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## STRATEGIES TO IMPROVE SEMEN QUALITY IN DOMESTIC ANIMALS

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**G**ood semen quality is an important factor for a successful breeding programs in domestic animals. It directly impacts the reproductive efficiency of the herd and profitability of the farm. High-quality semen increases the conception rates, minimizes the number of services required per conception and shortens the calving intervals. It eventually boosts the economy of the farmer or producer. In this article we will discuss how nutritional, health, housing and other management practices can help to ensure a good semen quality from the breeding male animals.

### Optimal Nutrition

It is well established that the attainment of puberty is influenced more by body weight at a specific age than by age alone (Singh et al., 2018). Dietary energy intake up to an optimal level promotes pre-pubertal development, whereas sub-maintenance feeding leads to reductions in scrotal circumference, testis mass, and sperm count in semen (Guan et al., 2014). Additionally, under-nutrition decreases sperm velocity while increasing DNA damage and oxidative stress (Aitken et al., 2012). It has been found that low energy diet results into impaired testicular morphology, lower ejaculate volume, abnormal sperm morphology, etc. On other hand low protein can cause retarded testicular growth, decreased seminal volume, reduced sexual activity, delayed puberty, reduced fertility etc (Singh et al., 2018). So, the animals need a balanced diet rich in essential nutrients, including proteins, vitamins, and minerals (e.g., zinc, selenium, and vitamin E) that support reproductive health. However, overfeeding should be avoided as obesity can lower reproductive performances and fertility (Young, 1974; Brown, 1994; Walker et al., 2009). During the breeding season, the animals should be provided energy-dense feed to support sperm production. The important phases in feeding of the male animals include pre-weaning nutrition, post-weaning nutrition,

conditioning before the breeding season, the breeding season itself and the post-breeding period. An optimal feeding program and nutritional plan during these stages are really crucial. Proper nutrition not only helps maintain the bull's physical condition but also affects the secretion of gonadotropins. This, in turn, supports sexual development in bulls (Singh et al., 2018). For Holstein bulls, it is recommended that a higher level of nutrition from 2 to 31 week is extremely beneficial, resulting increase in profit (Dance et al., 2016).

### **Health, Biosecurity Management and Exercise**

Regular veterinary exams, including reproductive evaluations, can help to catch early signs of fertility issues. It should be ensured that bulls are up-to-date with vaccines and parasite control to prevent infections that could impact fertility. In warmer and more humid climates, such as those in the Indian subcontinent, deworming twice a year is essential, particularly for younger bulls (King, 2021). Fly control is essential for bulls to prevent fly strikes in the scrotal region, as these can cause inflammation and disrupt the testes' thermoregulation (Christmas, 2001). Along with these, regular exercise will help the bulls to be active during semen collection. 1-2 hours of exercise for 3-4 days per week can be adequate for them (Upadhyay et al., 2014).

### **Breeding Soundness Evaluation (BSE)**

Annual BSEs before breeding season should be conducted to evaluate testicular development, semen quality, and physical ability for mating. It can reveal low semen motility, abnormalities, or other reproductive issues that might need addressing before breeding. It reduces risk and improves strategic usage of male animals and augment herd fertility (Lone et al., 2017).

### **Genetic Selection for Fertility Traits**

Bulls should be selected with proven high fertility or those from family lines with good reproductive traits. Genomic testing can also be considered to identify bulls with genetic potential for higher fertility and adaptability.

### **Bull Housing and Environment**

Animals need comfortable, spacious areas with good ventilation and shelter to protect from extreme weather conditions. Ample space should be provided for physical activity, which helps maintain muscle strength and stamina needed during the breeding season. The

standard floor space for a bull is 12 m<sup>2</sup> with a 24 m<sup>2</sup> run space (Upadhyay et al., 2014). Feeding manger and water trough should be placed in standard positions. The floor shouldn't be slippery and there should be provision of good drainage for urine, dung and waste water. The manger and the shed should be disinfected at regular interval. These will help to maintain a good hygiene and better semen quality.

### **Advanced Reproductive Technologies**

Artificial Insemination (AI) can help improve conception rates, particularly with high-quality semen from proven sires. The semen from a single bull can be used to fertilize thousands of cows. Besides, it is cost effective, reduces the spread of diseases, promotes breeding efficiency etc. Also, synchronizing the estrus cycle in female animals along with AI can increase the likelihood of conception, especially when using bulls with proven fertility. GnRH, PGF2 $\alpha$ , Estrogen and Progesterone can be used in different protocols for induction and synchronization of estrus (Pal & Dar, 2020).

### **Management of Heat and Cold Stress**

Heat and cold stress can affect sperm concentration, viability, motility, morphology, seminal plasma composition, and other semen parameters (Pal et al., 2023). The impact may vary species to species depending upon different agro climatic zone. It should be ensured that bulls have access to shade and plenty of water, especially in hot climates. In cold seasons, arrangements should be done to make the environment warm.

### **Conclusion**

Ensuring optimal semen quality in breeding males is vital for enhancing reproductive success and farm profitability in domestic animal operations. By following strategic nutritional guidelines, maintaining robust health management and providing adequate housing and environmental care, farmers can significantly improve semen quality of the animals. It will lead to better herd productivity and reduced breeding costs. Implementing breeding soundness evaluations and genetic selection further strengthens the reproductive potential of livestock. Together, these practices support sustainable herd growth and offer a strong economic advantage to farmers by maximizing fertility rates and promoting healthier, more productive animals.

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