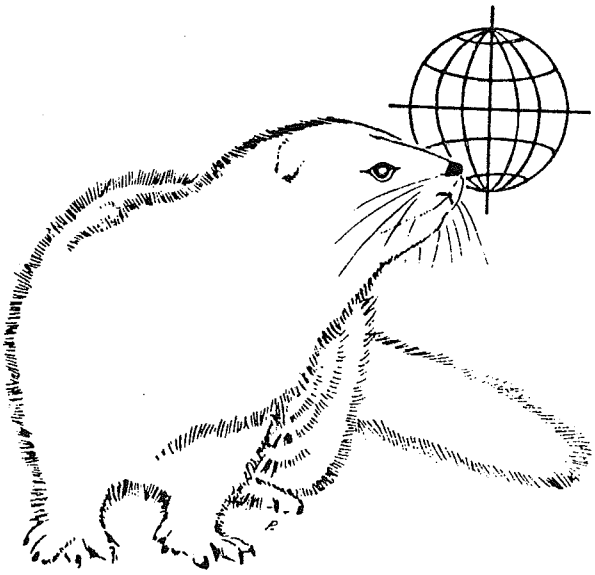

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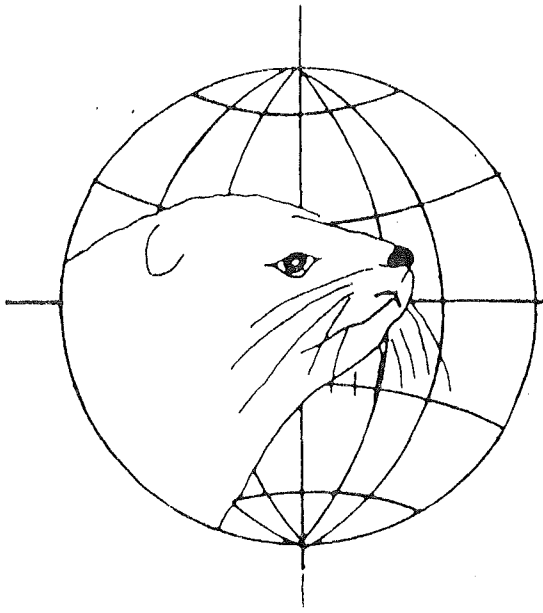

IFASA

NOTES

SCIENTIFUR

Vol. 13, No. 1
February 1989

Happy New year to all of you reading these notes and who care about the future.

Looking back on the very fantastic and interesting history of the fur animal production, you will find very dramatic waves, especially regarding skin prices and the willingness of farmers organizations and authorities to overcome the problems through investment for securing the future.

SCIENTIFUR does not have - during its 12 years of existence - meet any waves - only a slight increase in the numbers of subcribers during the first years. An increase which, unfortunately, cannot form the basis for developing of the journal so that it can continue to serve the fur animal production with the world wide scientific information, - essential for all frontiers in the industry.

We know that one of the reasons for less econimical supporting is the fact that SCIENTIFUR is too scientific and too special to attract a sufficient number of subscribers and advertisers.

Therefore, the board of the Fur Animal Division of the Scandinavian Association of Agricultural Scientists have decided to find a new way for ensuring this very important communication as SCIENTIFUR stand for.

Volume 13, of which this issue is No. 1, will be the last volume of the very scientific journal SCIENTIFUR.

The proposal of establisment of The International Fur Animal Scientific Association (IFASA) at the IV International Scientific Congress in Fur Animal Production, Canada 1988, was at the same time the start of realizing the idea of an International journal (written in English) for both scientists and farmers, - a journal of which about the half will continue as scientific information and the second half will contain practical information for farmers - which information we, during a lot of letters, have experienced many farmers want to receive.

Many of the participants at the IV Congress urged us to realize the new journal,

pores per square centimeter (P) and the number of hair per pore (H).

The differences between pelt A and B was about 3,000 hair per square centimeter and between pelt B and C was about 2,000 per square centimeter at position 2 and 3. While at position 7 the differences between pelt A and B were about 5,000 per square centimeter, and between pelt B and C were about 2,500 per square centimeter. As mentioned above the largest difference in hair density between pelts was recognized at the base of tail (position 7). On the other hand, the least difference was shown on the belly. From the above results it was concluded that the hair density in minkskin was controlled by the number of hairs per pore. And also the results of hair density calculated from the above methods was in accordance with the judgement by graders. The difference in the hair density between pelt A and B was more significant than it was between pelt B and C. Those results demonstrated that the judgement of the graders was severe for the high quality skin.

Acknowledgements
We are indebted to Miss Yuuko Nomura, Faculty of Agriculture, Hokkaido University, for the scanning electron microscopic examination.

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Original report

Protein and collagen changes in young mink skin.

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Abstract.
An important aspect of skin and hair growth concerns the intrinsic properties of dermal connective tissue, particularly collagen. By measuring the extractability of protein, the age and hair cycle related changes of skin collagen and non-collagenous protein in mink kits were undertaken in this study.

There was little collagen in dried defatted skin (DDS) of newborn mink, but its content increased with the thickening of the dermis in growing mink. On the contrary, non-collageneous protein made up the major portion of newborn DDS and its content decrease with growth. Though the contents of whole protein and collagen were constant in each period of the summer and winter coats respectively, the content of non-collagenous protein especially neutral salt insoluble protein increased markedly at the time of the autumn moult. This temporary increase corresponded to the thickening of the dermis. In the telogen thin dermis, the ratio of soluble collagen the whole protein was very high and there was little non-collagenous protein. It appears that there is a close correlation between an increase of collagen content and the thickening of the dermis corresponding to mink growth. In moulting and the anagen phase of the hair cycle, the amount of insoluble non-collagen protein may be closely related to the activity of hair follicle and the thickening of the dermis.

Introduction.

Mink shows seasonal moulting twice a year. In mammals which undergo seasonal moulting, individual hairs generally have independent hair cycle, but two adjacent hairs are usually in the same phase of the hair growth cycle (*Ryder, 1966*). It is well known that the hair follicles change length during the hair cycle; they grow as far as subcutanous tissue in anagen and shorten in telogen. It has been reported that not only the follicle length but also the skin thickness, especially the dermis, changes corresponding to the hair cycle in mice (*Chase et al., 1953; Chase, 1954; Hansen et al., 1984*). In mink, we have reported that the dermis becomes thicker according to the lengthening of hair follicles in early anagen and thinner in telogen (*Nishiumi et al., 1986; Kondo and Nishiumi, 1988*). Also the dermal thickness increases with the development of collagen fibers in growing mink from birth until 10 weeks old.

These observations support the idea that the dermis and hair follicles are a functional unit in the skin and they are interrelated with each other. Therefore the composition of dermal connective tissue is likely to change during the hair cycle and mink growth. In this study, the changes in the extractability of the connective tissue components such as collagen and non-collagenous protein in mink kits were investigated. We will discuss the relationship of dermal thickness, skin and hair growth and connective tissue components.

Materials and Methods.

Animals.
Male Sapphire mink, all sired by the same

sire, born around May 8, 1985, and raised under identical conditions were selected. They were sacrificed at the rate of one animal per week until December 12, 1985. The animals were frozen immediately after sacrifice in order to prevent as much as possible changes in the structural elements of the skin that body temperature might cause.

Treatment of the skin.
Skin samples were taken from the mid-dorsal region after hair removal. Then samples were powdered in liquid nitrogen, and defatted and dried. The dried defatted skin (DDS) was shaken in about 100 times volume (w/v) with neutral salt solution (1M NaCl, 0.05 M Tris HCl pH 7.2) for 24 hours at 4° C. The supernatant was removed by centrifugation at 10,000 rpm for 20 minutes. The resulting residue was designated as the "N-fraction".

Protein and collagen detection.
Protein concentrations in DDS and N-fraction were determined by the Kjeldahl-Nessler method or Biuret reaction. Hydroxyproline (Hyp) concentration was determined by digesting with 6N NCl at 110° C for 24 hours, oxidizing the free Hyp with chloramin-T and reacting with p-dimethylaminobenzaldehyde to form a chromogen which is measured spectrophotometrically (*Bergman and Loclry, 1963*). Collagen content was then calculated as described by *Neuman and Logan* (1950). They mentioned that most of the Hyp in the skin was of collagenous origin, with a minimal amount derived from elastin.

Results.
In the newborn mink, there was a high content of whole protein (WP) in dried defatted skin (DDS), but WP decreased at the age of 8 week (Fig.1). The low value of WP (500-600 mg/g) continued for eight weeks and then the WP increased until 18 weeks old and remained relatively high value (700-800 mg/g) until 30 weeks. The amount of neutral salt insoluble protein (NP) changes similarly to WP throughout the experimental period. The amount of neutral salt soluble protein (SP) decreased gradually from birth until 14 weeks then reached a plateau. The highest SP content was observed in mink kits just after birth (Fig. 1).

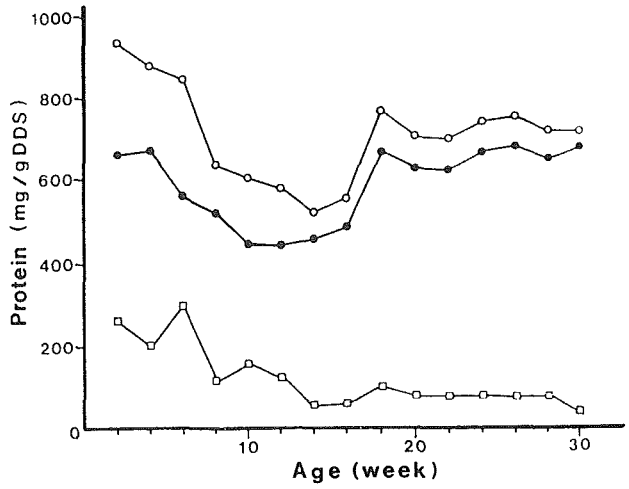

Fig. 1.
Concentrations of protein in DDS of mink at different ages. The contents of whole protein (WP, O), neutral salt insoluble protein (NP, ●) and neutral salt soluble protein (SP, □) in 1 g dried defatted skin (DDS) are given.

