

# Feeding the Stallion for Fertility and Reproduction

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**Nutrition plays a pivotal role in fertility and subsequent reproduction, with impacts on both males and females. Regarding the stallion, issues such as semen quality and function are of paramount importance. Adequate dietary intake of omega-3 fatty acids, antioxidants and carnitine is a foundation for continued reproduction; however, additional supplementation with these nutrients can contribute to enhanced fertility and reproductive success.**

## Omega-3 Fatty Acids

The quality of a stallion's semen plays a major role in fertility and reproduction and depends on the dietary intake and incorporation of omega-3 fatty acids, particularly docosahexaenoic acid (DHA), into the sperm plasma membrane, which is composed primarily of DHA and docosapentaenoic acid (DPA).<sup>1</sup> DHA and DPA's highly unsaturated nature helps increase membrane fluidity,<sup>2,3</sup> which is believed to aid in motility and fusion.<sup>4</sup> This fluidity also helps maintain membrane integrity and may protect against cellular damage initiated by stresses such as cooling or cryopreservation,<sup>5</sup> two techniques that are commonly used in today's breeding practices. DHA's importance in fertility is evidenced by reports of men with infertility issues that have a significantly low percentage of DHA in the seminal plasma and sperm membrane when compared to normal counterparts.<sup>6,7</sup> Supplementation with omega-3 fatty acids has previously been demonstrated to enhance measures of fertility in rodents,<sup>8</sup> chickens,<sup>9</sup> turkeys,<sup>10</sup> boars,<sup>11</sup> and infertile men.<sup>12</sup> Regarding horses, semen quality was evaluated in 8 stallions receiving a DHA-enriched supplement for 14 weeks.<sup>13</sup> At the end of the study, it was determined 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 detected had the background diet been more flax-based with a better omega-3 to omega-6 fatty acid profile.

Omega-3 fatty acids may also affect fertility in the stallion by supporting testosterone production as it has been noted to do in other male animals.<sup>14,15</sup> Possibly this relates to the anti-inflammatory benefits of omega-3 fatty acids since IL-1, an inflammatory cytokine modulated by omega-3 fatty acids, decreases testosterone production.<sup>16</sup>

## Protection Against Oxidative Stress

The production of free radicals by sperm, both fresh and frozen, has been reported in various species,<sup>17</sup> including horses.<sup>18</sup> Although required for fertilization,<sup>19</sup> excess free radicals can induce oxidative damage to lipid membranes and DNA and may have a negative impact on sperm function and stallion fertility.<sup>17,20</sup> The addition of antioxidants directly to semen has been shown to help preserve fertility parameters in ejaculate collected from stallions<sup>21</sup> as with other animals.<sup>22,23</sup> However, it has been suggested that dietary intake of antioxidants and their incorporation into the lipid membrane may provide sperm better protection against oxidative stress.<sup>24</sup> Reports from studies performed in a multitude of species such as rabbits,<sup>25</sup> quails,<sup>26</sup> pigs,<sup>27</sup> dairy cows and bulls,<sup>28,29</sup> and humans<sup>30-32</sup> demonstrate that oral antioxidant supplementation improves markers of fertility. Contri *et al.* (2011) examined the effect of antioxidant supplementation (which consisted of selenium, zinc, and vitamin E) on sperm quality of stallions with a proven history of fertility and noted significant improvements in sperm motility and membrane integrity as well as a

decrease in abnormal spermatozoa.<sup>33</sup>

Free radical production occurs naturally during many physiological processes and are unavoidable and necessary. However, external stressors such as ozone or intense exercise may exacerbate oxidative stress, particularly when endogenous defenses are reduced. Another important consideration should be the possible 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 and infertility.

## Carnitine

Carnitine is important for fertility in the stallion. Carnitine controls many sperm metabolic functions such as maturation and energy metabolism, and it is an effective antioxidant. In humans, 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.<sup>34-37</sup> In horses, seminal carnitine content and carnitine intake have been positively correlated with sperm quality.<sup>38,39</sup> Furthermore, supplementation of carnitine to stallions with suboptimal fertility characteristics can result in an increase in progressive motility and morphologically normal sperm (Figures 1 and 2).<sup>40</sup>

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

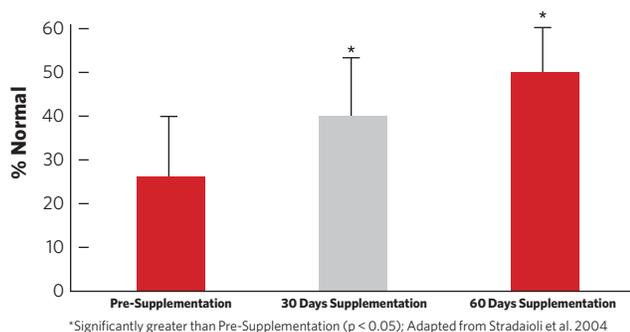
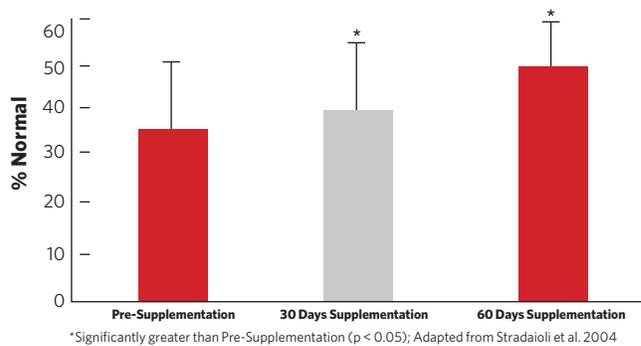


Figure 2. **Changes in Morphologically Normal Sperm following Carnitine Supplementation in Stallions with Low Motility**



## 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 fatty acids, antioxidants and carnitine may contribute to healthy and optimal fertility parameters and improvement in reproductive performance. Additionally, elimination of rancid feeds may also prove beneficial. All of these considerations may help increase the reproductive capacity of horses as well as aid in the prevention of chronic diseases.

## Putting it into Practice

- To ensure the overall health of the stallion, provide a high forage diet supplemented with vitamins, minerals, and omega-3 fatty acids.
- To avoid undue oxidative stress, reduce intake of rancid feeds.
- For optimal sperm function, supplement stallions with omega-3 fatty acids, antioxidants and carnitine.

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