Epidemiological Characteristics of Horses with Hyperinsulinemia in a Large Population of Horses[1]

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Introduction

Pituitary pars intermedia dysfunction (PPID) and Equine Metabolic Syndrome (EMS) have been described as the most common endocrinologic disorders in horses. Few studies exist that describe the epidemiological characteristics of horses with these endocrine diseases. The components of the EMS clinical syndrome have been described as increased adiposity, obesity, hyperinsulinemia (HI), hypertriglyceridemia, hyperleptinemia; and insulin resistance that is associated with an increased laminitis risk.[2,3] Further, this clinical syndrome of EMS has been shown to occur in horses diagnosed with PPID.[4]

Study Objective

The purpose of this study was to obtain information that included age, breed, sex, clinical signs, and ACTH/insulin/glucose status at initial diagnosis of potential endocrine cases (new cases) to determine the epidemiological characteristics of horses with hyperinsulinemia.

Materials and Methods

Horses of any age, breed, and sex from the continental US were eligible for study enrollment as long as they were documented to be exhibiting one or more of the following clinical signs: generalized or regional hypertrichosis, muscle wasting, abnormal fat distribution, lethargy, laminitis (unknown etiology), polyuria, polydipsia, susceptibility to infections, abnormal sweating, and/or inappropriate lactation. Normal horses were excluded from the study. At initial visit, demographic data, signalment, and a physical examination was conducted. Clinical signs were documented and blood was drawn for basal ACTH, fasting insulin, and glucose. Blood samples were processed and shipped overnight to the Animal Health Diagnostic Center, Cornell University, Ithaca, NY for analysis.

Statistical Analysis

The association between hyperinsulinemia (based on fasting insulin results), clinical signs and glucose were statistically evaluated individually using the Pearson chi-square test. Odds ratios for significant predictors of hyperinsulinemia were computed using corresponding 95% confidence intervals when applying multiple logistic regression analysis.

Results

Four hundred eighteen of nine hundred eighty-two horses with complete epidemiological information were included in the final data analysis. Of the 418 horses, 221 (52.8%) were HI+. Further, horses were stratified into 1 of 3 groups based on ACTH and insulin laboratory results (PPID+/HI+), (PPID-/HI+), and (PPID-/HI-). Of the 418 horses, 115 (27.5%) were PPID+/HI+, 106 (25.3%) were PPID-/HI+, and 197 (47.1%) were (PPID-/HI-). Of the 418 horses evaluated, 9.6% of horses <15 years of age were PPID+HI+, 23.5% of horses 15 to 19.9 years of age were PPID+HI+, 27.8% of horses 20 to 24.9 years of age were PPID+HI+, and 39.1% of horses >25 years of age were PPID+HI+. Further, 47.3% of horses <15 years of age were HI+, 61.2% of horses 15 to 19.9 years of age were HI+, 46.7% of horses 20 to 24.9 years of age were HI+, and 44.8% of horses >25 years of age were HI+. One hundred ninety-seven of four hundred eighteen (47%) horses were PPID-HI-.

