

**Meeting at the Danish Institute of Agricultural Sciences, Research Centre Foulum
on September 21th 1999 on the subject:**

How to prepare mink dams for mating, gestation and lactation?

Mink dams are selected for breeding in November, when they are fed for pelting. How these dams should be fed in the best way in order to prepare them for both mating, gestation and lactation, has been debated for many years. Based on experience, many farmers in Denmark have fed more restricted in practice than experimental results would indicate. The meeting focused on theoretical as well as practical aspects of feeding and management and its effect on production, health and welfare. The results were discussed in relation to the mink breeders' experience with different feeding strategies in practice.

The meeting hosted ten presentations on the topics: Feeding and reproduction, Feeding and lactation, and Behaviour.

Feeding and reproduction

Impact of energy supply and body condition on reproductive processes in female mink

Anne-Helene Tauson

This review pointed out some general metabolic features of importance for the reproductive performance of the mink. The fact that the mink has strict seasonal cycles of food intake and body weight change connected to the reproductive and fur moulting cycles, with obligatory weight loss during the winter and spring, and the fact that female mink endure periods of mobilisation of body reserves during pregnancy and lactation make it very questionable to apply a regime of very restricted feeding during the winter in order to improve reproductive performance. This practise is even more questionable in the light of results that clearly have pointed out deleterious effects of weight loss on reproductive performance of yearling female mink. A positive influence on the reproductive outcome could instead be achieved by applying a flush feeding regime comprising a 2-week period of moderately restricted feeding, followed by *ad libitum* feeding

from 3-5 days before the start of the mating season. Such a system has documented positive effects on litter size and induces metabolic and endocrinological changes with direct influence on the hypothalamus-pituitary-ovarian axis.

Physiological effects of energy supply before mating

Rikke Fink

The change in body weight and reproductive hormones of female mink fed according to three different strategies (*ad libitum*, restricted or flushing) from February 6 till mating, were investigated. Flushing, defined as a period of restricted feeding, followed by *ad libitum* feeding from shortly before mating, had an acute effect on energy metabolism and blood metabolites, leading to an increased number of corpora lutea. The effect of flushing on litter size may therefore be obtained without a drastic weight reduction during the winter.

Energy supply during the winter - Physiological effects

Christian F. Børsting

The effect of *ad libitum* feeding of yearling female mink from mid December until mid February, compared to a 20 % feed restriction was investigated. All females were fed according to the same flushing strategy from mid February to mating. The *ad libitum* fed females lost 11% and the restricted females lost 21% of their body weight from December to March. Litter size was not significantly influenced by the feeding strategies. Also measurements of plasma insulin and thyroid hormones showed that there was no extra effect of flush feeding of female mink which were feed restricted in a prolonged period of time. It is concluded that focus should be on a high feed intake just before mating, rather than on

the regimen of conditioning, in order to achieve the positive effects of flushing on litter size.

Energy supply during the winter - Effects in practice

Steen H. Møller

An experiment with 2266 brown primiparous females was conducted on four private farms. Half the females were fed a restricted amount of feed aiming at a 25% reduction in body weight from November to February. The other half of the females were fed almost ad libitum aiming at a 10% reduction in body weight. The pre-planned weight reduction and flushing did only succeed in both feeding groups at one farm, showing no difference in litter size between groups. Large differences were found in the percentage of mated as well as barren females between farms, but not between feeding strategies. The experiments showed that a long period of restricted feeding is not needed in order to achieve the full effect of flushing on litter size under farm production conditions. The flushing effect could be achieved by a proper flushing prior to the mating period. However, this feeding practice was only successful in one out of four farms indicating that feeding management during the winter is not an easy task and that better feeding management tools are needed.

