Deterministic modelling of energy supply and demand for foaling mares managed at pasture on commercial Thoroughbred stud farms.

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Abstract

There is an economic incentive to breed and foal mares early in the season within the New Zealand commercial Thoroughbred production industry. This has caused disparity between the natural and commercially imposed breeding season, and possibly, the period of peak pasture energy availability and the mare energy requirements. A deterministic model was developed to model the energy balance, energy intake and energy requirement of Thoroughbred mares managed at pasture under commercial conditions to assess their energy status. The response of energy intake and energy balance to changes in five variables were tested. The variables tested were dry matter intake, bodyweight, foaling date, pasture metabolisable energy, and energy requirement. For all foaling dates modelled, the mare was in energy surplus during pregnancy. Onset of lactation created a rapid and significant decrease in mare energy balance. Delay in foaling increased the magnitude of the post-partum energy deficit, and later foaling mares experienced a prolonged decrease in post-partum energy balance. The size of the deficit would, theoretically, decrease 1 body condition score, decrease circulating leptin concentration and initiate lean body mass mobilization which was previously found to negatively impact reproductive performance in the mares. The duration and size of the post-partum energy deficit could be reduced by shifting foaling date closer to the beginning of breeding season (1st September), thus synchronizing period of peak pasture energy with the mare's theoretical requirements. Energy balance and energy intake were more sensitive to pasture energy, dry matter intake and energy requirement changes with less influence from bodyweight to energy balance, suggesting pasture quality and quantity is an important influencer on nutritional status of the mare kept on pasture. Initiatives should be taken to monitor pasture quality and growth pattern, and optimize energy and dry matter intake in mares at pasture. These efforts could assist in maximizing pasture utilization, minimize energy deficit and achieve cost effective pastoral and nutritional management. When more pasture quality and growth data becomes available for equine stud farms, the model has the potential to achieve farm specific application on a wide range of equine body weights.

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