Cyanide Poisoning Now Linked to Kentucky Aborted Fetuses and Foals

Eastern Tent Caterpillar feeds on wild black cherry tree leaves which contain cyanide.
The insects overwhelmed Kentucky trees and fields in the spring of 2001.
Is there a connection to the aborted foal syndrome?
Photograph courtesy University of Kentucky College of Agriculture.

News Update - May 24, 2001 Lexington, Kentucky - Tonight laboratory experts confirmed that liver enzymes which indicate cyanide poisoning were confirmed in pathology analyses of aborted fetuses and foals. The main suspect for the cyanide source remains the Eastern Tent Caterpillar combined with the cyanide in wild cherry tree leaves containing more cyanide than normal because of the freeze after record high temperatures in mid-April. Still unknown is exactly how the caterpillar cyanide gets into the pregnant mares. While scientists begin more tests on pasture grasses, Lexington horse breeders are going to cut down wild cherry trees near their pastures and spray the Tent Caterpillar moths before they lay eggs that would hatch next spring.

May 23, 2001 Lexington, Kentucky - The University of Kentucky Livestock Disease Diagnostic Center reported today that since April 28th, the total number aborted fetuses and foals examined in its laboratory has climbed to 532. These unexplained deaths of first trimester and third trimester unborn foals are unprecedented in the history of horse raising anywhere in the world.

Last week several experts thought the answer was mycotoxins - poisonous residues left by fungi and molds on grasses. Scientists thought that the combination of very hot weather in the first two weeks of April followed by two days of freezing temperatures stressed the grasses so much that the parasitic molds and fungi took over and concentrated toxins that the horses ate.

But this week laboratory results were negative for mycotoxins. So now the focus has shifted to the lowly Eastern Tent caterpillars and the wild black cherry trees they live upon each spring. Tent caterpillars make silken tents to live in while they feed on their host trees.

Hundreds of Eastern Tent Caterpillar larvae live together in "tent webs" spun from silken threads produced by the insects. These collective nests are homes to the caterpillars from 4 to 6 weeks before the cocoon and moth stages.
Photograph courtesy University of Kentucky College of Agriculture.

There were so many caterpillars in Kentucky this year that whole cherry trees on farms were stripped bare. Wild cherry trees are known to have cyanide in their leaves. If the trees are stressed while protecting themselves from wildly fluctuating temperatures as occurred in April, the leaves will produce even more cyanide. The Tent caterpillars can eat the leaves without getting poisoned and carry the cyanide in their own guts for awhile. Scientists now wonder if the pregnant mares might have eaten some of the many caterpillars moving in pastures? Or eaten a cyanide residue on the grass as the insects moved from tree to tree?

Today, I talked with two men involved in the Kentucky investigation. One is an entomologist who has studied the Eastern Tent caterpillar. The other is an expert on horse nutrition. First, Dr. Lee Townsend, Extension Entomologist in the College of Agriculture at the University of Kentucky in Lexington. I asked Dr. Townsend if horses have ever been known to eat caterpillars?

Interview:

Lee Townsend, Ph.D., Extension Entomologist, College of Agriculture, University of Kentucky, Lexington, Kentucky: "That's a good question. Not that I know of. Tent caterpillars are pretty hairy and active and you would think that horses would be leery of them.

AS AN ENTOMOLOGIST, IS THERE ANY REFERENCE ANYWHERE IN ANY LITERATURE IN THE WORLD OF THESE KINDS OF CATERPILLARS EMITTING ENOUGH CYANIDE ON GRASS THAT THEY HAVE KILLED OTHER ANIMALS OR CAUSED CYCLES OF INTENSE ABORTED FETUSES?
There is nothing that I'm aware of that points to that. There is some information in the literature on a completely different caterpillar in a completely different part of the world whereby when it feeds on particular grasses, the response of the plants is to increase the protective chemicals in the leaf. Subsequently, animals that graze on this grass can become ill. But in terms of depositing anything on the leaves, there is not anything that I have seen in the literature about it and specifically with the Eastern Tent Caterpillar, the information that is available in terms of cyanide and the protective chemicals that are associated with the caterpillar are limited to the gut content as it's feeding on the foliage.