The contents of whole collagen (WC) and neutral salt insoluble collagen (NC) in DDS were small immediately after birth. They increased until 10 weeks and then reached a plateau. These medium contents of WC and NC (WC:450 mg/g, NC:350-400 mg/g) continued until 20 weeks. From week 24 trough week 30 relatively high contents of WC and NC (WC:650-700 mg/g, NC:600-700 mg/g) were observed. The content of soluble collagen (SC) was constantly low throughout the experimental period except for the period between 6-12 weeks and again at the age of 18 week (Fig. 2).

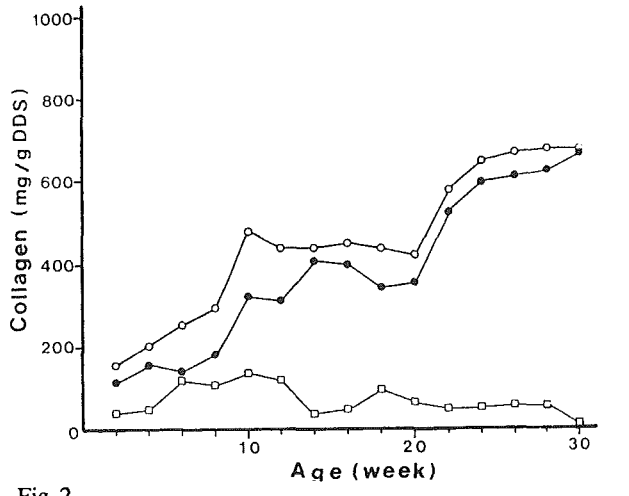

Fig. 2.
Concentration of collagen in DDS of mink at different ages. The contents of whole collagen (WP, O), neutral salt insoluble collagen (NC, ●) and neutral salt soluble collagen (SC, □) in 1 g DDS are given.

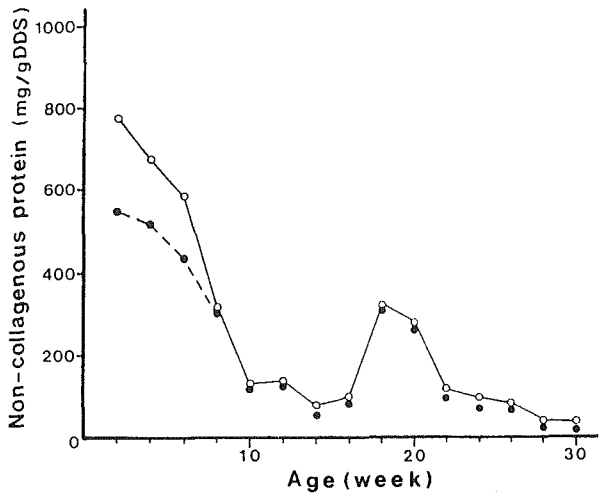

Fig. 3.
Concentration of non-collagenous protein in DDS of mink at different ages. The contents of whole non-collagenous protein (WP-WC, O) and neutral salt insoluble non-collagenous protein (NP-NC, ●) in 1 g DDS are given.

There was a great deal of non-collagenous protein (WP-WC) in very young mink DDS (Fig. 3). Then there was a sharp drop in WP-WC between 2 and 10 weeks. Though the content of WP-WC remained at a low level between 10 and 30 weeks old, it showed a temporary high value between 18 and 20 weeks. The content of insoluble non-collagenous protein (NP-NC) in DDS changed in the same manner as the WP-WC content and remained almost identical after 8 weeks.

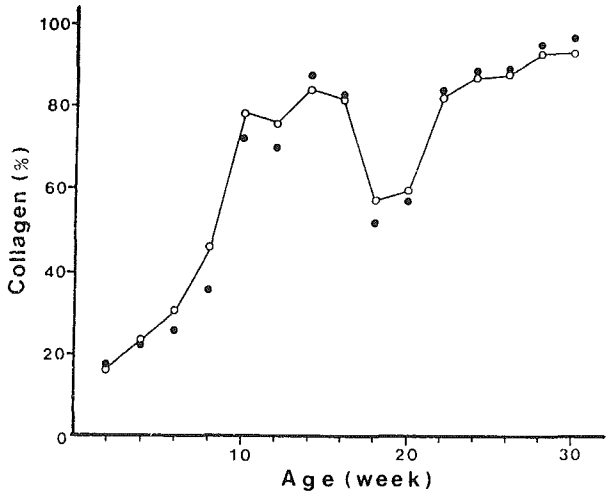

Fig. 4.
Percentage of collagen in DDS of mink at different ages. The ratio of collagen to protein in whole DDS (WC/WP, O) and in neutral salt insoluble fraction (NC/NP, ●) are given.

Both the rates of WC to WP (WC/WP) and NC to NP (NC/NP) changed similarly (Fig. 4). They only occupied about 15% at the age of 2 weeks, but they increased rapidly until 10 weeks old. After week 10, most protein in DDS could be considered as collagen (more than 80%) except between 18 and 20 weeks when it was 50-60%.

The rate of soluble collagen to whole protein increased gradually from birth until 10 weeks (Fig. 5, SC/WP). After 14 weeks, the SC/WP showed a low percentage (about 7%) but at the age of 18 weeks it showed a somewhat high percentage (about 12%). The rate of soluble non-collagenous protein to whole protein was about 20% from birth until 6 weeks old but decreased rapidly between 6 and 8 weeks (Fig. 5, (SP-SC)/WP). After 8 weeks, the (SP-SC/WP never rose above 5% till the end of experimental period at 30 weeks.

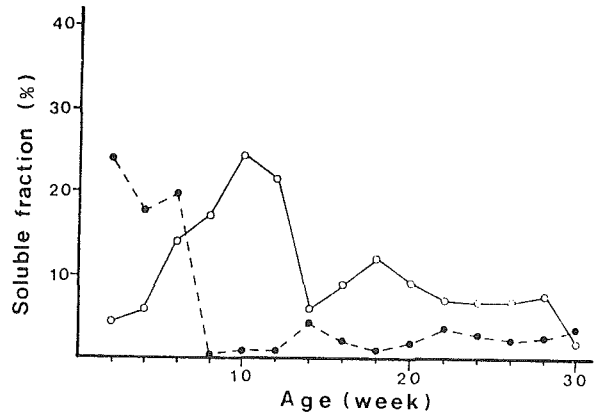

Fig. 5.
Percentage of soluble fraction in DDS of mink at different ages. The ratio of neutral salt soluble collagen to whole protein (SC/WP, O) and neutral salt soluble non-collagenous protein to whole protein ((SP-SC)/WP, ●) are given.

Discussion.

The above results will be discussed from the point of view of mink growth and the hair growth cycle. The changes of dermal thickness in the hair cycle in mink which have been reported previously by us (*Nishiumi et al., 1986; Kondo and Nishiumi, 1988*) are shown in Fig. 6 in order to compare with the results in this study.

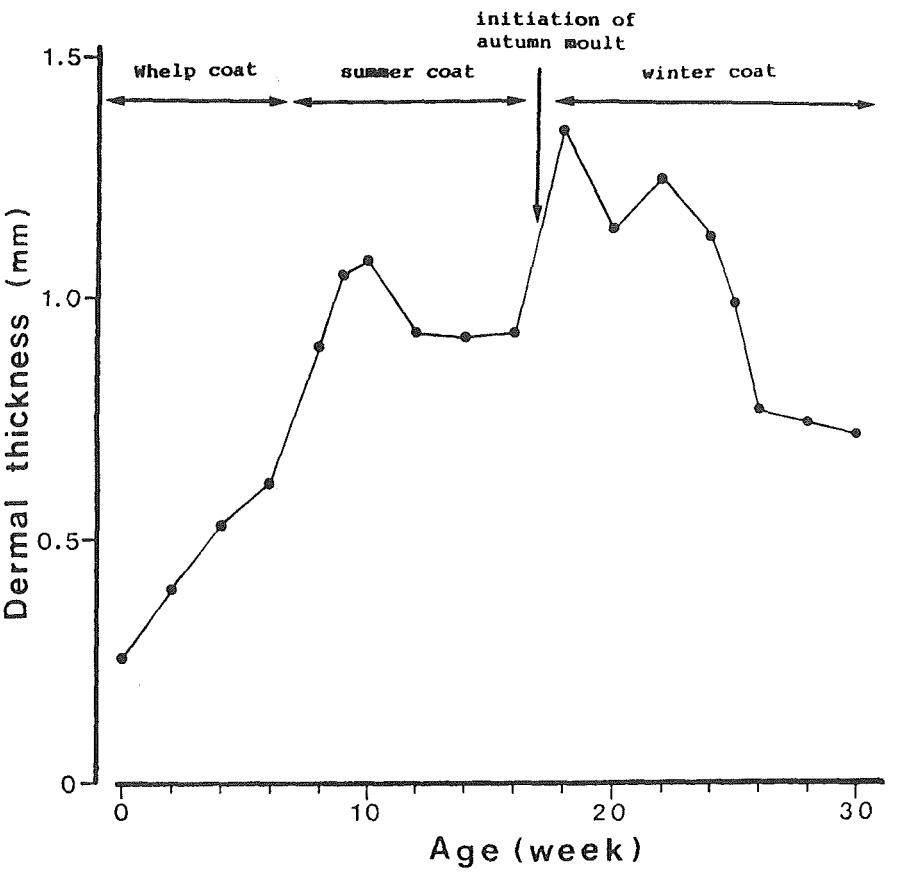

Fig. 6.
The thickness of dermis of mink skin at different ages. The mean dermal thickness from mink birth until 30 weeks are given. The autumn moult begins around 18 weeks.