Analysis for PPID+/HI+ and PPID-/HI+ horses was evaluated. Based on the data for clinical signs only in the PPID-/ HI+ horses, HI was significantly (p <0.000) greater among horses with cresty neck and laminitis present. Although not statistically significant (P >0.025), HI was greater in horses with 2 other clinical signs; abnormal sweating and pot belly/ weight gain. Based on clinical signs data alone, the odds of HI in horses with cresty neck was more than twice (2.3X) that for horses without this clinical sign present. Similarly, for horses with laminitis, the odds ratio of HI in these horses was also more than twice (2.2X) that for horses without this clinical sign present.
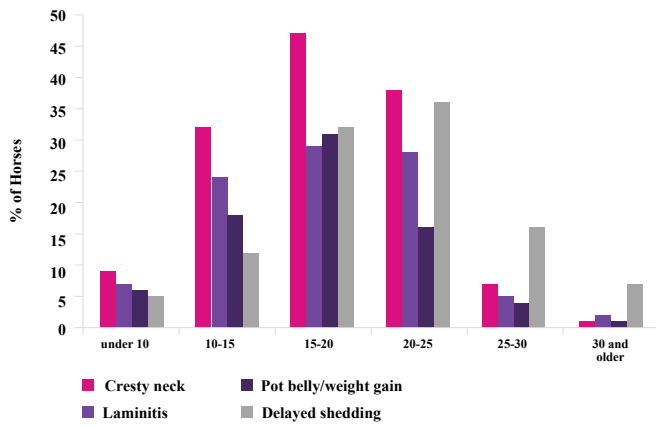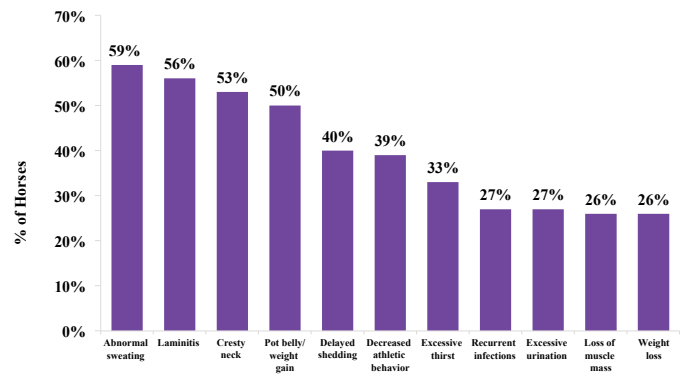
All HI+ Horses by Age
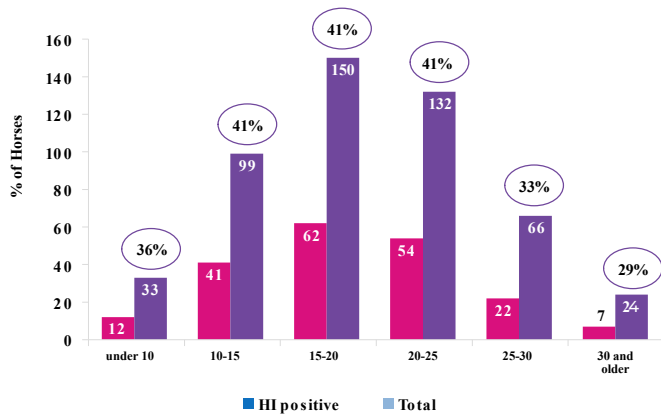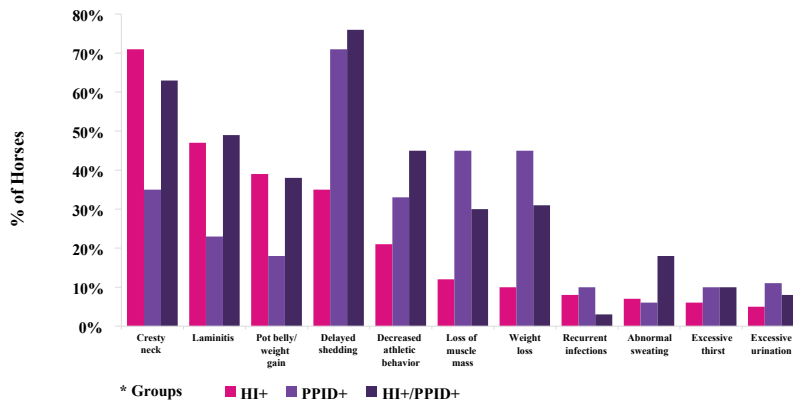

Clinical Signs Present: HI+ Horses
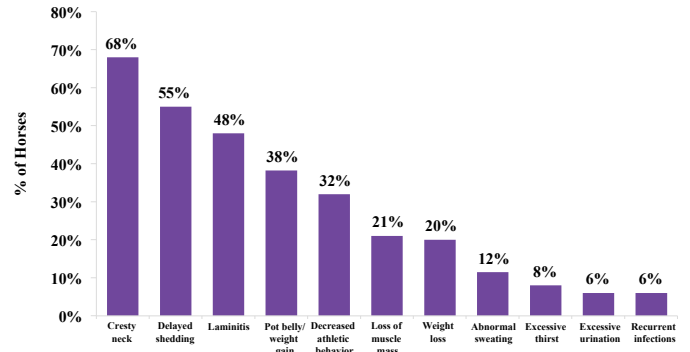
HI+ Horses: Clinical Signs Within Age Groups

HI+ Horses: Within Each Clinical Sign Group

Clinical Signs by Group*

Discussion

Of the 418 horses with complete data, 52.8% were diagnosed with hyperinsulinemia. Based on the combined data of clinical signs (11 interpretable), glucose levels and fasting status, cresty neck, laminitis and high glucose were found to be significant predictors of HI. Specifically, horses with high glucose levels were seen to have almost four times the odds (3.5X) of HI compared to those with normal glucose levels. Therefore, when evaluating horses with suspected endocrine disease; at a minimum, ACTH, insulin and glucose should be evaluated. Long-term studies need to be conducted in large populations of horses to further evaluate endocrinopathies in horses.

Take Home Message

In this study, hyperinsulinemia was diagnosed in over 50% of the horses with complete data. When PPID+/HI+ horses were stratified by age; the percent PPID+ horses that were also HI+ increased with age. The percentage of horses with laminitis also increased when horses were both PPID+ and HI+. Therefore, when evaluating horses with suspected endocrine disease, at a minimum, ACTH, insulin and glucose should be evaluated.

References

1. Grubbs S, Neal D, Keefe T. Epidemiological characteristics of horses with hyperinsulinemia in a large population of horses. *J Vet Intern Med* 2016; 30: 1502.

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