In association with

Research team
Dr. Ahmed Al Ansari BSc, DVM
PhD student and resident in Equine Medicine, UCD Veterinary Hospital
Emma Golding
PhD Student, School of Veterinary Medicine, UCD
Nicola Walshe
Assistant Professor Equine Clinical Studies, School of Veterinary Medicine, UCD
Carmel T Mooney
Professor, Clinical Director, Veterinary Hospital, UCD
Vivienne Duggan
Associate Professor Equine Clinical Studies, Section Head, Equine Clinical Studies, Diagnostic Imaging and Anaesthesia, School of Veterinary Medicine, UCD

OBESITY IN CONNEMARA PONIES IN IRELAND

Until now, little has been known regarding the prevalence of obesity in Irish ponies. This month, we report on a new study of obesity and associated disease conditions in Connemara ponies from a UCD School of Veterinary Medicine (UCDSVM) research team

Overview

Equine metabolic syndrome (EMS) as defined by the European College of Equine Internal Medicine (ECEIM) consensus statement is a collection of risk factors leading to endocrinopathic laminitis.[1] Horses and ponies with EMS are predisposed to laminitis that develops in the absence of other recognised causes such as carbohydrate overload or generalised severe inflammatory/infectious conditions. A study was conducted at UCDSVM to investigate the prevalence of obesity and associated metabolic disease conditions in the native Irish pony breed (Connemara pony) using a cross sectional study and to determine if hyperinsulinaemia in these ponies could be predicted by physical or metabolic markers.

Introduction

Obesity in humans is recognised worldwide as an epidemic, especially in developed and developing countries.[2] Significant health problems including metabolic syndrome and type 2 diabetes mellitus have been found to be associated with obesity.[3] Similarly, obesity in horses is found to be associated with adverse health conditions including increased blood lipid concentration, insulin dysregulation (ID) and endocrinopathic laminitis.[1] Laminitis leads to disruption in the soft tissues attaching the pedal bone to the hoof wall. Laminitis caused by a consistent increase in blood insulin concentration (also called Hyperinsulinaemia-associated laminitis [HAL] causes stretching within the dermal-epidermal layers of the hoof sensitive lamellae, as distinct from the complete detachment within the lamina basement membrane observed with other types of laminitis (sepsis and limb overload).[4] There is no specific treatment available for endocrinopathic laminitis.[5] Laminitis results in severe rotation and/or sinking of the pedal bone, which is extremely painful and euthanasia on humane grounds may be necessary in these cases.

Insulin dysregulation (ID) is the key feature of EMS and represents a disturbance of the normal homeostatic balance of insulin, glucose and lipid concentrations in plasma. ID does not only include increased basal insulin concentration (BIC), but also an abnormal insulin response to an oral or intravenous carbohydrate challenge as part of dynamic testing, with or without an increased or prolonged increase in blood glucose concentration, or insulin resistance (IR) at the tissue level, which may be manifested as an increase in triglyceride concentrations.[6,7]

Multiple studies have investigated the prevalence of obesity in horses and ponies and shown that equine obesity is highly prevalent,[8] ranging from 24 per cent in mature Icelandic horses in Denmark[9] and up to 54 per cent in leisure horses of different breeds in the UK.[10] The prevalence of obesity differs between horses and ponies. A study conducted in Australia showed that the prevalence of obesity in pony breeds was three times higher (31.4 per cent) than in horses (9.5 per cent) with a prevalence of 71.5 per cent in the Shetland pony breed.[11] The only study on obesity in horses and ponies in Ireland found that 45.0 per cent of the study population were overweight.[12] That study included 60 leisure horses and ponies of different breeds.[12] The aim of this study was to investigate the prevalence of obesity and associated metabolic disease conditions in Connemara ponies in Ireland.

Methods

The study population included only registered Connemara ponies from around Ireland. Horse-related public and veterinary social media posts were used to advertise and recruit the study subjects. Ponies included in the study underwent a physical examination and owners were given a questionnaire to answer regarding the information on their management and clinical history. Evidence of previous episodes of laminitis (the presence of divergent hoof rings) were recorded by the researcher (vet) conducting the study. Divergent hoof rings were differentiated from diet change-related parallel rings by the wider spaces between the rings at the heel level when compared to the toe (See Figure 1). The body condition score (BCS) was measured using the Henneke system; cresty neck score (CNS) and regionalised adiposity

Figure 1: Divergent hoof rings.

were also assessed. Hyperinsulinaemia was confirmed either by measuring serum basal insulin concentration (BIC) or serum insulin concentration after an oral sugar test (OST) using Karo corn syrup at 15ml/kg given orally using a dosing syringe. Blood glucose and triglyceride concentrations were measured. Plasma ACTH concentration was measured in ponies ≥ 10 years of age and those with plasma ACTH concentration above seasonal reference values were excluded from the study.

Logistic regression is a statistical analysis method that estimates the probability of an event occurring, such as disease or no disease, based on a given dataset of independent variables. Variables including BCS, CNS, blood glucose and triglycerides concentrations and the presence of laminitis (either owner-reported history or based on the presence of divergent hoof rings) were all included in the analysis. Logistic regression was applied to analyse and compare characteristics of hyperinsulinaemic versus insulin sensitive ponies.

