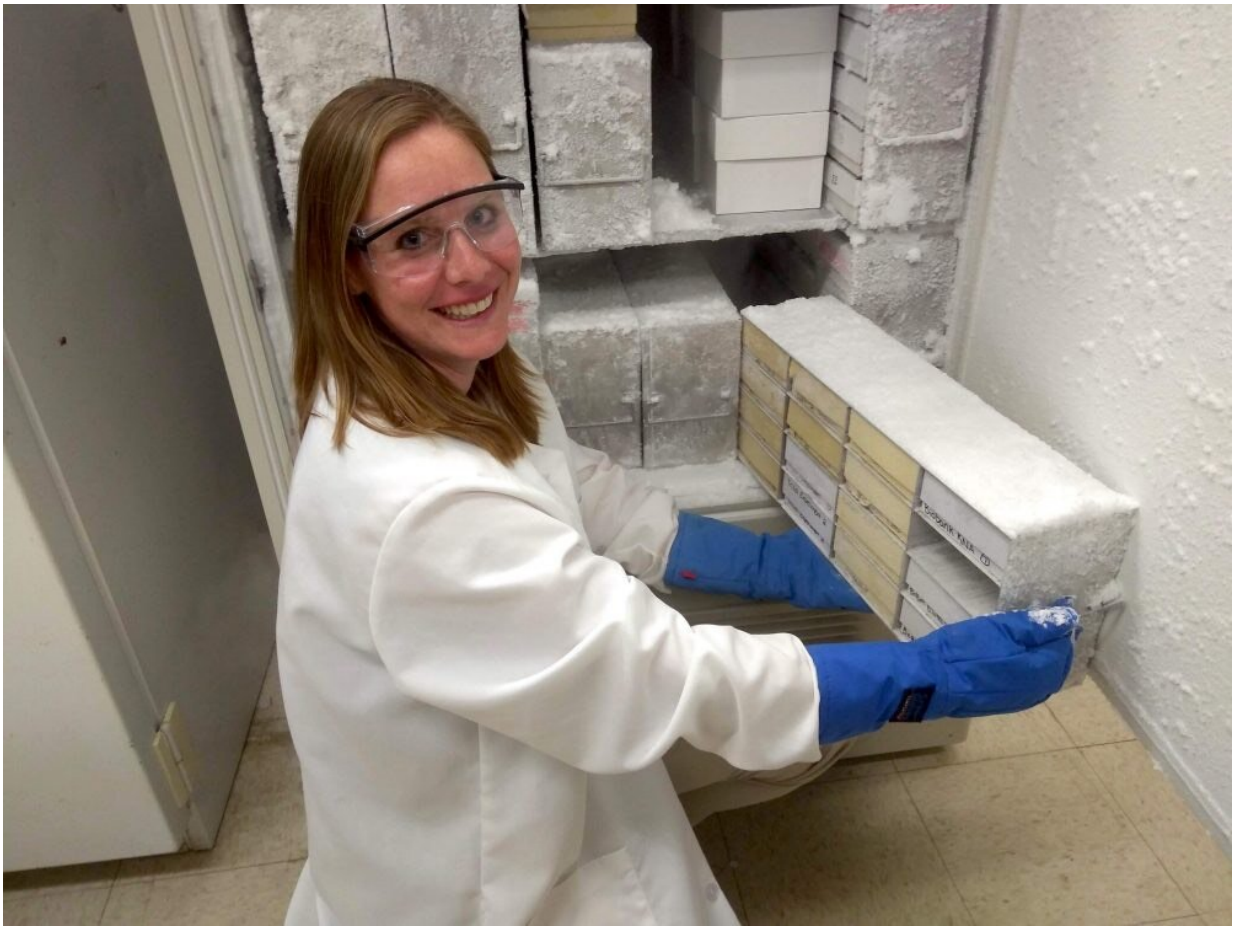

Mary Robinson, director of Penn Vet's Equine Pharmacology Laboratory, led work with lab member Jinwen Chen, to find fingerprints of shockwave therapy, a treatment used to address injury and pain in both humans and horses. The practice is banned in racehorses 10 days prior to competition. Credit: Paulick Report

A treatment called extracorporeal shockwave therapy (ESWT) is used in patients both human and equine to speed healing of injured tendons and ligaments. Using high-pressure sonic waves, ESWT is thought to increase blood flow to the treated area and has been shown to reduce pain over the short term.

In racehorses, however, masking pain can come with a cost: Overworked minor injuries could lead to major ones or even pose a life-threatening risk to both horse and rider.

For that reason, horse racing authorities have banned the use of ESWT for horses within 10 days of a race or sporting event. But the question of how to enforce this "invisible" therapy remained open. Now a team led by Mary Robinson, director of the School of Veterinary Medicine's Equine Pharmacology Research Laboratory, and lab member Jinwen Chen has found that the practice does in fact leave a trail. In a paper in *Equine Veterinary Journal*, they report finding potential biomarkers of ESWT that, with further testing, could one day be used to enforce the ESWT ban.

"Because it's not a drug—it's applied to the surface of the skin—it's just not an easy thing to detect," says Robinson. "After a lot of trial and error, our study was able to measure changes in levels of five inflammatory factors, some of which we could detect up to three weeks after the shockwave therapy."

The attempt to find these biomarkers dates back roughly a decade.

"It was Dr. Lawrence Soma, my predecessor, who said the lab was going to have to look at blood-based or urine-based biomarkers to try to detect shockwave therapy," Robinson notes.

To find the fingerprints that ESWT might leave behind, the researchers

tested the therapy on 11 horses kept as a study herd at Penn Vet's New Bolton Center. The researchers collected blood samples from the group of horses, composed of Thoroughbreds and Standardbreds, at several times both before and after each received a single dose of ESWT to a leg.

Over the years, the lab investigated a number of potential biomarkers, molecules that would indicate a horse received ESWT. They zeroed in on 10 pro-inflammatory and anti-inflammatory signaling molecules, called cytokines, which they can measure from the blood using a sensitive test called ELISA, short for enzyme-linked immunosorbent assay.

"We looked a week before giving the shockwave therapy to see if there were any changes in the baseline period, due to changes in time of day or anything else, and didn't see anything we could define as significant," Robinson says. "And in the post-shockwave period we went out to three weeks."

They could not detect changes in five of the cytokines they examined following ESWT. But the other five—TNF-α, IL1β, IL-1RA, IL-6, and sTLR2—did respond. Of those, TNF- α levels were significantly increased through the whole of the post-therapy study period, three weeks.

More study is necessary, Robinson emphasizes, before these biomarkers could be used to assess inappropriate use of ESWT in racehorses. For one, the researchers would like to see if measuring these same molecules in horses that are actively training and racing or that have an acute injury might change their results.

For that, she and her colleagues are actively pursuing follow-up studies to look at these biomarkers and other indicators using a biobank of

samples from client-owned animals, including injured and active racehorses, treated at New Bolton Center.

The end goal is to keep the sport safe.

"Shockwave therapy is great as long as people rest the horse after using it," she says. "We are concerned that it's being abused in the racehorse industry and that it could potentially result in breakdowns. That's exactly what we're trying to avoid."

More information: J.-W. Chen et al, Inflammatory mediators are potential biomarkers for extracorporeal shockwave therapy in horses, *Equine Veterinary Journal* (2019). DOI: 10.1111/evj.13183

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