



Do Environmental Factors Fit with a Poison as the Underlying cause of Mare Reproductive Loss Syndrome?

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Abstract

Abortions in mares linked to Eastern Tent caterpillars are known as Mare Reproductive Loss Syndrome (MRLS) (ETC; *Malacosoma americanum*). The purpose of this study is to determine whether the theory that a toxin is the root cause of MRLS can be tested using Westerman's Correlates of Causal Strength of Evidence (WCCSE) and still make sense given the environmental elements that are known to affect the development of MRLS. All correlations with WCCSE support a toxin as a likely causal agent. Environmental aspects supported this hypothesis as well. Higher than average ambient temperatures and less precipitation than usual were linked to MRLS incidents. A speedy tightly clustered hatching interval was made possible by higher temperatures, which resulted in a higher population density of ETCs during a specific time period and promoted more active intake of Black Cherry tree leaves.

Keywords: Toxin; reproductive syndrome; *Malacosoma americanum*.

Introduction

Four MRLS abortion storms (mare reproductive loss syndrome) have occurred in the previous 129 years, necessitating the coexistence of numerous environmental elements that affect the abundance and behavioural characteristics of the Eastern Tent Caterpillar (ETC). The main factor influencing MRLS is a dense population of caterpillars. Tent caterpillars go through population cycles every 10 to 20 years that are marked by rapid population growth and then a sharp drop. The eastern half of the United States is part of the native range of ETCs, and Black Cherry tree populations peak in those areas (*Prunus serotina*). A hatching interval that is closely spaced is encouraged by a period of high ambient heat. ETCs consume the young cherry tree leaves, from which they generate a toxin called mandelonitrile benzoate (MB), which the authors believe causes MRLS. During off-tree eating and/or searches for pupation places, the ETCs contaminate meadows. Mares are probably introduced to MB through consuming tainted food or water. Additionally, it is suggested that a lack of rain causes the toxin to build up on the grass following each ETC feeding session. Rainfall, on the other hand, dilutes the poison on the meadows, lowering exposure. Any modification to these environmental elements reduces the possibility of MRLS.

Correlations of causal strength of evidence according to Westerman

In the Ohio River Valley of the United States, MRLS was reported in 2001 and 2002. There, it resulted in a 500 million dollar loss for the horse production business. It comprised unilateral panophthalmitis, fibrinous pericarditis (FP), early and late gestation abortions (EGA and LGA), and *Actinobacillus meningoencephalitis* [1]. 2,998 early gestation pregnancy losses were reported in 2001, and over 550 late gestation abort uses were sent to the University of Kentucky's Veterinary Diagnostic Laboratory (UKVDL). 500 early gestation losses (EGL) and 165 late gestation miscarriages occurred in 2002 [2]. Around 60 cases of pericarditis were recorded in 2001 compared to nine cases in 2002 [4], and thirty occurrences of unilateral panophthalmitis were seen in 2001 as opposed to six cases in 2002 [3]. These "reported instances" accurately portray MRLS, but they are far less in number than the 14,000 cases that were previously estimated to have occurred [5]. There were 256 EGL reported in 1980, which was followed by 162 further losses of a similar nature in 1981. In both years, there

seemed to be "clusters" of abortions. Clusters were also noted in the MRLS cases from 2001 to 2002. Since clinical horse reproduction did not use ultrasound scanning in 1981, the echogenicity of foetal fluids between 30 and 80 days of gestation, which is linked to MRLS, was not discovered. The gestational ages and breeding dates in the 1980 to 1981 losses were comparable to those linked to the MRLS miscarriages seen in the ejection of foetal membranes occurred on rare occasions in both the 1980–1981 and 2001–2002 episodes, although the foetus itself was still inside the uterus or vagina. Because of the typical management procedures in place at the time, the severity of the pregnancy losses in 1980 to 1981 was not discovered until the pregnancy status of mares was assessed in the fall. Although some aborted tissues contained positive cultures of streptococci [6], the reason for the abortions in the years 1980 to 1981 was never discovered. The ambient temperature was exceptionally high during the last week in March and the first part of April in both 1980 and 1981, as well as in 2001 and 2002, according to environmental parameters [7].

In Central Kentucky, similar abortion storms had been observed. In 1906 and 1907, the term "slipping illness," which is characterised by spontaneous abortions of late-gestation pregnancies, was coined. Although a bacterial aetiology was suspected, no conclusive diagnosis could be made. These two years' weather records revealed warmer and dryer than usual circumstances. When both early and late gestation pregnancies were lost in 1890 and 1891, there was an even earlier abortion storm. It was calculated that mares of all breeds lost 75% of the foal crop. Despite the fact that this incident took place before weather events were recorded, horsemen at the time hypothesised that exceptionally warm weather was a major factor. The same worries were expressed from 1906 to 1907 [8].

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Discussion

According to Westerman's Correlates of Casual Strength of Evidence, every correlation points to an ETC toxin as a probable causal factor. The number of correlates would increase if the same correlations were applied to setae. Despite this, environmental research suggests that a toxin rather than setae is more likely to be to blame, particularly in light of the effects that weather has on the buildup of toxin in the environment rather than the growth of ETC. [9, 10].

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Conflict of Interest

The authors affirm that they have no known financial or interpersonal conflicts that would have appeared to have an impact on the research presented in this study.

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