IF THE CATERPILLAR/TREE CONNECTION ACTUALLY HAD SOMETHING TO DO WITH ALL THE ABORTED FETUSES AND UNBORN FOALS, THEN IT SEEMS FROM WHAT YOU ARE SAYING THAT YOU WOULD HAVE SEEN THAT LAST YEAR AND THE YEAR BEFORE WHEN YOU HAD INTENSE NUMBERS THEN AS WELL?
That is correct. The complicating factor to this is the early spring weather pattern of 2001 with that early warming and then the freeze which potentially

can effect plant chemistry with the wild cherry and some of the pasture grasses as well. While the caterpillar numbers are roughly the same or somewhat equivalent, the environmental conditions between the two years are different. It looks as if whatever the cause of this particular syndrome is, it seems to be associated with a particular set of circumstances that all came into place at the right time.

IF THERE HAS EVER BEEN A WORRY ABOUT CYANIDE IN CHERRY TREES, WHY IN THE WORLD WOULD KENTUCKY THOROUGHBRED FARM RAISERS HAVE SO MANY CHERRY TREES ON THEM TO BEGIN WITH?
That is a good question. Many of those trees I suspect are outside the fence line of the farm. Most trees on farms and pastures that I've seen have been fenced off so the animals don't have direct access to the trees and foliage themselves.

THAT EVEN REDUCES FURTHER THE LIKELIHOOD OF ANY DIRECT CONTACT BETWEEN THE HORSES AND THE CATERPILLARS.
It does, except for the wandering activity of the caterpillars when they are forced to leave trees or when they naturally leave them. The opportunity is there. The question is: did that actually take place and that's a tougher link to establish.

IT SEEMS LIKE A BIG LEAP.
It is a big leap. Yeah. So that's what this team of people will be looking at and also consider that the picture could change. Results from other tests could open up other avenues to follow."

Why Aren't the Mothers Affected?

ANOTHER QUESTION RELATES TO THE HEALTH OF THE MARES. IF CYANIDE POISONING KILLED THE UNBORN FETUSES AND FOALS, WHY WEREN'T THE MOTHERS AFFECTED? THAT QUESTION ALSO PUZZLES ONE OF LEXINGTON'S WELL KNOWN HORSE NUTRITION EXPERTS, STEPHEN JACKSON, PRESIDENT OF THE BLUE GRASS EQUINE NUTRITION CENTER IN VERSAILLES, KENTUCKY AND GRADUATE OF BOTH TEXAS A& M AND THE UNIVERSITY OF KENTUCKY. I ASKED HIM IF IT'S TRUE THAT SO FAR THERE HAVE BEEN NO REPORTS OF MAJOR HEALTH PROBLEMS WITH THE MARES.

Stephen Jackson, Ph.D., President, Blue Grass Equine Nutrition, Versailles, Kentucky: "That's correct. And although there were some instances of pericarditis and other problems in yearlings and other classes of horses, the general population of horses did not seem to be affected. Nor do cattle, at this point, seem to be affected. If you operate under the theory that caterpillars could be involved, then you have to come back and titrate a dose of cyanide that would be adequate to cause hypoxia in the developing fetus, but inadequate to cause severe signs in the mare.

