Sex hormone-binding globulin (SHBG) enhances mitochondrial dynamics and biogenesis while attenuating inflammation in adipose-derived mesenchymal stem cells (ASCs) derived from equine metabolic syndrome (EMS)-affected horses.

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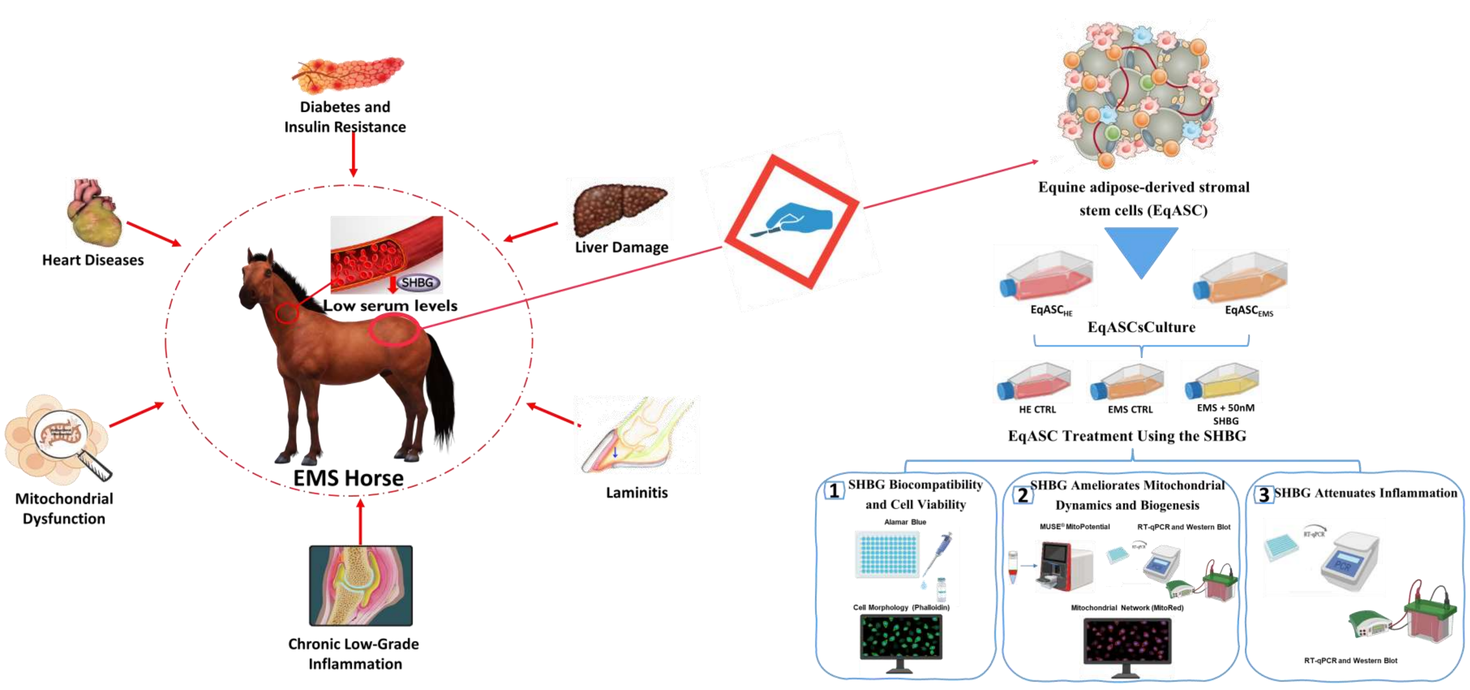
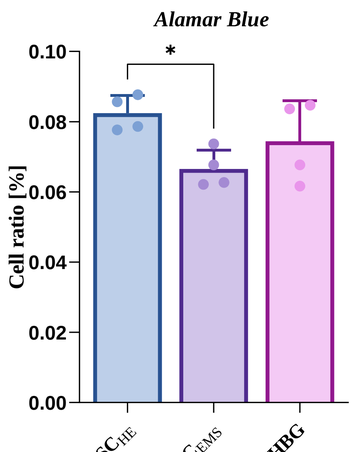
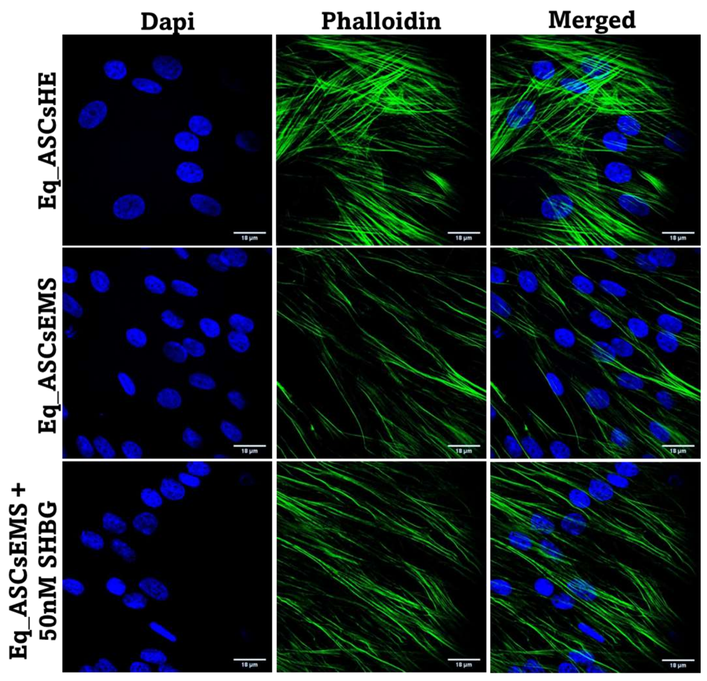