Young minks ranging in age from birth to 30 weeks old were used for our studies. In this case, the factor of growth is very important.

Newborn mink skin is characterized by a low collagen content and abundant non-collagenous protein (Figs. 2 and 3). *Miller and Karmas* (1985) reported that collagen fibers are interwoven somewhat loosely and there are considerable amounts of interfiber materials in newborn calf skin. In the newborn mink, the dermis was very thin and abundant in hair roots or hair follicles (Fig. 6). From these morphological aspects it is likely that the not-collagenous protein of newborn mink skin contains considerable amounts of keratin, elastin and interfiber protein like proteoglycan and fibronectin.

It is considered that the changes in histological and biochemical parameters in mink skin from birth to 10 weeks are mainly related to growth. Generally, the body weight of mink increased rapidly during this period. Mink skin of this period is characterized by the accumulation of collagen and thickening of dermis (Fig. 2 and 6). This characteristic is accompanied by the marked increase of the percentage of collagen (WC/WP, NC/NP and SC/WP) and a corresponding decrease in the amount of non-collagenous protein (Figs. 3, 4 and 5).

In other words, the accumulation of collagen causes the thickening of the dermis during the growth period. At this time the thickness of the dermis and the percentage of the collagen (WC/WP and NC/NP) increase at an approximately similar rate and both of them accelerate the rate of their increasing proportion from 6 weeks old (Figs. 4 and 6). The growth of mink skin can be divided into two stages or phases, the first being from birth to 6 weeks of age and the second from 6 weeks

through 10 weeks. The levels of whole and neutral salt soluble protein in DDS before 6 weeks are high and the soluble non-collagenous protein exists only in this initial growing stage (Figs. 1, 3 and 5). It is reported that the hair covering present at birth depilates and a summer coat grows before the autumn moult (*Blomstedt, 1987*). Blomstedt refers to the coat present at birth as the "whelp coat" and this is moulted beginning late in July. From the morphological aspect and the analysis of amino acid composition of coat in minks at different ages, it is confirmed that the whelp coat covers mink from birth until 6 weeks old (*Inoue et al., unpublished data*). Although the connection of dermal connective tissue components and the hair organization or development is not affirmed, the whelp coat may be interrelated with the behaviour of collagen and non-collagenous protein in the initial growing stage of mink skin.

After 10 weeks, the contents of WP and WC in DDS are constant in each period of the summer and winter coats, respectively, and the winter coat has a higher density of WP and WC than the summer coat (Figs. 1 and 2). The contents of soluble and non-collagenous protein remain low except during the thickening period of the dermis, and the thin dermis in telogen is characterized by the presence of neutral salt insoluble collagen in the DDS.

The temporary increase of non-collagenous protein between 18 and 20 weeks is followed by a sudden thickening of the dermis (Figs. 3, 5 and 6). In other words, accumulation of non-collagenous protein especially neutral salt insoluble protein causes the thickening of the dermis at the time of the autumn moult in mink skin. This is in contrast to collagen in the growing period of mink skin.

The moulting season is preceded by the activation of hair follicles. Hair follicles are surrounded by basement membrane and dermal connective tissues. These extracellular matrices are a regulating factor of the microenvironment of hair follicles. The active state of a hair follicle is induced and supported by dermal papilla (*Cohen, 1961; Oliver, 1967, 1970, 1980; Oliver and Jahoda, 1981; Jahoda et al., 1984*). It appears that not only dermal papilla but also extracellular matrix play important role in hair growth. Collagen and proteoglycan are main components of the extracellular matrix. The temporary increase of non-collagenous protein like proteooglycan and soluble collagen at the time of the autumn moult may reflect the activation of hair follicles. Further study is necessary to confirm the role of dermal connective tissue components in hair growth.

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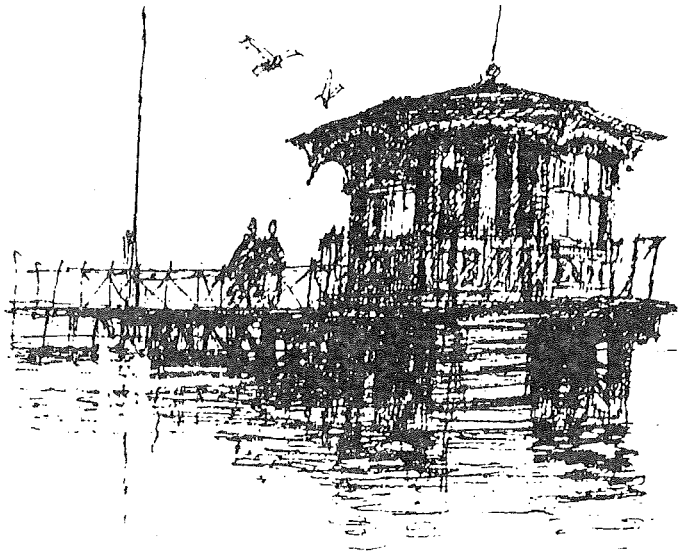

Original report.

Acidification of drinking water: Effects on water quality and welfare of farmed fur animals.

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Summary.
The suitability of acidified drinking water for farmed fur animals were studied. The results showed that drinking water acidified by strong HCl can be used to prevent growth of excessive algae inside water cups. Its preventing effects on growth of coliform and streptococcal counts were also evident. No harmful effects on fur quality or welfare of the animals were observed.

Introduction.
In commercial fur animal production, the important growing season from June to October coincides with warm air temperatures which sets special demands not only on the hygienic quality of feed, (*Juokslahti, 1980,; Korhonen and Harri, 1983*) but also on that of drinking water (*Smeds, 1983; Hendriksen and Clausen, 1986*). Animals' ability to stand drinking water of poor quality is probably no better than that of human beings. It is recommended that drinking water used for farmed furbearers has to fulfil the quality criteria of good tap water (*Kangas, 1981, Tarhaajan kalenteri 1981*). This, however, seems to be impossible in farming practice. It is a known fact that lots of green-coloured algae generally grow inside water cups if farmers do not clean them weekly (*Smeds, 1983*). Futhermore, raccoon dogs (*Nyctereutes procyonoides* gray 1834) readily defecate on their water cups (*Korhonen and Harri,* 1986). The fact that feed may also drop into the cups, leads us to suppose that bacterial counts of their drinking water may be high (c.f. *Hendriksen and Clausen*, 1986).

The main impetus for the present work was the fact that the Laboratory Animal Center of Kuopio University regularly provides their labortory animals (rats, mice, pigs, dogs etc.) with acidified drinking water of pH about 3.5. The low pH is achieved by mixing hydrochloric acid (HCl) into tap water. Acidified water seem to effectively prevent the growth of excessive algae and bacteria in drinking water systems. And what is more important, no signs of its negative effects on the growth and welfare of the animals has been detected in 10 years of use (*Nevalainen,* pers. com.).

The aim of the present study was to evaluate the effectiveness of acidified water in preventing excessive growth of green-coloured algae and bacteria in water cups used under fur farm conditions. It was further intended to clarify to what extent the long-term use of acidified drinking water influences body growth, acid-base balance, fur quality, and water or feed consumption of the animals. Additionally it was tested whether the animals prefer to drink acidified or conventional water if both are simultaneously available.

Materials and Methods.
General procedures.
Adult and juvenile raccoon dogs and polecats were used. They were all farm-born and farmbred, and in good conditions. Raccoon dogs were housed in standard rearing cages measuring 105 cm x 120

cm x 60 cm (width x length x height), and polecats in cages accordingly measuring 40 cm x 60 cm x 40 cm. All animals were caged singly, and fed basal, ready-mixed farm feed according to the standards of the Finnish Fur Breeders' Association (c.f. *Juokslahti, 1980*). Feeding normally took place once a day according to conventional procedures. Feed consumption of the animals was monitored. The animals were weighed every third week on a Satorius 1364 MP electric balance to the nearest 5 g. After pelting the pelts were graded subjectively by professional fur graders of Finnish Fur Sales Ltd. on a 10-point scale (1 = poorest, 10 = best) according to mass, quality, overall impression, cover and colour purity.

Laboratory measurements.
For experiment 1, 500 ml decanter glasses were filled with water of the following pH values: (1) 8.5, (2) 6.0, (3) 4.7 and (4) 3.5. The pH was adjusted with strong (37%) hydrochloric acid (HCl) in tap water. Thereafter, 5 g of raccoon dog's faeces and 2 ml of water with algae were added to the glasses. All decanter glasses were kept for 12 days at room temperature (+ 20°C). The amount of algae was visually estimated every day. At the end of the experiment, water samples were taken from each glass. Nitrate and nitrite levels as well as streptococcal and faecal bacteria counts were performed according to standard methods (c.f. *Juokslahti, 1970*).

8 decanter glasses with the following arrangement were supplied for experiment 2: (1) raw tap water (untreated), (2) acid water, (3) raw water with 5 g faeces added, (4) acid water with 5 g faeces added, (5) raw water with 5 g feed added, (6) acid water with 5 g feed added, (7) raw water with 5 g of both faeces and feed added, and (8) acid water with 5 g of both faeces and feed added. Raw water glasses contained conventional tap water of pH 7.0, and the acid water glasses contained acidified (37% HCl) water of pH 3.5. Thereafter, 2 ml of water taken from water cups (from farm) containing lots of green-coloured algae were put into each glass. The decanter glasses were held at a temperature of about + 20° C for 14 days. Dirtyness of the glasses was estimated daily according to the following score: 1 = clean, 2 = slightly dirty, 3 = moderate dirty, and 4 = very dirty (lots of algae etc.).

Experiment under farm conditions.
Experiment 3 was carried out between June 17 and August 8 using 10 adult male polecats caged alone. Two conventional, plastic water cups (volume of 500 ml) were allowed for each animal. The first contained tapwater (pH 6.9) and the second acidified (37% HCl) water of pH 3.5. Both cups were unused and clean before the experiment. Water consumption and dirtyness score of the cups were monitored daily during a three week period. Dirtyness of the cups was estimated as described above. Water samples were taken at the end of the experiment from the cups, well and water tubes. Total coliform and streptococcal bacteria counts were determined according to standard methods (c.f *Korhonen and Harri, 1983*).