Variable associated with hyper-insulinaemia	Odds ratio (95% CI)
Body condition score (BCS) ≥ 7	6.53 (2.95, 15.21)
Owner reorted history of laminitis	5.76 (2.29, 14.41)

Table 1: Multivariable model logistic regression odds ratio for various factors associated with hyperinsulinaemia in 200 Connemara ponies.

Results

The study included a total of 200 ponies. There were 135 (67.5 per cent) females and 65 (32.5 per cent) males (18 stallions and 47 geldings). Of these 59 ponies (29.5 per cent) were considered obese with a BCS of ≥ 7. Fifty-eight (29.0 per cent) ponies had a cresty neck score (CNS) of ≥ 2.5 and 135 (67.5 per cent) had regionalised adiposity; 137 (68.5 per cent) ponies had at least one of these abnormalities. Owner-reported history or clinical evidence of chronic laminitis (based on the presence of divergent hoof rings) was found in almost half (46.0 per cent) of the studied population.

Serum insulin concentration above normal cut-off values was detected in 32 ponies (16.0 per cent), including 23 of 91 (25.3 per cent) tested by oral sugar test (OST) and 9 of 109 (8.3 per cent) by basal serum insulin concentrations (BIC). High triglyceride concentration was observed in 12 of 198 ponies (6.1 per cent) and hyperglycaemia in 11 of 197 ponies (5.6 per cent) ponies. The statistical analysis (logistic regression) conducted on the data showed that the odds of hyperinsulinaemia increased by a factor of 6.53 (95 per cent CI: 2.95, 15.21) when the pony was obese, i.e., with a BCS of ≥ 7.

One of the main limitations of the study was that the OST was not performed in all ponies due to the management system of the ponies in a less intensive manner in some parts of the country.

Conclusions

This is the first study to focus on EMS in the native Irish pony breed. This research study found that more than one quarter of the studied population of Irish Connemara ponies, are considered obese. It also found that the prevalence of confirmed hyperinsulinaemia was approximately 25 per cent using the OST but <10 per cent when measured using non fasting BIC. Taking into consideration the limited sensitivity of these tests, these results are likely an underestimation of hyperinsulinaemia. Obesity represented by an increased BCS was found to be significantly associated with hyperinsulinaemia in this study, with obese ponies being at almost seven times more risk of hyperinsulinaemia. A history of laminitis was also found to be significantly associated with hyperinsulinaemia in this population. These findings follow the widely recognised theories that obesity and hyperinsulinaemia are major risk factors associated with endocrinopathic laminitis. More effort should be made to educate owners on the links between obesity, EMS and endocrinopathic laminitis, as these lead to significant welfare risks for their ponies. The information obtained from this study gives additional and useful information about these conditions in this native Irish pony breed.

References

1. Durham AE, Frank N, McGowan CM, *et al.* ECEIM consensus statement on equine metabolic syndrome. J Vet Intern Med 2019;33(2):335–49.
2. Christopher C. Imes & Lora E. Burke. The Obesity Epidemic: The USA as a Cautionary Tale for the Rest of the World. Popul Health Metr 2014;1:82–8.
3. Guh DP, Zhang W, Bansback N, Amarsi Z, Birmingham CL, Anis AH. The incidence of co-morbidities related to obesity and overweight: A systematic review and meta-analysis. BMC Public Health 2009;9:1–20.
4. Lane HE, Burns TA, Hegedus OC, *et al.* Lamellar events related to insulin-like growth factor-1 receptor signalling in two models relevant to endocrinopathic laminitis. Equine Vet J 2017;49(5):643–54.
5. Eades S, Fugler LA, Mitchell C. The management of equine acute laminitis. Vet Med Res Reports 2014;39.
6. Grenager NS. Endocrinopathic Laminitis. Vet Clin North Am - Equine Pract [Internet] 2021;37(3):619–38. Available from: https://doi.org/10.1016/j.cveq.2021.08.001
7. de Laat MA, Fitzgerald DM. Equine metabolic syndrome: Role of the enteroinsular axis in the insulin response to oral carbohydrate. Vet J [Internet] 2023;294(February):105967. Available from: https://doi.org/10.1016/j.tvjl.2023.105967
8. Carslake HB, Pinchbeck GL, McGowan CM. Equine metabolic syndrome in UK native ponies and cobs is highly prevalent with modifiable risk factors. Equine Vet J [Internet] 2020;evj.13378. Available from: https://onlinelibrary.wiley.com/doi/10.1111/evj.13378
9. Jensen RB, Danielsen SH, Tauson AH. Body condition score, morphometric measurements and estimation of body weight in mature Icelandic horses in Denmark. Acta Vet Scand 2016;58(1):19–23.
10. Stephenson HM, Green MJ, Freeman SL. Short Communications Prevalence of obesity in a population of horses in the UK. 2010;(2006):6281.
11. Potter SJ, Bamford NJ, Harris PA, Bailey SR. Prevalence of obesity and owners' perceptions of body condition in pleasure horses and ponies in south-eastern Australia. Aust Vet J 2016;94(11):427–32.
12. Golding E, Al Ansari ASA, Sutton GA, Walshe N, Duggan V. Rate of obesity within a mixed-breed group of horses in Ireland and their owners' perceptions of body condition and useability of an equine body condition scoring scale. Ir Vet J [Internet] 2023;76(1):1–12. Available from: https://doi.org/10.1186/s13620-023-00237-w