# Nutritional Requirements of Pregnant and Lactating Fallow Deer of Two Genotypes

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## Abstract

The nutritional requirements of pregnant and lactating fallow deer were determined with individually housed does of European (Dama dama dama, n=6) and hybrid (¾ D.d.dama, ¼ D.d.mesopotamica, n=6) genotypes (hereafter referred to as E and H, respectively). A ration containing 14MJME/kgDM and 16% crude protein (CP) was fed to 3 individuals of each genotype, and a maintenance ration containing 10.3 MJME/kgDM and 12.0% CP was fed to the remaining individuals. Fawn weights at birth, 6 and 12 weeks, as well as dam nutrition and feeding behaviour, were compared with a pasture-fed cohort (n=9 of each genotype) grazing improved pasture with energy and protein values ranging between 9-12 MJ/kgDM ME and 8-14% CP, respectively. There was no difference within genotype in average daily weight gain or gross energy intake between animals fed different types of concentrate feed, or pasture ($p<0.05$). The average DM intake for both genotypes increased gradually from 800g/head/day at week 10 of pregnancy to 1100g/head/day by parturition. Total feed intake varied significantly between the genotypes throughout pregnancy and lactation ($p<0.05$). E does consumed between 50 and 150g/head/day more than did H does from day 175 of pregnancy until parturition at 234 days. This higher level of intake continued until day 84 of lactation, at which time the fawns were weaned. The average $W^{0.75}$ energy intake for E does ranged from 0.61 to 0.77 MJME/$kg^{0.75}$/day between weeks 14 and 33 of pregnancy, and for H does ranged from 0.53 to 0.68 MJME/$kg^{0.75}$/day during the same period. Feeding behaviour studies with the individually penned animals revealed 3 distinct feeding periods at sunrise, sunset, and around midnight, with up to 5 other, shorter periods of feeding throughout the day, particularly around midday.

The energy requirement for E and H does during the first 12 weeks of lactation represented 38% and 36% respectively of their annual energy requirement. The combined energy requirement for the last trimester of pregnancy and the first 12 weeks of lactation for E and H does represented 60% and 57%, respectively, of their annual feed requirements. These data confirm the importance of strategic feeding of fallow does in late pregnancy and lactation, particularly in seasons where pasture conditions in late spring and early summer are

unfavourable. Furthermore, hybrid does were shown to be efficient production animals when compared with their European counterparts.

**Key words:** fallow deer, nutritional requirements, pregnant, lactating

## Introduction

Quality assurance is vitally important to the future development of the international deer farming industry, and is largely governed by the ability of farmers to grow animals to meet market specifications. Production outcomes are primarily a combination of genetic background of animals, the effect of feeding, and astute management decisions. Nutrient intake, in particular, is a vital component in this complex, yet there is little information available on the nutritional requirements of pregnant and lactating fallow deer. Mulley (1989) reported energy intakes for group fed European fallow deer (Dama dama dama) does throughout pregnancy, and Milligan (1984) and Asher (1992) reported calculated energy requirements for various sex and age classes of fallow deer that were extrapolated from those for red deer (Cervus elaphus: Fennessy et al, 1981).

High rates of reproductive wastage in farmed fallow deer (Mulley et al, 1990a; Asher 1993), inconsistent lifetime rearing performance of does (Mulley, et al, 1990 b), and low birthweights of fawns associated with poor survival rates (Asher and Adam, 1985; Mulley, 1989) are likely manifestations of inappropriate nutrition of breeding stock. The concept of strategic feeding (Suttie et al, 1996) to achieve improved production outcomes should form part of the management of any deer farming system, especially for breeding stock during late pregnancy and lactation when nutritional demands are known to be higher.

There are no clear guidelines for the feeding of fallow deer does in late pregnancy and lactation. Feed restrictions during late pregnancy of red deer hinds is commonly practiced in New Zealand on the supposition that this will avoid over-fatness that might lead to dystocia. While this strategy is questionable, as the effects on foetal growth are not fully understood, similar strategies have not been necessary for European fallow deer, where maximal foetal growth is encouraged to increase fawn birthweight and subsequent survival (Mulley et al, 1990a; 1992). Despite the obvious need for information on the energy requirements of fallow deer in late pregnancy, this aspect of the management of farmed deer is yet to be investigated to any extent.