For experiment 4, two groups of adult polecats (N = 6 of both sexes) were selected: (1) the raw water group was provided with tap water of pH 7.1, and (2) the acid water groups was provided with acidified (37% HCl) water of pH 3.5. The experimental procedures were same as in experiment 3.

Experiment 5 includes raccoon dogs of three different groups (N = 18): (1) acid water group (pH 3.5), (2) raw water group, pH 7.0, delivered by hand ladle, and (3) raw water group (pH 7.0), delivered by automatic water system. The experiment was undertaken between August 5.-17. By the end of the experiments water samples were taken from each water cup. Total bacteria and coliform bacteria counts were determined according to standard methods. Water consumption of the animals was estimated.

Acid-base balance.
Two juvenile groups were formed at the beginning of July both consisting of 10 male and 10 female polecats. Group 1 received only acidified (37% HCl) water of pH 3.5 until pelting time in December. Group 2 was the control provided with conventional tap water (pH 7.0). Animals were housed alone according to conventional procedures. Animals were inspected daily, and they remained healthy during the experiment.

For the analyses of the acid-base data anaerobically arterialized blood was collected. The blood samples were taken on November 11th at about 10-11 o'clock before feeding. Before sampling an animal was caught by hand, and a right back toe was extended, slightly massaged and held by hand. Then the nail was cut off (*Jepsen et al., 1981*), and some of 500 µl of blood was collected in heparinized injection tubes. The blood was stored in air-tight injection tubes which were cooled on ice for a maximum of 4 hours before analyses. The acid-base data were analysed according to the Astrup method (*Kliiniset Laboratoriotutkimukset 1971*).

Statistics.
The data were expressed as mean +/-SD. Statistical analyses were computed by analysis of variance and Student's t-test. Data were processed by the VAX 11/780 computer and SPSS (Statistical Package for Social Sciences) program.

Results.
Growth and welfare.

Table 1 shows the growth data for juvenile polecats. Initial body weights of acid water and control groups were of the same order of magnitude ($p > 0.05$). Body weight gain in both groups was normal), and no significant differences in final body weights or fur quality were observed.

Table 1. Body Weights of growing polecats. The values are expressed as means +/- SD (N=10 for both sexes of the groups).

Date	Sex	Control group	Acid water group	S
Jul 7	male	393 +/- 84	331 +/- 147	NS
	fem.	316 +/- 55	315 +/- 44	NS
Jul 28	male	678 +/- 112	709 +/- 91	NS
	fem.	559 +/- 44	540 +/- 48	NS
Aug 12	male	983 +/- 112	1002 +/- 127	NS
	fem.	727 +/- 47	721 +/- 64	NS
Aug 26	male	1304 +/- 117	1330 +/- 136	NS
	fem.	826 +/- 62	827 +/- 80	NS
Sep 16	male	1614 +/- 114	1699 +/- 188	NS
	fem.	966 +/- 64	950 +/- 87	NS
Oct 31	male	1808 +/- 114	1906 +/- 239	NS
	fem.	1006 +/- 106	996 +/- 101	NS
Nov 20	male	1937 +/- 200	1978 +/- 201	NS
	fem.	1076 +/- 115	1070 +/- 116	NS

Significance: NS = not significant (analysis of variance).

The appetite of animals in both groups was good and normal. Feed consumption followed the feeding standards of the Finnish Fur Breeders' Association. For details, see *Korhonen and Harri* (1986).

Water consumption of animals in both test groups was of the same order of magnitude ($p > 0.05$). In 1985, males of control and acid water groups consumed 155 +/- 47 and 104 +/- 32 ml of water per animal daily, respectively. The next year, the corresponding values were 104 +/- 34 and 116 +/- 53 ml of water per animal daily. Water consumption of females in 1985 was not determined. However, in 1986, the control and acid water groups consumed 118 +/- 8 and 111 +/- 34 ml of

water per animal daily, respectively. No significant differences between the years or sexes were found.

Parameters typically used for the estimation of an animal's acid-base balance are presented in Table 2 for acid water and control animals. There were no statistical significant differences between the groups.

Table 2. Acid-base values of blood of juvenile male polecats at pelting time. Values are reported as mean +/- SD. (N=10 for both groups).

Variable measured	Control group	Acid water group	S
Actual pH	7.36 +/- 0.06	7.36 +/- 0.05	NS
pCO_2, mmHg	36.8 +/- 3.9	36.3 +/- 3.2	NS
Base excess (BE), mmol/l	-3.8 +/- 0.2	-3.9 +/- 0.2	NS
Buffer base, mmol/l	44.4 +/- 4.6	41.5 +/- 4.3	NS
Standard HCO_3, mmol/l	21.1 +/- 2.0	20.9 +/- 1.8	NS

Significance: NS = not significant (analysis of variance).

Bacterial quality.

Results from experiment 4 are given in Table 3. As can be seen, the quality of the well water fulfilled the quality criteria set for good tap water. Both coliform and streptococcal bacteria counts were very high in water cups of pH 7.1. Acidified water (pH 3.5) significantly decreased these counts. In water cups where automatic water systems were used these bacteria counts were of the same order of magnitude as in water cups where water was provided by hand ladle. Inside the water tube bacterial counts were still rather small indicating that these counts mainly originated from the cups.

Table 3. The means of faecal streptococcal and coliform bacteria counts of water on a fur farm. The samples were taken on August 8 at noon.

Sample	Faecal coliform bacteria (counts/100 ml)	Faecal streptococcus (counts/100 ml)
Well	0	4
Water cup, pH 7.1	28000	530000
Water cup, pH 3.5	2200	7300
Water cup[a], pH 7.1	38000	386000
Water tube[a], pH 7.1	100	200

[a] = automatic water system.

The results from experiment 3 were parallel to those described in the experiment 4. Typically, bacterial counts decreased with decreasing pH of the drinking water. The same trend was evident for faecal coliform as well as for faecal streptococcal counts.

Acidification of drinking water did not affect their NH_4N values (exp. 1), but these were rather high for all experimental groups (Table 4). No signs of NO_3-N were found. In experiment 1, coliform and streptococcal bacteria counts were generally high in all experimental groups.

Table 4. The means of faecal coliform and streptococcal bacteria counts and NH_4-N and NO_3-N values of water. The experiment was made under laboratory conditions.

Sample	NH_4-N (ug/l)	NO_3-N (ug/l)	Faecal coliform bacteria (counts/100 ml)	Faecal Streptococcus (counts/100 ml)
Well	13	2	0	4
Water cup, pH 6.5	7400	1	2900	2700
Water bottle, pH 8.5	12000	0	6700	a
Water bottle, pH 6.0	9600	0	6600	3700
Water bottle pH 4.7	2600	0	2000	a
Water bottle pH 3.5	8900	0	4900	3600

[a] membrane entirely covered with streptococcal counts.

Table 5. Dirtyness score distribution of drinking water cups of adult male polecats (N=10). The experiment was done during 1985 under farm conditions.

Date	Dirtyness score distribution (%)							
	1		2		3		4	
	R	A	R	A	R	A	R	A
17.7	100	100	0	0	0	0	0	0
18.7	100	100	0	0	0	0	0	0
19.7	100	100	0	0	0	0	0	0
20.7	100	100	0	0	0	0	0	0
21.7	100	100	0	0	0	0	0	0
22.7	80	100	20	0	0	0	0	0
23.6	80	100	20	0	0	0	0	0
24.7	80	100	20	0	0	0	0	0
25.7	70	100	20	0	10	0	0	0
26.7	70	100	20	C	10	0	0	0
27.7	70	100	20	0	10	0	0	0
28.7	70	100	20	0	10	0	0	0
29.7	70	80	10	20	20	0	0	0
30.7	70	80	10	20	20	0	0	0
31.7	70	80	10	20	20	0	0	0
1.8	60	80	20	20	20	0	0	0
2.8	30	80	50	20	20	0	0	0
3.8	30	80	50	20	20	0	0	0
4.8	30	80	50	20	20	0	0	0
5.8	30	80	50	20	20	0	0	0
6.8	30	80	40	20	20	0	10	0
7.8	30	80	40	20	20	0	10	0

R = raw water, pH 6.5, A = Acid water, pH 3.5.
Dirtyness score: 1 = clean, 2 = slightly dirty, 3 = moderately dirty, 4 = very dirty (lots of algae).

Dirtyness score.
Results for dirtyness score distribution of water cups are given in Tables 5-7 (exp. 3 and 4). After 5-6 days from starting the experiments, dirtyness of control cups began to increase. Acidified cups, however, stayed clean for 12-14 days. After three weeks, 10-20 percent of the control cups were very dirty including lots of green-coloured algae. Acidified cups were markedly cleaner. The same trend was observed during both experimental years, and no marked differences between the sexes were evident.

Table 6. Dirtyness score distribution of drinking water cups of male polecats (N=6) in 1986 under farm conditions.