Feeding and lactation

The effects of body size on litter size

Bente K. Hansen, P. Berg, J. Jensen, P. Madsen

Genetic correlations between body size in September and subsequent litter size and kit mortality has been demonstrated in experimental data. It is, however, not known if this is a general correlation that may be found in field data as well. Litter size at second count of 57706 litters and body weight at grading of 171598 kits from pure lines of brown and black colour types from 9 farms were included in this investigation. The genetic correlation between body weight of kits and litter size was estimated on two farms with the brown colour type. Records on body weight from 22905/25379 kits and litter size from 9692/11437 litters were used. Body weight and litter size were analysed using univariate Animal Models by an Average Information REML algo-

rithm for each colour type on each farm. The heritability estimates varied between 0.37-0.64 and 0.01-0.12 for body weight and litter size, respectively. No genetic correlation between body weight and litter size was found on the two farms ($r_{g-farm1} = 0.06 \pm 0.04$, $r_{g-farm2} = 0.04 \pm 0.05$), but more effort need to be put in this topic.

Effects of dietary protein level on health in mink females

Birthe M. Damgaard

Effects of dietary protein levels ranging from 61% to 39% of metabolisable energy (ME) and dietary carbohydrate levels ranging in a reciprocal fashion from 1% to 25% of ME and a constant dietary fat level of 36-38% of ME were investigated in female mink from January and until weaning of the kits in June. Feed consumption, mobilisation of body reserves and plasma concentrations of hormones, nutrients and metabolites in female mink and growth performance in kits were studied. The daily energy consumption was largely the same at all dietary protein levels. No metabolic diseases in females were observed. Dietary protein content did not affect the kit weight gain. The plasma concentrations of nutrients, metabolites and hormones were not affected to any great extent by the experimental diets.

The effects of feeding level on the amount of mammary gland tissue

Steen H. Møller, Martin Tang Sørensen.

Four groups of mink dams were fed a combination of high or low levels of dietary energy during the autumn and winter and/or during the gestation period. From each group five dams were euthanised 1 and 6 weeks after whelping. The mammary glands were sampled and the area, weight, volume and DNA content were measured. The feeding strategy during the autumn and winter did not affect the amount of mammary gland tissue after whelping quantified by any of the measures applied. Restricted feeding during the gestation period reduced the weight of the mammary glands six weeks after whelping by 25%, indicating a reduced length of the lactation period. The number of cells in the gland as quantified by the content of DNA did, however, not differ significantly. The weight of the mammary

glands is a good indicator of the amount of milk producing tissue, but for a precise estimation of the gland cell number quantification of DNA may be necessary.

Behaviour

Restrictive feeding – a provoking factor for stereotypes in farm mink

Steffen W. Hansen

The purpose this study was to examine how feed reduction, as part of the flushing strategy in connection with mating, affected the level of activity and the incidence of stereotypes. The purpose of the study was also to examine if slimming proved more effective on stereotyping mink than on non-stereotyping mink. The study demonstrated that restrictive feeding of mink increased the animals' level of activity as well as the incidence of stereotypes compared to mink being fed ad libitum. What is more, the incidence of stereotypes among mink fed restrictively was further increased just after feeding. Compared to the fact that the level of stereotyping is significantly higher among mink needing to really 'work for their living' than among mink needing to work less, we may conclude that frustration caused by e.g. restrictive feeding is an essential factor as regards the incidence of stereotypes among mink. The study also revealed that stereotyping mink had a significantly higher need for feed than non-stereotyping mink, and that, during periods of restrictive feeding, they lost twice as much weight as non-stereotyping mink.

The effect of maternal behaviour on neonatal mortality in mink kits

Jens Malmkvist, Steffen W. Hansen

Maternal behaviour in terms of the dam's care for the kits from whelping to weaning, is paramount for kit survival and growth. Maternal behaviour involves lactation, nursing and protection against cold and potential predators. Stillborn kits amounted to 39% of all kits found dead within 5 days after whelping. No significant correlations were found between kit loss and female activity or nest building. A 'kit in need' test 5 days after whelping indicated that the time passed before a female collected a kit placed in the cage was positively correlated to kit loss.

The effect of an empty cage between females in the lactation period

Lise Overgaard

The effect of an empty cage between females during the lactation period was investigated on three private mink farms. The females placed in every second cage had a lower kit loss and weaned more and larger kits than females placed in each cage. Significant effects on litter size were seen in yearling females of the Standard black colour type on two of the farms. The females placed in every second cage were significantly less active, less willing to leave their nest box and had a significantly lower frequency of the "sticky kit" syndrome.