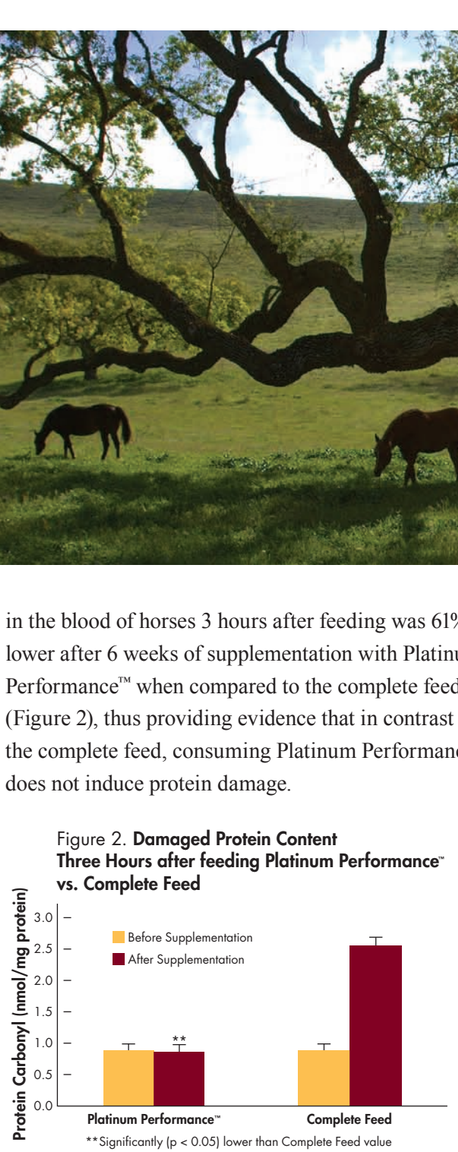
Free Radicals Can Damage Feeds

Free radicals also damage fats in feeds, causing the fats to become rancid. This rancidity can then cause oxidative damage in the body[14]. Although omega-3 essential fatty acids are required for normal cellular function and are pivotal in reducing inflammation in the horse, they are highly susceptible to rancidity. As an indicator of rancidity, an independent laboratory determined the peroxide concentrations in Platinum Performance™ and five complete feeds containing omega-3 fatty acids (Figure 1). While the level of rancidity in the complete feeds ranged from 14 mEq/kg fat to 32 mEq/kg fat, it was nearly undetectable in Platinum Performance™ (2.6 mEq/kg fat). In fact, out of all the compounds tested, Platinum Performance™ was the only one within the acceptable and safe range for peroxides (1 - 10 mEq/kg fat)[15].

Rancid Feeds and Oxidative Damage

Having seen the huge difference in peroxide concentrations between the complete feeds and Platinum Performance™, researchers at the University of California at Davis tested the hypothesis that ingestion of feeds containing rancid fat cause free radical damage in the horse. This hypothesis was tested by comparing levels of oxidative damage in horses after 6 weeks of supplementation with Platinum Performance™ or one of the complete feeds having a mid-range peroxide value of 26 mEq/kg fat. The level of protein carbonyls in the blood of horses 3 hours after feeding was 61% lower after 6 weeks of supplementation with Platinum Performance™ when compared to the complete feed (Figure 2), thus providing evidence that in contrast to the complete feed, consuming Platinum Performance™ does not induce protein damage.

Figure 2. **Damaged Protein Content Three Hours after feeding Platinum Performance™ vs. Complete Feed**

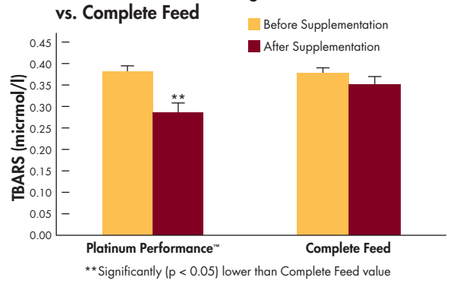


**Significantly ($p < 0.05$) lower than Complete Feed value

Figure 2: Compared to a commercially available complete feed, protein carbonyl content in blood 3 hours after feeding was lower following six week of supplementation with Platinum Performance™.

Similarly, blood concentration of TBARS 3 hours after feeding was 32% lower after 6 weeks of supplementation with Platinum Performance™ when compared to the complete feed (Figure 3), indicating that consuming Platinum Performance™ reduces fat damage.

Figure 3. **Damaged Fat Content Three Hours after feeding Platinum Performance™ vs. Complete Feed**

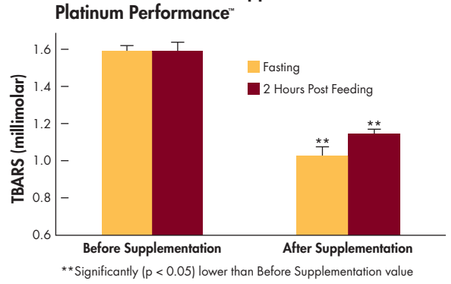


**Significantly ($p < 0.05$) lower than Complete Feed value

Figure 3: Compared to a commercially available complete feed, TBARS content in blood 3 hours after feeding was lower following six weeks of supplementation with Platinum Performance™.