Date	Dirtyness score distribution (%)								T_a
	1		2		3		4		
	R	A	R	A	R	A	R	A	(°C)
15.7	100	100	0	0	0	0	0	0	20
16.7	100	100	0	0	0	0	0	0	18
17.7	100	100	0	0	0	0	0	0	19
18.7	100	100	0	0	0	0	0	0	23
19.7	100	100	0	0	0	0	0	0	20
20.7	100	100	0	0	0	0	0	0	19
21.7	0	100	100	0	0	0	0	0	20
22.7	0	100	100	0	0	0	0	0	21
23.7	0	100	100	0	0	0	0	0	21
24.7	0	100	100	0	0	0	0	0	22
25.7	0	100	100	0	0	0	0	0	20
26.7	0	100	100	0	0	0	0	0	19
27.7	0	100	100	0	0	0	0	0	23
28.7	0	100	80	0	20	0	0	0	27
29.7	0	80	60	20	40	0	0	0	25
30.7	0	80	60	20	40	0	0	0	25
31.7	0	80	60	20	40	0	0	0	27
1.8	0	80	60	20	40	0	0	0	27
2.8	0	80	60	20	40	0	0	0	25
3.8	0	60	40	40	40	0	20	0	22
4.8	0	60	40	40	40	0	20	0	23
5.8	0	60	40	40	40	0	20	0	23
6.8	0	60	40	40	40	0	20	0	22
7.8	0	60	40	40	40	0	20	0	15

R = raw water, pH 6.5, A = acid water, pH 3.5.
Dirtyness score: 1 = clean, 2 =slightly dirty, 3 = moderately dirty, 4 = very dirty (lots of algae).

Results from experiment 2 are illustrated in Table 8. Here again, acidified water proved to effectively prevent the growth of algae (and probably also of bacteria, although this was not measured). When no feed or faeces were added to the experimental water bottles, they stayed clean whether they were acidified or not. Bottles containing low pH water remained clean longer when only feed was added than when faeces were added. Additive effects of feed and faeces together inside bottles were very strong, and even acified water could not prevent clouding of such water.

Table 7. Dirtyness score distribution of drinking water cups of adult female polecats (N=6). The experiment was performed under farm conditions during 1986.

Date	Dirtyness score distribution (%)								T_a
	1		2		3		4		
	R	A	R	A	R	A	R	A	(°C)
15.7	100	100	0	0	0	0	0	0	20
16.7	100	100	0	0	0	0	0	0	18
17.7	100	100	0	0	0	0	0	0	19
18.7	100	100	0	0	0	0	0	0	23
19.7	100	100	0	0	0	0	0	0	20
20.7	100	100	0	0	0	0	0	0	19
21.7	40	100	60	0	0	0	0	0	20
22.7	40	100	60	0	0	0	0	0	21
23.7	40	100	60	0	0	0	0	0	21
24.7	40	100	60	0	0	0	0	0	22
25.7	40	100	60	0	0	0	0	0	20
26.7	40	100	60	0	0	0	0	0	19
27.7	40	100	60	0	0	0	0	0	23
28.7	40	100	60	0	0	0	0	0	27
29.7	40	80	40	20	20	0	0	0	25
30.7	40	80	40	20	20	0	0	0	25
31.7	40	80	40	20	20	0	0	0	27
1.8	40	80	40	20	20	0	0	0	27
2.8	40	80	40	20	20	0	0	0	25
3.8	40	80	40	20	20	0	0	0	22
4.8	0	60	40	40	40	0	20	0	23
5.8	0	60	40	40	40	0	20	0	23
6.8	0	60	40	40	40	0	20	0	22
7.8	0	60	40	40	40	0	20	0	15

R = raw water, pH 6.5, A = acid water, pH 3.5.
Dirtyness score: 1 = clean, 2 =slightly dirty, 3 = moderately dirty, 4 = very dirty (lots of algae).

Discussion.

The results confirm the previous opinions of laboratory animal breeders that drinking water acidified by HCl can be used to prevent growth of excessive algae inside water cups. Our bacteriological analyses, furthermore, revealed that both coliform and streptococcal counts can be decreased by the reduction of water pH close to 3.5. This effect is, however, most effective if no feed or faeces exists inside the cups. These ingredients, of course, decrease the preventative effect of HCl, and if water includes both together, even acidified water loses its effect.

The use of acid-preserved fish in farm feed has increased during recent years which has brought up the question of how the excessive acid load affects the welfare of the animals (c.f. *Joukslahti and Näveri, 1983; Näveri, 1984; Mäkelä, 1986*). Minks fed acid feed of pH 5.5 or less changed their acid-base balance to a metabolic acidosis which negatively affected their reproductive ability and body weight gain (*Poulsen and Jørgensen, 1976; Jørgensen et al., 1976; Poulsen and Jørgensen, 1977*). It has been found that minks fed acid-preserved feed, to some extent, also refused to eat the acid feed supplied (*Poulsen and Jørgensen, 1977*). This is, of course, animals normal rejection against improper food stuffs.

Table 8. Dirtyness score distribution of acidified and raw tap water in eight decanter glasses under laboratory conditions (+ 20° C).

Date	Raw I	Acid I	Raw II	Acid II	Raw III	Acid III	Raw IV	Acid IV
Oct. 21	1	1	1	1	1	1	1	1
Oct. 22	1	1	1	1	1	1	1	1
Oct. 23	1	1	1^a	1	1^a	1	1^a	1
Oct. 24	1	1	2^a	1	1^a	1	2^a	1
Oct. 25	1	1	2^a	1	1^a	1	2^a	2
Oct. 26	1	1	2^a	1	1^a	1	2^a	2^a
Oct. 27	1	1	2^a	2	1^a	1	2^a	2^a
Oct. 28	1	1	3^a	2^a	2^a	1	2^a	2^a
Oct. 29	1	1	3^a	2^a	2^a	1	3^a	2^a
Oct. 30	1	1	3^{ab}	2^a	2^a	1	3^{ab}	2^a
Oct. 31	1	1	3^{ab}	2^a	2^a	1	3^{ab}	2^{ab}
Nov. 1	1	1	3^{ab}	3^{ab}	2^{ab}	1^b	3^{ab}	3^{ab}
Nov. 2	1	1	3^{ab}	3^{ab}	2^{ab}	1^b	3^{ab}	3^{ab}
Nov. 3	1	1	3^{ab}	3^{ab}	2^{ab}	1^b	3^{ab}	3^{ab}

I = tap water, II = 5 g of faeces added, III = 5 g of feed added, IV = 5 g of faeces and feed added.
a = clouded, b = algae membrane covered.
Dirtyness score: 1 = clean, 2 = slightly dirty. 3 = moderately dirty.

No data are available for the acid-base parameters of polecat in literature. However, one would expect that, due to the polecat's close relationship to the mink, both species have acid-base values of the same order of magnitude (c.f. *Poulsen, 1974*). This is confirmed by the fact that the actual pH, pCO_2 and buffer base of our polecats were similar to that described for the mink (*Poulsen, 1974*). The normal buffer excess (BE) values from -1.4 to -2.7 has been described for minks (*Poulsen and Jørgensen, 1977*). BE values were somewhat lower for our polecats in the acidiotic direction. The BE values for both acid and raw water groups, however, were similar which tempts us to conclude that metodological factors may explain the difference between these species.
On the other hand, it has been suggested that if animals get excited during blood collection, their acid-base balance may change in the acidiotic direction (*Poulsen. 1974*). However, our polecats - as polecats in general are - were even-tempered and no signs of excitement during the collection of blood samples were detected.

According to the present study, it seems obvious that acidified drinking water - although used at as low a pH as 3.5 - does not have any negative effects on the animals welfare. Nor did the animals seem to prefer to drink conventional raw water instead of acidified water. Normal water consumption of minks is well known and varies from 60-300 ml per day, depending on the dry matter content of the feed (c.f. *Erikkson et al., 1984*). Although no data on normal values for polecats are available, it is supposed that, due to their close relationship to minks, both species have values of the same order of magnitude. Water consumption values observed in the present study agree well with this assumption.

It is important to note that acidified water in itself does not cause health problems for the animals. The pH of gastric juice is acid in mammals, varying from 1 to 3, which is due to the hydrochloric acid excreted from the mucous membrane. Due to the fact that the animals normally excrete hydrochloric acid, its use is reason-

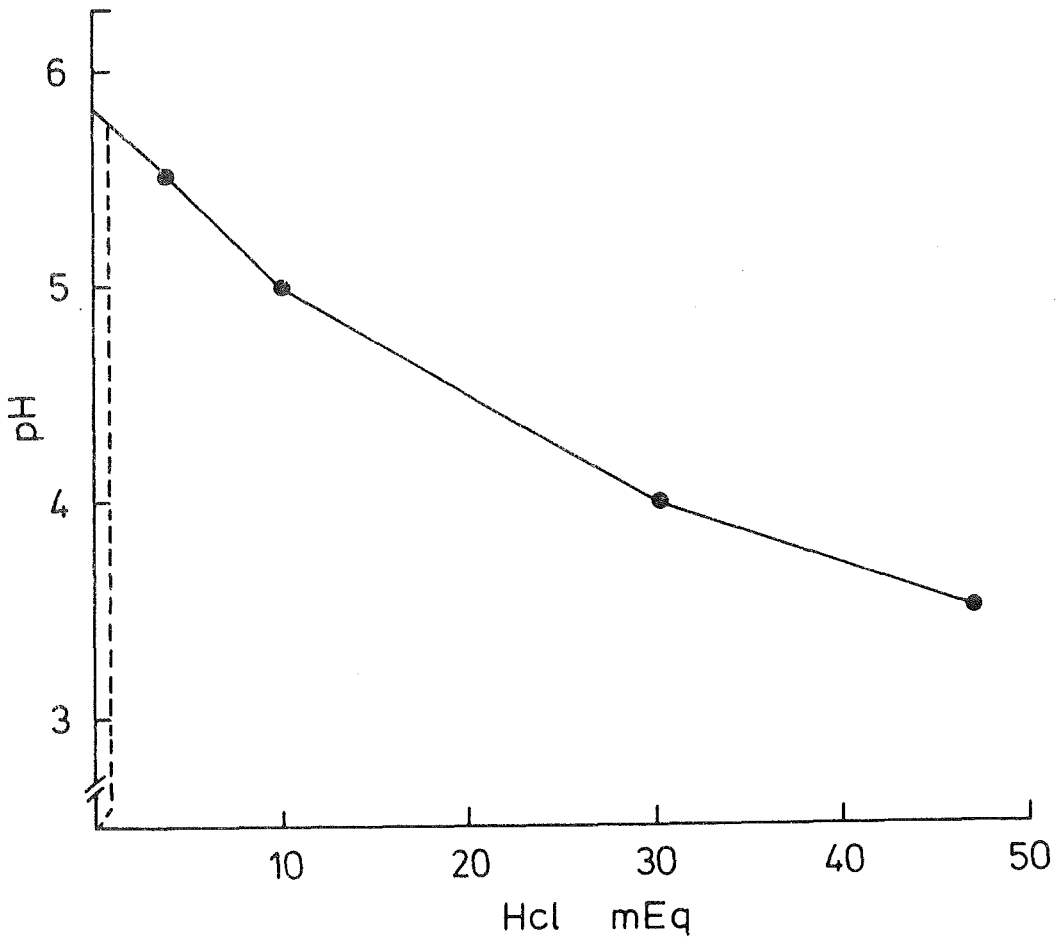

Fig. 1.
The dependence of pH on HCl added to feed or drinking water.

able when setting the pH of drinking water also. The amounts of hydrochloric acid received from drinking water are low compared to that excreted from the animal's mucous membrane itself. For instance, the ventriculus excretes about 320 mmol of HCl daily. Acid-treated drinking water, on the other hand, contains 7 mmol of HCl per liter. If an animal drinks 500 ml of acidified water daily, it achieves 3.5 mmol of HCl which is about 1% of the total amount of HCl excreted by the ventriculus per day.