Similarly, there are no data on the nutritional requirements of fallow does during lactation. Fennessy et al (1981) calculated that the energy requirement for lactating red deer hinds doubled, and Suttie et al (1996) further suggest that the peak energy demand for red deer hinds

is in early to mid lactation. They further explain that when hinds have gestated and suckled a hybrid (red deer X wapiti) calf, this pressure is magnified. It is likely that fallow deer does are similar to red deer in terms of feed energy demands. Furthermore, the more widespread use of hybrid genotypes containing various percentages of Mesopotamian fallow deer (D.d.mesopotamica) genes requires particular attention in terms of feeding requirements. Strategic feeding at particular times during the production cycle should result in better nutrition for farmed fallow deer.

This paper describes the feeding requirements for pregnant fallow deer of two genotypes, from mid-pregnancy to weaning of their fawns at 12 weeks of age. Feeding behaviour patterns are also described.

## Materials & Methods

In April 1997 fifteen 3 year old European fallow deer does (E) with a mean liveweight of 40kg, and fifteen 3 year old hybrid fallow deer ( ¾ European and ¼ Mesopotamian fallow deer) does (H) with a mean liveweight of 42.5kg were obtained from a commercial deer farm and mated to European fallow bucks, following oestrus synchronisation with CIDR devices (~~hormone~~). All were confirmed pregnant at 50 days by ultrasonography (~~reference~~). Each of the does were randomly assigned to treatment group, to be fed either a formulated concentrate ration or pasture fed for the duration of pregnancy and lactation. Deer assigned to individual pens and concentrate feeding underwent a four week period of habituation to the pens, and weighing procedures. All deer were weighed at weekly intervals throughout the trial.

### *Pen Feeding*

Twelve does, 6 of each genotype, were housed individually in pens ($12m^2$). Each pen had coarse sawdust flooring, and provided shade, shelter from wind and rain and ad libitum water. Three deer in each genotype were fed ad libitum a maintenance ration containing 10.3 MJME/KgDM and 12% protein, while the remaining deer were fed ad libitum a high energy ration containing 14 MJME/KgDM and 16% protein.

Deer were fed at 1600 hours each day, and feed residues from the previous 24 hour period recorded. Infra-red light beams were placed across the feeding station in six of the pens (three of each genotype) and connected to a data logger to determine 24 hour patterns of feeding. Does were allowed to fawn in their individual pens, with the birthweight, six-week and twelve-week weights recorded for each fawn.

### *Pasture Feeding*

Eighteen does (9 of each genotype) were grazed on kikuyu dominant pasture which also contained perennial rye-grass and clover. The pasture quality was monitored fortnightly and

ranged between 9 and 12 MJME/kgDM for the duration of the trial. Fawns were tagged at birth and weighed at 6 and 12 weeks of age. Grazing and fawn suckling behaviours were monitored at various times throughout the trial.

## Results

Growth of does from conception to fawning for E and H on pasture was 57g/day and 51g/day respectively, and 54g/day and 46g/day for E and H does fed concentrate rations, respectively. Most does (27/30) lost weight between conception and week 10 of pregnancy. The change in liveweight for individual animals in the first 10 weeks of pregnancy ranged from +2.4% to -11.8% of mating weight. Within genotype, there was no difference in average daily weight gain or gross energy intake between animals fed different types of concentrate feed, or pasture. Oscillations in voluntary daily gross energy intake showed similar patterns for both genotypes, with intakes for E does increased above that of H does for the last 9 weeks of pregnancy, and throughout lactation to weaning at 12 weeks post-partum (Figure 1). The first handling procedure of does and fawns, when the fawns were 6 weeks old, disrupted voluntary feed intake of does for several days.