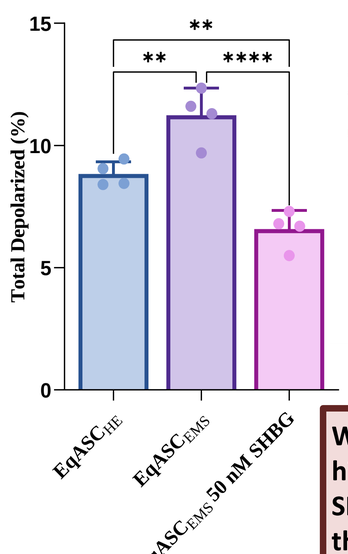
Introduction: Equine Metabolic Syndrome (EMS) is a common and complex metabolic disorder that affects horses. Like metabolic syndromes in humans, EMS is characterized by a combination of obesity, insulin resistance, and an increased risk of laminitis, a painful hoof condition. While the exact cause of EMS is not fully understood, researchers have identified various contributing factors, including genetics, diet, and insufficient exercise. One intriguing aspect of EMS is its connection to low circulating levels of Sex Hormone-Binding Globulin (SHBG), a protein that plays a crucial role in regulating the bioavailability of sex hormones. Low levels of SHBG in the blood have been observed in some horses with EMS, and this phenomenon may have implications for the hormonal imbalances seen in EMS-affected equines. Understanding the link between EMS and SHBG can provide valuable insights into the underlying mechanisms of this condition and help in developing effective strategies for its management and prevention.

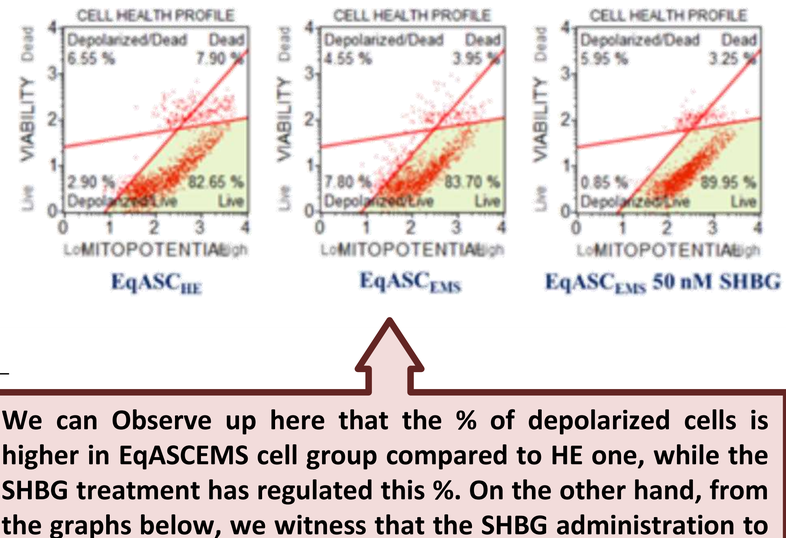
Methods: In our presented study, our primary objective was to investigate the potential protective effects of exogenous SHBG on EqASCEMS. To achieve this, we exposed EqASCEMS cultures to a 50 nM concentration of SHBG; then, we evaluated various parameters, such as cells viability, mitochondrial dynamics, metabolism, and biogenesis. Additionally, we analysed the expression of both inflammatory and anti-inflammatory markers.