A reduction of water pH to 3.5 can be easily made. One requires only 15 ml of strong HCl per 25 l water. This is due to the weak buffer capacity of water, and can be deduced from Fig. 1. The buffer capacity of feed, on the other hand, is much higher and, thus, markedly greater amounts of HCl are required to reduce feed pH to 3.5. On farms, lowering of water pH is handy, and, in fact, no accurate arrangements will be needed. One may say that it is enough if only some acid is added to the water. A reduction of water pH to 3.5, in addition, is not expensive; it costs only few Finnish penni per liter of water.

It has been claimed (*Kangas, 1981*) that acid water may dissolve heavy metals from water taps. This might be true, and further studies will be needed to clarify it. In the present study, animals were watered by hand ladle. Since their growth, fur quality and acid-base balance were normal, no harmful amounts of heavy metals could have been dissolved. Futhermore, if acidified water is used only during the most critical period, i.e. June-August, the time for possible metal dissolving shortens. Use of plastic water taps, of course, eliminate the problem entirely.

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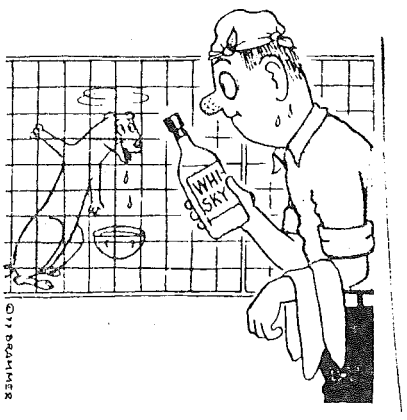
Tarhaajan kalenteri. 1981. Suomen Turkiseläinten Kasvattajain Liitte r.y.



Practical aspects of photoperiodism in investigations of academician D.K. Belyaev.

D.V. Klotchkov.

Survey of works of academician D.K. Belyaev, dedicated to the practical aspects of photoperiodic regulation of reproduction and development of pelt in fur animals, is presented.

Genetica, USSR, 23, 7, 178-1283, 1987.
In RUSS, su. ENGL.
2 tables, 1 fig., 14 references.

Author's summary.

Determination of optimum cage density rate of polar foxes slaughtered for skins.

Andrzej Zon, Dorota Kubanek, Maciej Meller.

A trial was conducted on 210 foxes from weaning till slaughter. Young weaned foxes were placed in cages of 1.28 m^2 floor area at the following stocking rates: group I - 1, group II -2, group III - 3 and group IV - 4 animals per a cage. The foxes kept individually were highly aggressive and their feed intake was depressed by about 15% comparing with that of foxes in the other groups. Initial body weight of foxes was equal in all groups, in September it ranged from 4370 to 4970 g. Body weight in group I was significantly different from that in groups III and IV ($P<0.001$) and II ($P<0.05$). The differences at slaughter were higher and body weight ranged from 5595 g in group I to 6354 in group III. Body weight in group III and IV were significantly different from that in group I ($P<0.01$) and II ($P<0.05$).

Licence results were similar in groups II, III and IV. The foxes in group I were of lower breeding value and their body length was lower. The skins obtained in 5.0-5.4% were within the quality class II. The majority of beyond standard skins (10.5%) were found in group IV where 60.0-67.9% of the skins were evaluated as class IV and V. The quality class of the skins in group IV was generally lower. The density rate of 2-3 foxes per cage should be accounted optimum.

Rocz. Nauk. Zoot. T., 14, 1, 1987, 187-293.
In POLH. Su: ENGL, GERM, RUSS.
3 tables, 8 references.

Authors' summary.

Growth of polecats housed in groups of different sizes and with different sex ratios.

L.E. Pozdnyakova.

Polecats were housed 2 (1 female + 1 male), 4 (2 females + 2 males), 6 (3 females + 3 males) or 8 (4 females + 4 males) per cage measuring 70 x 35 x 40 cm, or 20, (10 females + 10 males) per cage measuring 3 x 1 m. For the 5 groups resp., the floor area per animal averaged 1225, 612, 408, 308 and 470 cm^2, body weight at cropping 955, 975, 938, 874 and 908 g for females and 1942, 1917, 1832, 1774 and 1665 g for males, and the consumption of energy during rearing 280, 310, 309, 290 and 280 kcal. Animals caged in mixed-sex groups averaged higher body weights than animals caged in groups of the same sex.

Nauch. Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 116-123, 1984.
In RUSS.
2 tables, 2 figs., 7 references.

CAB-abstract.

Hygienic aspects of keeping furbearing animals in a hot climate.

B.Z. Gazizov.

Under the conditions of the Central Asian Republics of the USSR, mink could be kept in well-ventilated double-row sheds providing the air temperature did not exceed 35 deg.C. Nutria were kept in pens with access to a water bath. A correct microclimate was essential for averting losses. It was necessary to add

0.5% lactic acid for meat-and-fish meal as a preservative.

Veterinariya, Moscow, USSR, 5, 26-29, 1987.
In RUSS.
2 tables.

CAB-abstract.

Abnormal behaviour in farmed silver fox vixens (Vulpes vulpes L.): Tail-biting and infanticide.

B.O. Braastad.

Ever since the first fox farms were built a century ago, many farms have had problems with reproduction, which may be related to a weak degree of domestication; some vixens bite off the tail of their pups and may even kill them. Our work is aimed at revealing the causes of such behaviours and finding appropriate measures to avoid them. Since these behavioural disorders may indicate stress or fear, such measures would also imply improving the welfare of these animals.

Twelve silver foxes, some of which had showed normal and some abnormal behaviou the previous year, were observed from 2 days before parturition to about 5 days after at our farm. A specially designed video-camera box, with infrared light for day and night recording was fitted on top of the nest box.

Behaviour during and shortly after parturition was quite normal in all 10 multiparous vixens, including those which later killed their offspring. Labour usually lasted only a few minutes. In most cases the vixen was lying curled up during parturition, but in a few cases during labour she seemed to need to stretch out her body more than the inner nest box (measuring 40 x 40 cm) allowed. However, nothing indicated that later pup mortality could be attributed to too small a nest box.

Ten deaths in 5 litters were judged to be caused by infanticide. The almost invariably started with tail-biting, from a few hours to a couple of days postpartum. Some vixens bit off the tails gradually, 1-2 cm at a time, until virtually nothing was left. Infanticidal vixens usually bit off the tail of all pups, although only a few pups might later be killed.

Infanticide occurred 13 h to 5 days postpartum (average 1 day 15 h). Eight killings were performed between 22.00 and 07.00 h. In one case a pup was killed simultaneously with intense screaming from blue foxes near by. Both tail-biting and most cases of infanticide occurred during a period of intense licking of the pups, perhaps a "displacement licking". Some females bit off body parts in this sequence; tail, hind legs, hind part, forepart. These observations might suggest that tail-biting and killing could be caused by stress-induced disinhibition of a biting pattern during, e.g., eliminatory licking.

Vixens almost always ate dead pups, whatever the cause of death, but very often at first only partly.

In 19 litters of vixens which had showed normal behaviour the previous year, on average 4.0 pups were weaned uninjured, whereas the corresponding figure for 18 litters of vixens which earlier killed pups was 0.11 (2.4% of pups born). This clearly shows that disturbed behaviour patterns are repeated in later years. Hence, such vixens should always be taken out of breeding.

Quantitative analysis showed that infanticidal vixens faced the nest-opening during rest or sleep, looked out of the nest box and went out of the nest box more often than did normal vixens. This indicates that infanticidal vixens feel more tense and insecure under present housing conditions. An analysis of 2 such vixens in 2 different nest boxes in subsequent years suggests that it will be possible to design a nest box in which at least some vixens show a more relaxed behaviour. Effort to accomplish this will be continued.

Appl. Animal Behaviour Sci., 17, 3/4, 376-377, 1987.

Author's abstract. *(Only abstract rec.)*

Intravenous infusion in ferrets.

Yigal Greener, Barbara Gilles.

As a result of increasing public awareness of the conduct of biomedical research, the search for the best animal models for predicting human toxicity has reached new dimensions. The use of the ferret in biomedical research, with particular interest in toxicological studies, was presented by *Hoar* (1).

