Fasting of male mink after mating and its influence on liver fat content and blood ketone bodies

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Introduction

Earlier investigations at pelting have shown that liver fat content is dependent on the feed used (Clausen & Sandbøl, 2005; Clausen et al., 2007b; Damgaard et al., 1998a; Damgaard et al., 1998b; Damgaard et al., 1994). Liver fat content also depends on how long before investigation the mink is fasted (Clausen & Sandbøl, 2005; Clausen et al., 2007a; Clausen, 1992; Bjørnvad et al., 2004; Mustonen et al., 2005). In cats, liver fat infiltration also increases with increasing fasting time (Biourge et al, 1994). Both in cats with IFHL (Idiopatisk Felin Hepatisk Lipidose) (Pazak et al, 1998) and in cats with fasting induced fat infiltration in the liver (Biourge et al, 1994) there is a high content of ketone bodies (β-hydroxybutyrate) in the blood. In mink there also seems to be a higher blood ketone concentration when the liver fat percent is high (Clausen et al., 2007a; Clausen & Sandbøl, 2005).
The purpose of this investigation was to evaluate whether fasting male mink in normal body condition right after mating, can provoke a fat infiltration in the liver, and whether there is a correlation between liver fat content and blood ketone bodies.

Methods

We used 98 brown mink males right after mating. The males were body scored ad modem Rouvinen (Hynes et al., 2004) before and after mating. After mating they were fasted for 0 – 12 – 24 – 36 – 48 – 60 or 72 hours before they were euthanized. The animals were weighed and blood samples were taken to measure ketone bodies (β – hydroxy-butyrate) (PTS Panels Ketone Test Strips for use with CardioChek Brand Analyzer). The liver was weighed and Hepatosomatic Index HSI calculated (liver weight in percent of body weight). Liver samples were analysed for dry matter content and liver fat percent calculated according to Clausen & Sandbøl (2004). Liver fat content (%) = 1.15 * (Liver dry matter) – 24.9 (R2=0.97).

Results and discussion

The males gained weight during mating from body score 2.4 on Marts 3rd, to 3.0 on Marts 20th.
The HSI (Table 1) decreased within the first 24 hours of the fasting period, probably due to depletion of reserves of glycogen and labile amino acids, thereafter it remained constant for the rest of the period. Compared to males at pelting (who are very fat) the HSI is high in all groups (Clausen & Sandbøl, 2005).
There was no difference in liver fat percent after fasting up to 72 hours (Table 1). This does not correspond with results from fat mink males at pelting, were an increase in fasting time increase fat infiltration in the liver (Clausen & Sandbøl, 2005). In cats we also see an increased liver fat infiltration after fasting, but only in fat cats (Biourge et al, 1994), and the disease IFHL is only seen in cats with a history of obesity (Blanchard et al, 2004).
Fat mink males at pelting is probably in another physiological condition than lean males after mating. If the males are divided in groups based on body score on Marts 20 (Table 2) it is seen that fat males (body score = 4) had a lower HSI and a higher liver fat content than males with body score 2 or 3.
There is a significant difference between groups in blood keton body concentration (Table 1). After fasting 24, 48, 60 and 72 hours blood ketone increase compared to 0 or 12 hours, this probably is due to an increased catabolism of fat.
In cats with IFHL and in cats with fasting induced fatty liver (liver fat 31 %) there is an increase in blood ketone concentration (β-hydroxybutyrate) (Pazak et al, 1998; Biourge et al, 1994). There was no correlation between blood ketone concentration and liver fat content in this investigation. In all samples the liver fat percent was much lower than in previous investigations (Clausen & Sandbøl, 2007).

Conclusion

Fasting up to 72 hours of male mink with normal body score right after mating, gave a reduction in relative liver weight within the first 48 hours. There were no change in liver fat percent after fasting, but fat male mink, had the highest fat content in the liver. The blood content of ketone bodies increased after 24 hours of fasting, due to an increase in fat catabolism.

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Fasting time, hours	HSI, %	Liver fat percent	Ketone bodies, mmol/l
0	3,54 (0,42) A	5,22 (1,28)	0,34 (0,08) C
12	3,28 (0,32) AB	5,50 (1,32)	0,36 (0,08) C
24	3,14 (0,35) B	6,07 (1,55)	0,49 (0,17) A
36	3,12 (0,45) BC	5,97 (1,67)	0,39 (0,10) BC
48	2,80 (0,44) C	6,91 (1,77)	0,51 (0,20) A
60	2,95 (0,51) BC	5,72 (2,02)	0,46 (0,10) AB
72	3,01 (0,52) BC	5,69 (1,61)	0,48 (0,12) AB
p-value	0,0008	NS	0,001

Table 1. Relative liver weight (HSI), liver fat percent and blood content of ketone bodies (β – hydroxybutyrate), mmol/l.

Body score	HSI, %	Liver fat percent	Ketone bodies, mmol/l
2	3,31 (0,50) A	5,68 (2,18) B	0,45 (0,10)
3	3,15 (0,45) A	5,74 (1,53) B	0,44 (0,15)
4	2,64 (0,39) B	7,24 (0,81) A	0,40 (0,11)
p-value	0,004	0,03	NS

Table 2. Males divided in groups based on body score on Marts 20.