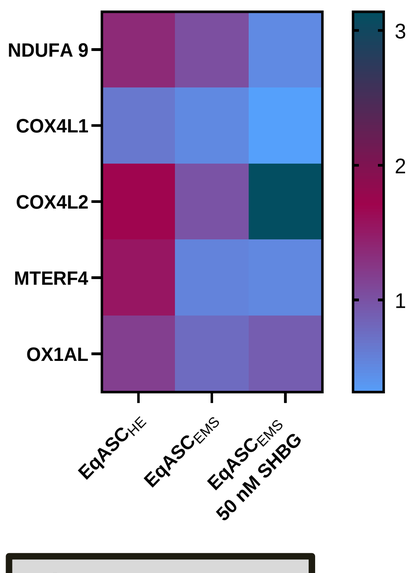


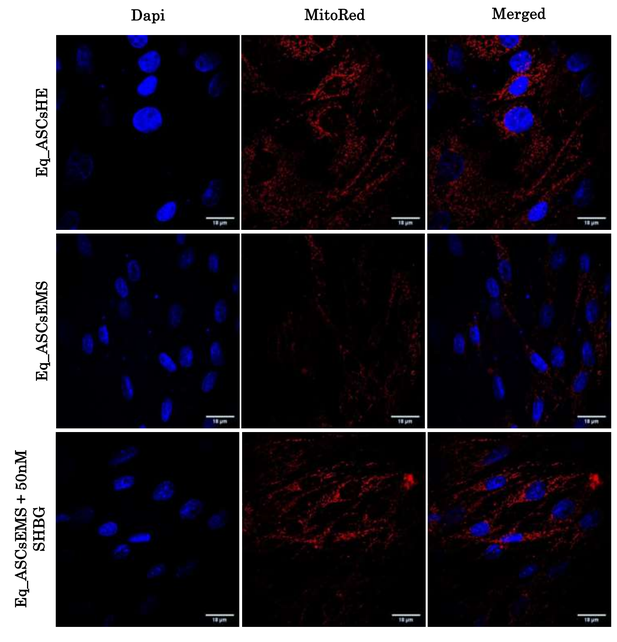
The percentage of cell ratio in EqASCHE is higher than EqASCEMS, after the administration of the SHBG treatment to the EMS cells, we noticed that the percentage increased of living cells increased.

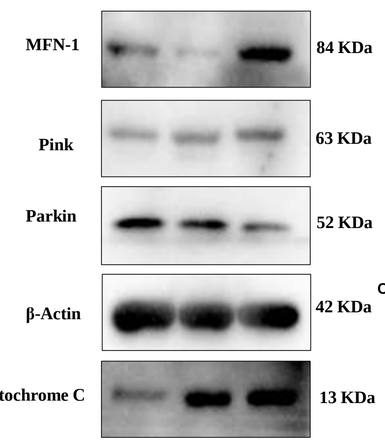


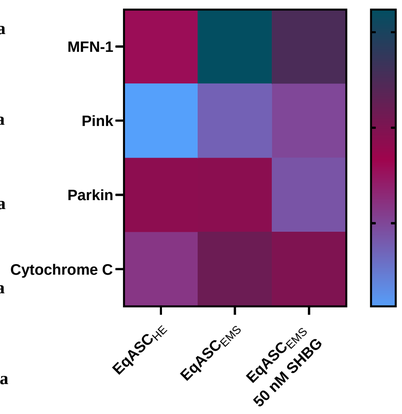


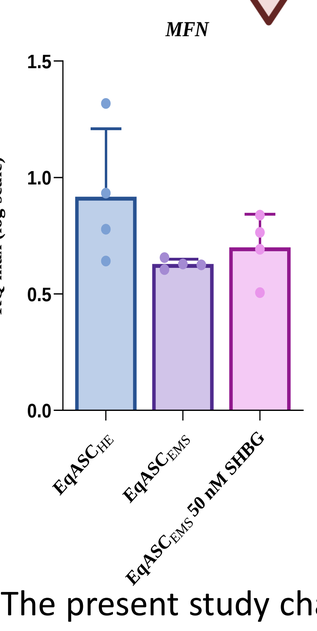
We can Observe up here that the % of depolarized cells is higher in EqASCEMS cell group compared to HE one, while the SHBG treatment has regulated this %. On the other hand, from the graphs below, we witness that the SHBG administration to the EMS cells has regulated the gene and protein expression of some mitochondrial dynamic and biogenesis markers, while it didn't improve the expression of some others.

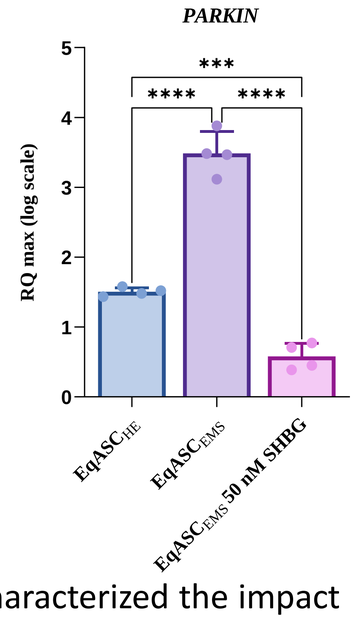












Conclusion: The present study characterized the impact of exogenous SHBG on EqASCEMS. We showed, that SHBG ameliorates aspects of the mitochondrial metabolism, dynamics and biogenesis through the modulation of mitoribosomes and the mitochondrial oxidative phosphorylation (OXPHOS) system. It is also exerting strong anti-inflammatory activity, it is in fact reducing the expression of pro-inflammatory cytokines expression and activated the expression of the anti-inflammatory ones. Our study suggests that the SHBG is endowed with crucial beneficial effects on ASC metabolic activities and could serve as a valuable therapeutic target for the development of efficient EMS treatment protocols.

The exogenous SHBG application on EqASCEMS cells has significantly decreased the expression of pro-inflammatory cytokines while it increased the expression of anti-inflammatory ones.