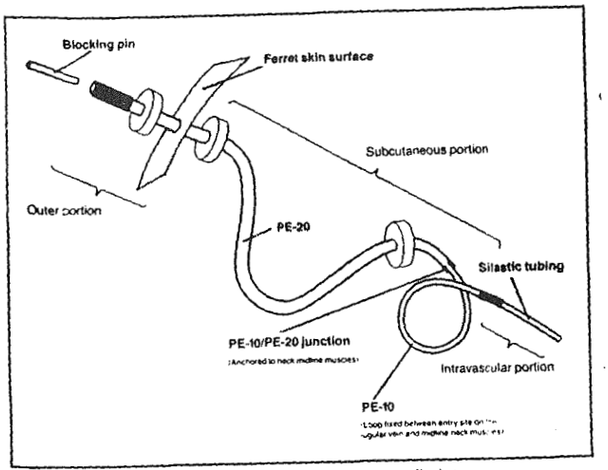


Figure 1. Schematic diagram of the indwelling intravenous catheter.

In addition, with the development of the new parantial nutritional solutions and the increased use of the intravenous (IV) route for drug delivery in the clinical environment, the assessment of the safety of a variety of chemical solutions administered chronically via IV route has become necessary. Several techniques have been developed for the chronic administration of fluids and withdrawal of blood from the unrestrained rat (2-5). In this study, the use of the indwelling intravenous catheter in ferrets permitted the instillation of fluids and the withdrawal of blood for up to seven months without the use of anticoagulants and without apparent stress or pain to the animals.

Lab. Animals, USA, 14, 6, 41-44, 1985.
2 figs., 6 references.

Authors abstract.

The digestive postdiaphragmatic organs of the nutria (Myocastor coypus).

V. Cotofan, C. Cotea, Otilia Cotofan, Valentina Hritcu.

The stomach is large and simple and it has a cardiac sphincter and a large and keratinized valvule. The striated muscle fibres of the esophagus continue in two superficial bands along the small and large curvauture of the stomach. The cecum comma shaped, is quite large, it is undulated and lacks any cecal apendix. The ascendent colon is made up of two loops. The liver lacks any polyedricale design, it has six lobes of which the square one is small and triangular in shape. The pancreas is dispersed between the duodenum loops and has only one excretion duct.

Lucrari Stiintifice, Inst. Agron. "Ion Ionescu de la Brad" Iasi, Zootehnie-Med. Vet., 29, 65-66, 1985.
3 references.

Authors' abstract.

An evaluation of the accuracy of measuring body length in mink.

Z.A. Mashtak.

The accuracy of assessors in measuring body length was tested individually and for pairs of assessors. 480 measurements were compared. Errors of up to 1 cm were obtained for 40.6% of measurements, and errors of up to 2 cm for 3.5%.

Nauch. Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 11-20, 1984.
5 tables, 1 fig.
In RUSS.

CAB-abstract.

Body measurements and coat colour in raccoon dogs.

I.V. Shapovalova.

Data are tabulated on body weight, body measurements, colour, shade and incidence of veiling in the offspring of large and

small, red and silver, dark and light, and veiled and non-veiled parents mated in different combinations.

Nauch. Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 156-162, 1984.
4 tables.
In RUSS.

CAB-abstract

Silver fox pelt prices as affected by time of pelting, sex, and age.

Chas. E. Kellogg.

The auction prices of 10,689 of the more than 14,000 mature and pup silver fox pelts produced by the Nieman ranches in Wisconsin and Michigan in 1935 under similar conditions of breeding, feeding, and climate were critically studied. About 34 percent of the pups produced were retained as breeders. Naturally they were the best animals, and most of them were full silvers. The number of pelts represented, however, is considered sufficiently large to give accurate information.

The most striking fact disclosed by this study is that pelts of males sell for considerably more than those of females. Pelts taken during the normal pelting season from mature males sold for nearly 16 percent more than those of comparable females; skins from male pups, for 8 percent more than those from female pups. This price differential between the sexes was even greater for those pelts removed from animals that died before regular pelting time. Buyers recognized a commercial difference between the male and female skins, because the prices compared are actual auction values placed upon the pelts by men who had no knowledge of the sex of the animals from which the pelts were taken. The larger size of the male pelts is believed to be the primary reason for their greater valuation.

Pelts from mature animals that died before the regular pelting season sold for more than pup pelts of the same sex, but the pup pelts taken during pelting season brought a higher average price than the mature skins taken during that time. There was considerable variation in prices received for mature and pup pelts, depending upon the degree of silver.

Pelts taken early in fall had a sale value of approximately 30 percent of that of those taken during the regular pelting period, but this relative value increased uniformly and rapidly until about the first of November, when it was 93 percent of that of pelts taken at the regular time.

The extent of the prime-fur period could not be definitely determined from the data, but indications are that pup pelts can be taken over at least a 3-week period without affecting their sale price, providing the late-whelped pups are pelted last.

Circular No. 460, U. S. Dept. of Agriculture

One of the finer specimens of silver foxes raised by the Herbert A. Nieman Co.

The full silver pup pelts sold for 32.5 and 51.7 percent more, respectively, than three-fourth and half silvers. These higher values for the full silvers have led the Nieman ranches, by selective mating to produce full silvers to the extent of 59 percent of the entire pup crop.

Through the prevalence of certain methods and the necessity of doing things at a particular time on a well-conducted commercial fox ranch prevent the exactness of results that would be found in a carefully planned experiment, it is believed that the large number of skins included in this study gives a high degree of validity to the results. It would be almost impossible to produce this number of pelts under rigid experiment.

U.S. Dept. of Agriculture, Circular 460, 1-27, 1937.
2 leaves of plates, ill, Publ. Washington, D.C.U.S., Dept. of Agriculture.

Author's summary.

Heritable collagen-dysplasia in domestic animals and man: A comparative review.

J. van Leuven.

In the present articel, a review is made of recent literature on heritable collagen-dysplasia in domestic animals and man. Some differences an similarities are emphasized.

Vlaams Diergeneeskundig Tijdschrift, 56, 2, 89-99, 1987.
In DUTH.
2 tables, 35 references.

Author's summary.

The inheritance an effect of age at cropping on the incidence of the broken hair defect in raccoon dogs.

N.I. Syrnikov, A.M. Nersesov.

For the offspring of males without the broken hair defect mated with females free of the defect, with low expression of the defect or with a high expression, the percentage free of the defect was 63.1, 58.1, and 38.7 resp. for males and 59.1, 53.8, and 45.2 for females. For matings of males and females free of the defect, free males with affected females, and of affected males and females, the percentage of offspring free of the defect was 19.3, 4.8 and 0 resp. for males and 10.6, 6.7 and 0 for females. The incidence of the defect increased with age at cropping, from 79% for animals killed in Oct. to 100% in Dec.

Nauch. Trudy, Nauchno-Issledovatel'skii Inst., Pushnogo Zverovodstva i Krolikovodstva, 31, 149-155, 1984.
In RUSS.
4 tables, 5 references.

CAB-abstract.

Serum cortisol radioimmunoassay values in the normal ferret and response to ACTH stimulation and dexamethasone suppression tests.

B.A. Garibaldi, M.E. Pecquet-Goat, J.G. Fox.

Normal serum cortisol levels have not been previously established in the European ferret, *Mustela putorius furo*. cortisol values were obtained from 30 ferrets using a commercial (I^{125})radioimmunoassay. Sera from 24 males (19 intact, 5 neutered) and 6 females (4 intact, 2 were assayed spayed). Resting serum cortisol values ranged from 0.22-2.70 ug/dl for males (average = 0.97 ug/dl) and 0.551.84 u/dl for females (average = 0.93 ug/dl). Resting cortisol values of both males and females were comparable with those of the cat (1.0-3.0 ug/dl). A 7 year old male ferret with suspected hyperadrenocorticism and an adrenal mass had a cortisol level of 10.9 u/dl. Adrenal cortical carcinoma was the histologic diagnosis. To test the efficacy of methods used in dogs and cats to measure adrenal function, an ACTH stimulation test (1 U/kg IM) and a low-dose dexamethasone suppression test (0.1 mg/kg) were performed on three ferrets. Post-ACHT serum cortisol levels increased by an average of 42%. Post-dexamethasone serum cortisol values decreased by an average of 27% 6 hours post-injection. These responses were similar to the pub-

lished results for the normal dog and cat.

Only abstract received.
Authors' abstract.

Some hematological indicators of the peripheral blood in nutrias (Myocastor coypus).

Vladimir Parkanyi, Jan Rafay, Ivor Jakubicka, Milan Barta.

In males of standard nutrias at the age of 4 months, the authors assessed from the peripheral blood gained from the *arcus venosus dorsalis digitalis* some hematological characteristic: pH, pCO_2, pO_2, the maximal and the minimal osmotic resistance of erythrocytes, the size of erythrocytes and the blood differential.

Macrocytosis is typical of the erythrocytes of nutria males (x = 7.7224 = 0.0608 μm). A lower blood pH level (7.2174 = 0.0172) and a higher pCO_2 level (x = 50.9071 = 2.6566 mmHg) are close relation to the lower osmotic resistence of erythrocytes (maximal osmotic resistance 0.3460 = 0.0068 %, minimal 0.4560 = 0.0057 %). Lymphocytes (x = 50.2352 = 2.9562 %) and neutrophils (x = 43.9412 = 2.9264) are most frequently represented in the leucogram.

Polnohospodarstvo, Czechoslovakia, 33, 5, 469-475, 1987.
In SLOE. Su. ENGL, RUSS.
2 tables, 10 references.

Authors' summary.

Changes in blood serum concentration of some of the indices of protein metabolism in hybrids of skunk-and-ferrets in the postnatal period.

Roman Szymeczko.

Investigations of some of the indices of protein metabolism of blood serum in 105 skunk-and-ferrets of different ages have been carried out. The growth and development period of skunk-and-ferrets was characterized by a great dynamics in the change of the investigated indices: whereby the lowest level of alfa amino nitrogen, urea, creatinine, AspAT and AlAT transaminase activities and the lowest absolute content of total protein and its electrophoretic fractions were found in the first month of skunk-and-ferrets life. In the blood serum of 2, 3, 4 and 7.5 months old skunk-and-ferrets a higher AlAT activity than AspAT one was observed. In comparison with other species of breeding animals the postnatal period in skunk-and-ferrets was marked by lower gamma globulin fraction content in blood serum.