In a follow-up study, blood concentrations of TBARS and protein carbonyls were measured in horses before and after 3 weeks of supplementation with Platinum Performance™ in addition to their normal diet of hay. Blood TBARS concentrations in fasted horses were reduced by 36% ($p < 0.0001$) at the end of the 3 week supplementation period, and by 30% ($p < 0.0001$) 2 hours post-feeding (Figure 4). Additionally, blood concentration of protein carbonyls in fasted horses was reduced by 10% at the end of the 3 week supplementation period ($p = 0.04$), and by 11% 2 hours post-feeding ($p = 0.03$; Figure 5).

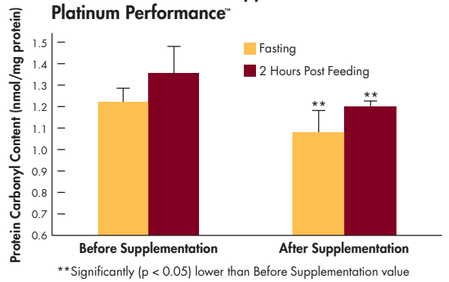
Figure 4. **Damaged Fat Content Before and After Three Weeks of Supplementation with Platinum Performance™**



**Significantly ($p < 0.05$) lower than Before Supplementation value

Figure 4. TBARS content in blood was lower at both fasting and 2 hours post-feeding following 3 weeks of supplementation with Platinum Performance™.

Figure 5. **Damaged Protein Content Before and After Three Weeks of Supplementation with Platinum Performance™**

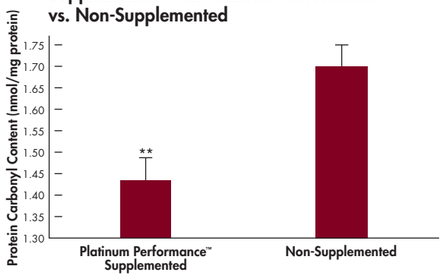


**Significantly ($p < 0.05$) lower than Before Supplementation value

Figure 5. Protein carbonyl content in blood was lower at both fasting and 2 hours post-feeding following 3 weeks of supplementation with Platinum Performance™.

While the results of these two controlled studies demonstrate that oxidative stress is reduced in horses consuming a diet of hay supplemented with Platinum Performance™, even more striking differences were noted in a study comparing blood concentrations of protein carbonyls in 113 horses on different farms being fed various combinations of common feeds. In this study, horses supplemented with one to four scoops of Platinum Performance™ per day had an 18% lower level of blood protein carbonyls ($p = 0.032$) when compared to non-supplemented horses (Figure 6). Therefore, regardless of the type of feed consumed, horses supplemented with Platinum Performance™ had significantly less oxidative damage than non-supplemented horses.

Figure 6. **Damaged Protein Content in Horses Supplemented with Platinum Performance™ vs. Non-Supplemented**



**Significantly ($p < 0.05$) less than Non-Supplemented value

Figure 6. Protein carbonyl content in blood was lower in horses supplemented with Platinum Performance™ compared to non-supplemented horses.

Conclusion

Free radicals can lead to oxidative stress, which has been associated with various equine diseases. In both controlled and observational studies, Platinum Performance™ reduced oxidative stress in horses, as measured by blood concentrations of protein carbonyls and TBARS. These findings suggest that horses consuming Platinum Performance™ may be protected against chronic levels of oxidative stress.

PUTTING IT INTO PRACTICE

- Avoid feeds with high levels of rancidity.
- Supplement with an antioxidants.
- Increase intake of forage and pasture grazing.

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Feeding to Reduce Oxidative Damage and Improve Health

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Free radicals are chemicals produced in the horse's body either as a result of normal metabolism, or in response to exercise, inhalation of dust and air pollutants, ingestion of rancid feeds, and exposure to ultraviolet light. Free radicals cause oxidative damage to proteins, lipids, and DNA[1], and contribute to several equine diseases. For example, in one of the first studies examining the relationship between oxidative stress and laminitis, Neville et al.[2] reported that thiobarbiturate reactive substances (TBARS), a marker of oxidative damage to lipids, were three times higher among ponies with chronic laminitis when compared to healthy ponies. Although further studies in this area are warranted, it appears that oxidative stress may be related to the development and progression of laminitis.

Oxidative stress associated with exercise may also lead to the degradation of various joint components, such as collagen, proteoglycans, and hyaluron[3-5]. Increased concentrations of TBARS have been detected in Thoroughbred race horses after a simulated race[7], and other measures of oxidative stress have been correlated with intense exercise as well[8,9]. Furthermore, significantly increased concentrations of protein carbonyls, a marker of oxidized proteins, have been detected within diseased joints of horses[6] and in the circulation and muscle after strenuous exercise[10]. Additionally, exercise-induced oxidative stress has been associated with pulmonary hemorrhage[11-12], exertional rhabdomyolysis[13], and impaired performance[7].

Figure 1. **Peroxide Comparison Between Platinum Performance™ and Five Complete Feeds**

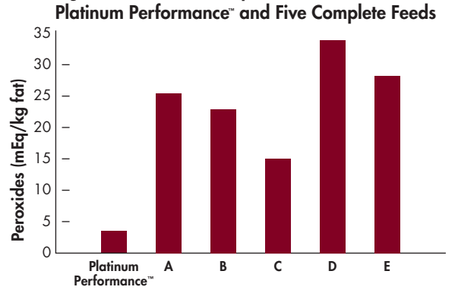

Figure 1. Average peroxide value of Platinum Performance™ was significantly lower compared to five complete feeds containing omega-3 fatty acids.

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