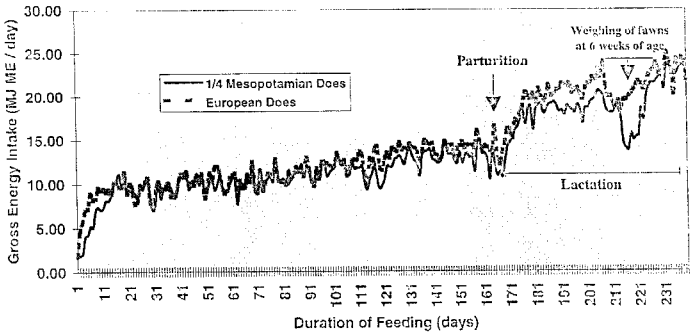


**Figure 1:** Average daily gross energy intake from week 10 of pregnancy through to weaning of fawns 12 weeks post-partum, for ¼ Mesopotamian fallow deer and European fallow deer.

The average dry matter (DM) intake for both genotypes increased gradually from 800g/day at week 10 of pregnancy to 900g/day by week 24, and then to 1100g/day by parturition. E does consistently ate between 50gDM/day and 150gDM/day more than H does from day 175 of pregnancy until parturition at 234 days, and this greater DM intake for E does continued during the first 84 days of lactation, at which time the fawns were weaned. These data equate with an

energy intake for both genotypes of approximately 10 MJME/day from conception to week 26 of pregnancy, 12 MJME/day for H and 13MJME/day for E from week 26 of pregnancy to parturition, and 19 MJME/day for H and 20.5 MJME/day for E during lactation to 12 weeks post-partum. When the data were corrected for $W^{0.75}$ energy intake, the average requirement for E does ranged from 0.61 to 0.77 MJME/$kg^{0.75}$/day between weeks 14 and 33 of pregnancy, and H does ranged from 0.53 to 0.0.68 MJME/$kg^{0.75}$/day during the same period (Figure 2).

The proportion of fawn birthweight to doe liveweight at mating and at parturition was greater for E (12% and 11% respectively) than for H (11% and 9.8% respectively), in both the concentrate fed and pasture fed deer. There were no differences in fawn birthweights, 6-week weights or 12-week weights between the two genotypes being fed concentrates, or between deer fed pasture and deer fed concentrates, with average weights of fawns at these times being 5kg, 14kg and 22kg respectively.

A study of feeding behaviour patterns for the deer fed in pens revealed three distinct feeding periods, these being at sunrise, sunset and around midnight. Up to 5 other shorter visits to the feeder occurred at various times during the day, particularly around midday. Does with a nervous disposition were easily disturbed while feeding, and made many more visits to the feeding station than calmer deer. Voluntary feed intake (VFI) was retarded on very hot days when the maximum temperature rose above 34°C. The fitting of identification collars towards the end of pregnancy also affected feed intake for a number of days, as evidenced by the decline in the weekly average $W^{0.75}$ energy intake (Figure 2).

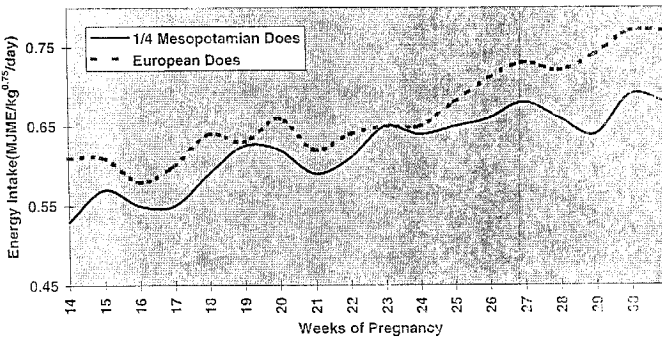


Figure 2: Average weekly metabolic bodyweight energy intake (MJME/$kg^{0.75}$/day) for ¼ Mesopotamian fallow deer and European fallow deer does, from week 14 of pregnancy through to parturition.

