Pain or Stress indicators in Horses (*Equus caballus*)

Topic summary

Horses (*Equus caballus*) are prey species that coexist with donkeys, sheep, and cows. As prey, they try to avoid predators such as lions and bears, and they frequently conceal signs of pain (Ashley et al., 2010). The nervous system detects pain by using nociceptors, which send external signals to the spinal cord and brain to warn the individual of potential damage (Bussieres et al., 2008).

While humans can easily communicate when they are in pain, animals like horses cannot (Bussieres et al., 2008). When horses experience pain through the use of nociceptors, they exhibit behavioural and physiological changes. Increased blood pressure, temperature, and heart rate are common physiological changes, implying that stress activated the adrenal medulla and hypothalamic-pituitary-adrenal cortex, which are responsible for these elevated parameters (Lundblad et al., 2021).

Visual observations have proven to be extremely effective in identifying various pain-related behaviours in horses. It is critical for horse owners and researchers to understand the consequences of surgeries and diseases that affect horse welfare. Bussieres et al. (2008) investigated pain-related behaviours in horses suffering from orthopedic pain using composite pain scales (CPS) and discovered that there were significantly increased behaviours such as pawing on the floor, kicking at the abdomen, and moving their heads when compared to horses that were not in pain. Bussieres et al. (2008) also wanted to see if the addition of anesthesia had any effect on these behaviours. They discovered that horses with orthopedic pain who were given anesthesia were less agitated than horses who were not given anesthesia. Pritchett et al. (2003) investigated changes in behaviour using a numerical rating scale (NRS) and discovered that sweating, pawing, and lying down were common behaviours after celiotomy (abdominal surgery). Dalla Costa et al. (2014) used a horse grimace scale to study pain-related behaviours caused by routine castration (HGS). They discovered that horses undergoing routine castration had significantly more jaw clenches and facial grimaces than normal horses. Mayaki et al. (2020) used visual inspection and palpation to examine changes in horses suffering from back pain. They came to the conclusion that horses with back pain had higher pain response, muscular hypertonicity, thoracolumbar joint stiffness, and physical dysfunction scores. Gleerup et al. (2015), on the other hand, used painful stimuli such as pressure and a painful creme to observe pain-related behaviours and observed tense stares and dilated nostrils. These various pain-related behaviours in all of these studies suggested a high level of stress/pain in horses.

While these were direct factors influencing behavioural changes in horses, there are some indirect factors that also play a role in inducing stress/pain in horses. Riding horses, for example, are subjected to a variety of stresses, and Mullard et al. (2017) sought to investigate the behavioural changes associated with riding. They accomplished this by developing an ethogram to define facial changes and observed increased jaw tightness, open mouth, and salvation. Merkies et al (2019) conducted another significant study to investigate the effects of factors

such as feed and isolation on horses. They discovered that feed restriction was the most stressful situation because those horses displayed increased eyelid twitches and restless behaviours when compared to normal horses. Some researchers, such as Lundblad et al. (2021), investigated external factors that influence horse facial expressions, such as transportation and isolation. When horses were isolated and transported, they developed facial changes such as flared nostrils, tongue protrusion, and ear flickers.

Hausberger et al. (2016) examined previous research critically and concluded that, despite extensive research, we cannot clearly define these behaviours because they are mostly observational. However, other factors must be considered, such as the horse grimace scale's inability to assess the intensity of pain in horses, making it difficult to accurately define pain (Dalla Costa et al., 2014). Another important consideration is that prey species, such as horses, have evolved to conceal any signs of pain in order to avoid predators (Ashley et al., 2010). As a result, additional research is required to gain a clear picture of these pain-related indicators in horses (*Equus caballus*), and this research can be used to improve current clinical practices.

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