

Bile Acids: Linking Metabolic Syndrome To Infertility

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This study tests whether bile acids drive infertility in mares with Equine Metabolic Syndrome and if ursodeoxycholic acid (UDCA) can improve ovarian function.



Equine Metabolic Syndrome is recognized as a major threat to horse health due to its strong link with laminitis, but its impact on fertility has received far less attention. Many broodmares with EMS experience disrupted reproductive cycles, irregular ovulation, or prolonged luteal phases, all of which reduce conception rates and foaling efficiency. Our preliminary research shows that EMS mares have elevated levels of specific bile acids—chemicals that not only regulate metabolism but also act directly on the ovary. In humans and cattle, high concentrations of primary bile acids in the follicular fluid surrounding the egg are associated with poor oocyte quality, while protective bile acids such as UDCA are linked with improved embryo development.

By studying granulosa and luteal cells from EMS mares, we will determine how individual bile acids influence hormone production, cell survival, and ovarian function. In parallel, we will test whether oral administration of UDCA—a drug already used safely in horses with liver disease—can shift the bile acid environment in vivo and restore healthier ovarian function. This research provides a novel mechanistic link between metabolism and reproduction in mares and could lead to new therapeutic options for managing subfertility in EMS.

Importance to Industry: EMS affects up to one in four horses worldwide, with major costs from laminitis but hidden costs from reduced reproductive efficiency in broodmares. Poor fertility not only decreases the success of breeding programs but also undermines the value of mares in Thoroughbred and sport horse industries where reproductive performance is critical. By identifying bile acids as drivers of ovarian dysfunction, this project addresses an urgent knowledge gap and opens new possibilities for diagnosis and treatment. The evaluation of UDCA as a therapeutic intervention has immediate clinical relevance: it is already safe, inexpensive, and widely available for equine use. Collectively this proposal both investigates the direct mechanism for metabolic induced ovarian dysfunction and proposes a potential direct therapeutic intervention.

Importance to Industry: Stomach ulcers are the most common disease of the horses' stomach. Stomach ulcers are commonly caused by a direct exposure of the lining of the stomach to the acidic contents within the stomach. There are several risk factors that have been demonstrated to increase the likelihood of horses to suffer from stomach ulcers and these include housing in stables, exercising on an empty stomach, a diet that is high in grain and low in hay or grass and some medications.

These risk factors are often present in the environment of racehorses in training. Horses with stomach ulcers may have a dull hair coat, a decreased appetite, resist saddling or riding, colic or not perform to the best of their ability. Due to the exposure to risk factors as well as the large number of horses impacted by stomach ulcers, it is very common for horses to be treated for stomach ulcers preventatively without appropriate investigation to determine if stomach ulcers are actually present. Omeprazole is the most common drug used for the treatment and prevention of stomach ulcers.

Historically, omeprazole has been considered a safe drug by the veterinary community with few adverse effects reported. Currently, there has been no investigation into the adverse effects of omeprazole administration beyond 90 days. Within human medicine there is concern regarding a sudden increase in stomach acid secretion and a resultant decrease in stomach pH beyond the levels that are considered normal when the medication is discontinued. The objective of this study is to determine if discontinuation of omeprazole results in a decrease in stomach pH, beyond the normal acidity of the horse stomach.

This may lead to further investigation into if the dose of omeprazole, the type or the length of treatment influence rebound stomach hyperacidity, and investigation into how this adverse effect can be managed. The results of this study may also influence the indiscriminate use of omeprazole within the equine industry.