- For optimal overall mare health and ovulation, as well as provision of ideal nutrients to ensure a healthy foal, supplement with omega-3 FAs, antioxidants, trace minerals and vitamins, such as those found in Platinum Performance™ Equine.

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Feeding for Fertility and Reproduction

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Nutrition plays a pivotal role in fertility and subsequent reproduction, with an impact noted on both the male and female sides. In addition to a well-balanced diet, supplementation with specific nutrients can contribute directly to fertility and reproductive success, which includes issues such as semen quality and function as well as the mare's provision of an ideal environment for the developing fetus and later health of the offspring. The adequate intake of omega-3 fatty acids (FAs), antioxidants and carnitine is a foundation for continued reproduction; however, supplementation with these nutrients can actually contribute to enhanced fertility.

Stallion Health

The quality of a stallion's semen plays a major role in fertility and reproduction and is dependent on the dietary intake and incorporation of omega-3 FAs, specifically docosahexaenoic acid (DHA), into the sperm plasma membrane. DHA in the membrane promotes fluidity,[1] which is believed to aid in sperm motility and fusion,[2] as well as help maintain membrane integrity and protect against cellular damage often incurred from stresses such as cooling or cryopreservation,[3] both commonly employed with current breeding practices. DHA's importance in fertility is evidenced by reports of men with infertility issues that often have a significantly low percentage of DHA in the seminal plasma and sperm membrane.[4] Supplementation with omega-3 FAs has previously been demonstrated to enhance measures of fertility in chickens,[5] turkeys,[6] and boars.[7] Recently, a study was published that looked at the semen quality from 8 stallions receiving a DHA-enriched supplement.[8] After 14 weeks of supplementation, it was noted that DHA supplementation protected against some of the damaging effects generally seen with cooling or freezing. The authors suggested that even greater benefits may have been noted had the background diet been more flax-based with a better omega-3 to omega-6 fatty acid profile.

Broodmare Health

Omega-3 FAs are reported to aid in fertility among female animals, as well. For example, ovulation is increased in rats consuming a high omega-3 FA diet

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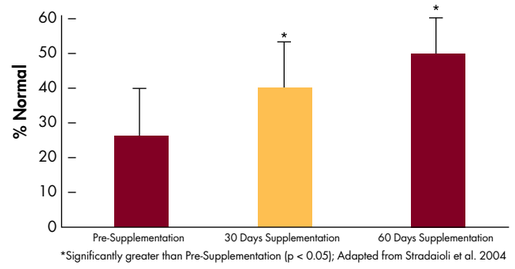
and decreased with an elevated omega-6 FA intake.[9] The mechanism is not fully known, but FA-induced changes in prostaglandin synthesis could be the link.[10] Indeed, chronic inflammatory markers have been suggested as predictors of female infertility.[11] Control of inflammation through omega-3 FA supplementation is a possible route for improved fertility in males, as well, since the inflammatory cytokine, IL-1, decreases testosterone formation.[12]

Foal Health

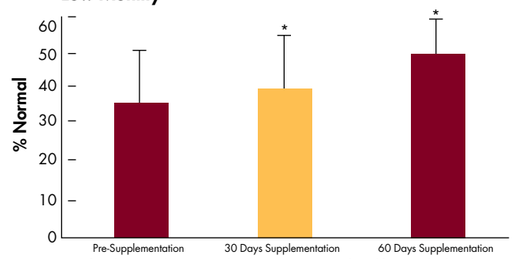
In addition to optimizing sperm function and ovulation, omega-3 FA intake will have a significant role in the growth, development, and overall health of offspring. DHA has long been identified in the neural development of the fetus.[13] In addition, omega-3 FA intake has improved gestation time and birth weights among humans.[14,15] Interestingly, it is now being suggested that susceptibility to various chronic diseases may be altered in offspring in conjunction with changes in maternal intake of omega-3 FAs. For example, supplementation with omega-s FAs during pregnancy can contribute to an alleviation of allergic responses among infants.[16] Similar reductions in food allergic responses among rat offspring have also been reported.[17] In addition, zinc homeostasis, a mechanism in the development and progression of Alzheimer's disease, is impaired among grown rat pups with altered omega-3 FA intake during gestation.[18] The high degree of immune-modulation

Figure 1. **Changes in Sperm Progressive Motility following Carnitine Supplementation in Stallions with Low Motility**



*Significantly greater than Pre-Supplementation ($p < 0.05$); Adapted from Stradaioli et al. 2004

Figure 2. **Changes in Morphologically Normal Sperm following Carnitine Supplementation in Stallions with Low Motility**



*Significantly greater than Pre-Supplementation ($p < 0.05$); Adapted from Stradaioli et al. 2004

that occurs during the perinatal period,[19] in conjunction with the aforementioned and other reports on allergic responses and metabolic alterations due to omega-3 FA intake during pregnancy and lactation, suggests a wide selection of immune-related chronic diseases may be influenced in the offspring by alterations in the maternal diet, including omega-3 FA supplementation.

Oxidation and Reproduction

The production of free radicals (FR) by sperm, both fresh and frozen, has been reported in various species,[20] including horses.[21] Although required for fertilization,[22] FRs in abundance can induce oxidative damage to lipid membranes and DNA and have a negative impact on fertility.[20] The addition of antioxidants directly to semen aids in maintenance or preservation of fertility parameters in semen collected from horses[23,24] and other animals;[25,26,27,28] however, it has been suggested that dietary intake of antioxidants and incorporation in the lipid membrane provides better protection against oxidative damage.[29] Although studies are limited in horses, reports from rabbits,[30] quails,[31] boars,[32] dairy cows,[33,34] and humans[35,36,37] demonstrate oral antioxidant supplementation does improve markers of fertility.

Another nutrient critical to fertility is carnitine, which controls many sperm metabolic functions such as maturation and energy metabolism. Supplementation of L-carnitine and acetylcarnitine to men with abnormal sperm function, low sperm count, or other issues related to infertility has improved fertility parameters.[38-40] In horses, carnitine intake has been linked to improved sperm quality.[41] And supplementation of carnitine to stallions with suboptimal fertility characteristics can result in an increase in progressive motility and morphologically normal sperm[42] (Figures 1 and 2).

Conclusion

Provision of a diet adequate in both macro- and micronutrients is the foundation for equine fertility and reproduction. However, inclusion of supplemental nutrients, including omega-3 FAs, antioxidants and carnitine, may contribute to prevention of poor fertility parameters and improvement of reproductive performance. Another consideration is the intake of rancid feeds, which are foods exposed to the oxidation process without any protection. Rancid feeds have a lower nutritive value and present the horse with added oxidative stress. Therefore, limiting the intake of rancid feeds may help protect against oxidative damage. All of these considerations may help increase the reproductive capacity of horses as well as aid in the prevention of chronic diseases as foals develop and mature.

Putting it into Practice

- To ensure the overall health of the stallion and breeding mare, provide a high forage diet supplemented with vitamins, minerals, and omega-3 FAs.
- To avoid undue oxidative stress, reduce intake of rancid feeds.
- For optimal sperm functioning, supplement stallions with omega-3 FAs, antioxidants and carnitine, such as those found in Platinum Performance™ Equine, Platinum Potency™, and Motility Plus™ formulas.