**Discussion**

The daily energy requirements (MJME) of adult European fallow deer does during the second and third trimesters of pregnancy and during lactation (10, 13 and 21 MJME/day respectively) established from the present study were lower than estimates for fallow deer (Milligan, 1984; Asher, 1993) derived from work on red deer in New Zealand (Fennessy et al, 1981), but higher than for group-fed fallow deer does in Australia (Mulley, 1989). These data indicate that the energy requirement during the first twelve weeks of lactation for fallow deer represents 38% of the annual ME requirement for an adult doe. This compares with 43% for red deer hinds (Fennessy et al, 1981) although the length of the lactation period was not defined in the latter study. Furthermore, the combined energy requirement for fallow deer does in the last trimester of pregnancy plus the first 12 weeks of lactation accounted for 60% (2856 MJME) of the annual ME requirement. These data indicate the highly seasonal nutritional requirements for management of a breeding herd of fallow deer, a situation that requires particularly careful monitoring under Australian pastoral conditions, where seasonal rainfall is unreliable in most areas where deer are farmed.

The energy requirements of the larger and heavier hybrid does in this study were marginally lower than for their European counterparts, with 36% (1596 MJME) of their annual ME intake during the first twelve weeks of lactation, and 57% (2520 MJME) during the last trimester of pregnancy plus lactation. In effect the hybrid does produced fawns of equivalent size, and similar average growth rates to weaning as did the European does, while utilising 5% less feed energy (MJME). This indicates that they were slightly more efficient as a reproduction unit in terms of resource utilisation. In previous controlled feed intake studies comparing ¼ bred Mesopotamian fallow deer bucks with European fallow deer controls, Mulley et al (1996) showed that the hybrid bucks were also more efficient in feed conversion than their European counterparts. Based on these observations, the larger framed ¼ Mesopotamian fallow deer doe should be viewed favourably by fallow deer farmers, where feed utilisation efficiency and ease of fawning are major considerations for successful reproductive performance.

The ME requirements for domesticated ungulates (sheep, cattle and goats) and wild ungulates such as deer lie between 0.42 and 0.58 MJME/$kg^{0.75}$/day, and rise to between 0.58 and 0.71 MJME/$kg^{0.75}$/day in late pregnancy (Anon, 1975, 1976, 1978, 1981; Simpson et al, 1978; Loudon, 1985). This requirement has been shown to rise to higher levels during lactation in white tailed deer (Holter et al,1976). Data from the present study show that the ME requirements for European fallow deer are higher than for other domesticated ungulates, but that hybrid fallow deer does fall within those limits. The data also indicate that the average

daily requirement for energy is not static (Figure 1) and fluctuates from day to day, in some instances markedly. These fluctuations are thought to be in response to changes in the external environment, including interventions by man. The major reduction in feed intake during lactation in Figure 1 was the result of disturbance of the daily routine of animals to collect 6-week weights of fawns, and is a clear indication of how simple farm management procedures can affect VFI. This was further evidenced by the reduction in average $W^{0.75}$ energy intake in week 29 of pregnancy (Figure 2) that co-incided with fitting of identification collars to the deer. The effects of social isolation on weight gain reported in red deer calves (Hanlon et al, 1997) were not apparent in the present study, with no significant differences in weight gain between pasture fed groups of does, and does of either genotype fed concentrates and housed in isolation. Furthermore there were no differences between any of the groups for fawn birth weights or their subsequent growth to 12 weeks of age. Diurnal feeding behaviour patterns for does at pasture and in pens were also similar. Although differences in live weight gain were reported by Hanlon et al (1997) for red deer calves raised in isolation from contact with other deer, they also reported that there were no differences in food intake between isolated and group fed deer. Although the deer used in the current study were obtained from a commercial deer farm, and underwent only a four week period of habituation to the pens, and weighing procedures, they were calm in the pens and very quickly learnt the daily and weekly routines. All growth and production parameters measured compared similarly to pasture fed deer, and there was no evidence that the deer were adversely stressed, or that housing and isolation adversely affected appetite.

The data from this study indicate that strategic feeding of fallow deer does, as suggested for red deer by Suttie et al (1996), should be implemented in the third trimester of pregnancy, and during lactation, if pasture conditions in late spring are unfavourable. Obviously such a recommendation would need to be made in conjunction with consideration of feed availability, stocking rates and pasture sward heights (Barry et al, 1998).

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