WOULDN'T THAT IMPLY THAT SOME HOW THE HORSES WOULD HAVE TO BE EATING THE CATERPILLARS?
Exactly. And that's the big stretch right now. Being a nutritionist, that's what my major field is, I've watched horses graze and eat for hours and a horse can spit out a pebble. If you put a pebble in their feed trough with 5 pounds of feed, when you look after they are through eating, that pebble will be there sitting on the bottom of the trough. They are just very selective about what they ingest. So, it was inconceivable to me - and still is somewhat inconceivable that a dang horse would eat a caterpillar! You know, a bird won't. And the caterpillars do have high levels of cyanide in their gut and that is their natural protection mechanism. So, it's still somewhat of a reach to get the cyanide into the horse and then to titrate the dose of cyanide that it would take to make the fetal injuries. But there are lots and lots of dead ends here and there is a high correlation between the presence of these defoliated cherry trees and the

incidence of problems on farms. And several farms in fact where they've had no problems and they've had no cherry trees. And no caterpillars. So there is a lot of circumstantial evidence that would indict the caterpillars, but it's going to be awhile before people can put all the pieces together, if they fit, to say conclusively that it is either cyanide or some sort of metabolite or precursor of cyanide that is causing the problems in these mares.

BUT DID YOU FIND ANY ELEVATED LEVELS OF CYANIDE IN ANY OF THE ANALYZED FETAL ABORTED FOALS?
That's again... cyanide is very labile. It turns gaseous. Hydrogen cyanide is a small molecule. At this point, there has been no cyanide per se found, but what we have to look at now is not cyanide itself, but enzymes in the liver tissue of some of the animals that were posted that could indicate the cyanide was there. And that's what the people in the veterinary science department are doing now.

BUT IT STILL IS A MYSTERY.
It is very much a mystery. Luckily, we appear to be out of the woods in terms of the early fetal losses and late term losses and more mares that were bred later are ultrasounding still pregnant than in the past.

The problem with the diagnostic laboratory numbers is that the late term losses are fairly accurate in terms of establishing how many foals are dying in central Kentucky, because most of those late term foals that die would be submitted for autopsy or necropsy. But the early term pregnancies, I would suspect that less than 5% of those early fetal losses would be submitted for necropsy because a lot of times you can't find them. These are tiny little embryos and you go in and ultrasound the mare and see the embryo is in trouble, there is a lot of echogenic flocculent material on the screen, on the ultrasound, and then you come back and it's gone. So it's not like you can harvest that embryo. It's only in a few cases where they look at the mares they can see a discharge and fetal membrane. But very few of the early embryonic deaths are actually going into the diagnostic laboratory because you can't find them at that stage.

WHAT YOU ARE SAYING IS THAT THE NUMBER OF 520 OR SO COULD EVEN BE MUCH GREATER?
Oh, there is no doubt in my mind that the number of 500 doesn't represent 10%. That 500 number is extremely misleading. I have clients that have lost 80 to 100% of the early embryos, the early breedings they have had from February bred mares. I know one owner who had 72 mares bred in February and 72 mares have slipped. And they have submitted probably 4 of the early embryonic loss fetuses to the diagnostic laboratory.

WHAT KIND OF IMPACT ARE YOU GOING TO SEE NEXT YEAR FROM THESE LOSSES AND WHAT HAPPENS IN 2002 TO 2003?
Well, I think that is somewhat up to conjecture. It is a huge economic loss. Estimates have been from 200 to 250 million dollars and I think that is probably small.

THE ASSOCIATED PRESS ARTICLE ON MAY 22ND SAID, 'ESTIMATES INDICATE THAT KENTUCKY'S $1.2 BILLION THOROUGHBRED INDUSTRY COULD SEE A 30-40% REDUCTION IN THE NUMBER OF HORSES BORN IN 2002 AND THE LOSSES OF HUNDREDS OF MILLIONS OF DOLLARS OVER THE NEXT SEVERAL YEARS.'
And that's not even considering the trickle down effect. I know farms that belong to friends of mine that have already laid off half of their staff because mares have left the state and they don't have any work for them to do. That probably doesn't account for the labor and economic effect on labor or the effect on feed companies that will sell less feed, or for agents fees that are going to sell fewer horses and collect fewer commissions. The trickle down effect is really huge."

Websites:

http://www.ca.uky.edu/

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