Medycyna Weterynaryjna, 43, 8, 493-496, 1987.
In POLH. Su. ENGL, RUSS.
3 tables, 39 references.

Author's summary.

Morphofunctional state of hypothalamic and epiphyseal structures in relatively wild and domesticated silver foxes during estrus.

M.N. Yurisova, L.A. Kolesnikova, L.N. Ivanov.

A histochemical and cytometric analysis of the hypothalamo-hypophyseal neurosecretory system (HHNS), the suprachiasmatic and arcuate nuclei, as well as the epiphysis in sexually mature silver fox females during estrus revealed the activation of peptidergic and monoaminergic neurosecretory components, as well as glial and vascular components. All signs of increase (frequently significant) in the secretory activity of the HHNS and epiphysis were more distinct in the domestic foxes. The results obtained indicate the more active production and release of neurohormones involved in regulating the reproductive process in domestic foxes and permit the postulate that the changes in their periods of estral activity are associated specifically with these distinctions.

Journ. of Evolutionary Biochemistry and Physiology, 23, 3, 264-269, 1988.
(Translated from: Zhurnal Evolyutsionnoi Biokhimii i Fiziologii, 23, 3, 355-360, 1987).
In ENGL.
2 tables, 3 figs., 15 references. *Authors' summary.*

A natural killer cell assay for the mink using a mouse lymphoma as the target cell line.

Nancy C. Pace, Reed P. Warren, LeGrande C. Ellis.

A natural killer cell assay was developed for the mink (*Mustela vison*) using mink peripheral mononuclear cells as effector cells and a mouse lymphoma cell line as targets. Baseline levels of natural killer cell activity were established in fertile mutation mink, primary infertile dark mink and secondary infertile dark mink with autoimmune orchitis.

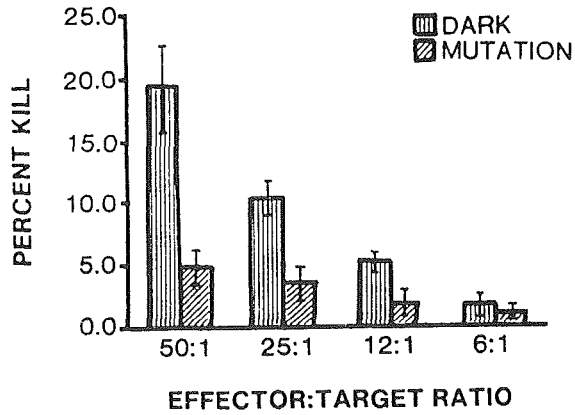


Figure 1 Peripheral blood mononuclear cells were used in all assays. Percent chromium release (Percent Kill) was dependent on the effector:target ratio, indicating that the assay worked. There was a significant difference ($p<0.01$) in natural killer cell activity between infertile dark and fertile mutation mink.

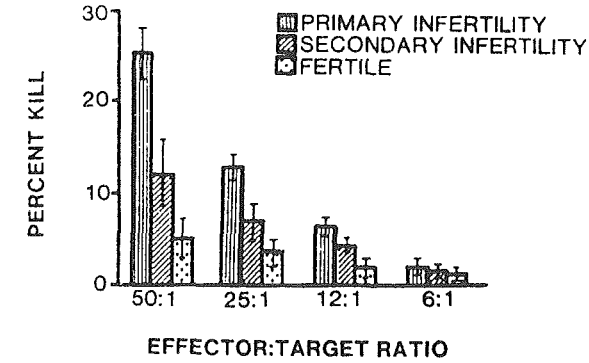


Figure 2 Breeding males were classified as to fertility status during the regular breeding season (March). Peripheral blood mononuclear cells were used in all assays. Primary infertile dark mink had significantly higher natural killer cell activity than secondary infertile dark mink at the 50:1 and 25:1 effector: target ratios, and significantly higher natural killer cell activity than fertile mutation mink at the 50:1, 25:1 and 12:1 effector: target ratios.

Blood samples were taken from dark mink at the end of March and from mutation mink during the first 2 weeks in April. Statistically significant differences in activity were noted between color phases and among groups. The possibility of genetic and/or seasonal differences in natural killer cell activity is discussed.

Laboratory Animal Science, 37, 2, 220-229, 1987.
2 figs., 20 references.

Authors' abstract.

A source of cutaneous maternal semiochemicals in the mink?

J.A. Yager, D.B. Hunter, M.R. Wilson, O.B. Allen.

Unique hypertrophic apocrine sweat glands are described in the neck, perineal and inguinal skin of mink kits. These glands enlarge after birth, only to regress rapidly and become vestigal by weaning. No similar phenomenon has been recognized before in mammals. Behavioural studies indicate a possible role for the glandular secretion in maternal recognition of the young.

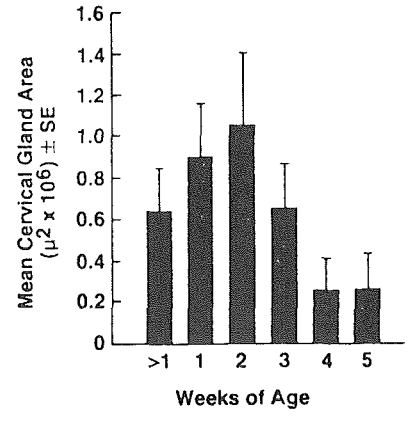


Figure 2. Graph illustrating the changes in the area of secretory units from cervical apocrine glands in mink from birth to 5 weeks of age.

Experientia, 44, 1, 79-81, 1988.
1 table, 2 figs., 19 references.

Authors' summary.

Mucus secretion by tracheas of ferret and dog.

Helen Kyle, N.P. Robinson, J.G. Widdicombe.

Mucus secretion, stimulated by nerve exitation or drugs, was measured from the ferret trachea in vivo by two methods: (a) from the whole trachea, and compared with the volume of submucosal glands estimated from histological sections; and (b) from mounted segments of trachea, by displacement of tantalum dust applied to the epithelium and compared with changes in tissue volume estimated by probing the epithelial surface between hillocks. Maximal secretion rates (2-3 $ul.min.^{1}.cm^{2}$) with tracheal segments were 5-6 times greater per unit area than those with the whole trachea. During secretion the tissue shrank by a volume close to that of the secretion. Similar experiments with the hillock method and dog trachea in vivo gave variable results. Although the ferret submucosal glands can secrete 0.87-5.4 times their volume per minute, any change in tracheal resistance to airflow would be rather small.

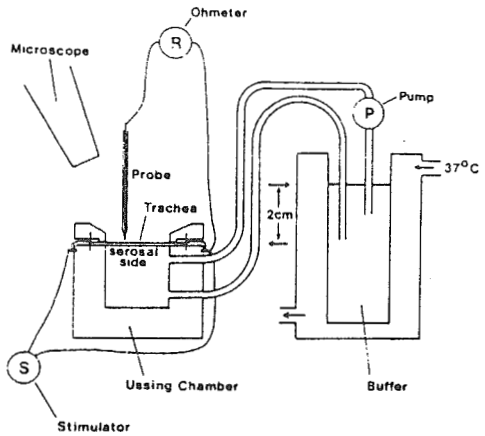


Figure 1. Diagram of method for assessing mucus secretion by measurement of 'hillocks' under tantalum dust, and tissue shrinkage by probing the epithelium between hillocks. For description see text.

Eur. J. Respir. Dis., 70, 14-22, 1987.
5 figs., 20 references.

Authors' abstract.

The health status of Norwegian fur farms in 1987.

G. Loftsgaard.

Based on reports obtained throughout the year from veterinarians working in institutions or in practice, the following disease situation emerged; viral hepatitis, recorded on 3 farms in different parts of Norway: viral enteritis of mink, reported from 10-12 farms (the first new cases for many years); plasmacytosis, estimated that about half of the fur farms in the country are now free of the disease; salmonellosis, 5 deaths from S. dublin infection; Sarcoptes infestation, reported from 37 fox farms and 1 coypu farm; botulism, caused the death of 800 animals on one fox farm.

Norsk Veterinærtidsskrift, 100, 1, 34-35, 1988.
In NORG.
1 table.

CAB-abstract.

Alternatives to chromium tanning. Part IV: The stability of aluminium and other tannages in acidic solutions.

K.C. Montgomery.

Solo aluminium, combination aluminium and a range of other tannages were investigated for their stability under acidic conditions, particularly conditions likely to be encountered in woolskin dyeing. Most aluminium tannages, including the well-established vegetable-aluminium tannage, deteriorated under the conditions of a standard dyebath test method developed for this investigation.

J.Society of Leather Techn. and Chemists, 71, 6, 187-194, 1987.
12 figs., 27 references.

Author's summary.

Production and marketing of rabbit skins.

J. Rougeot.

Rabbit skins are a by-product of meat production, particularly in intensive production systems where, owing mainly to early slaughtering, they are often of inferior quality. However, extensive and rational production systems with adequate health measures can produce good-quality fur pelts, for which there is a substantial world market. Developing countries wishing to begin rabbit pelt production should ensure that future producers are trained in improved husbandry and processing techniques in order to be able to sell a good-quality semi-finished product. The author gives the history of rabbit fur production in France and describes the various methods employed for the production of pelts for both fur and hair, together with their classification.

World Animal Review (FAO), 60, 7-17, 1986.
9 figs., 14 references.

Author's heading to review.

An olfactory recognition system in the ferret Mustela furo L. (Carnivora: Mustelidae).

B. Kay Clapperton, Edward O. Minot, Douglas R. Crump.

This study demonstrates that ferrets can use variations in odours from anal sac secretion as a communication system. Odour preference tests showed that ferrets can discriminate between male and female ferret anal sac odours, between strange and familar, familar and their own, and fresh and 1-day-old odours. They did not discriminate between fresh and 1-h-old odours, nor did male ferrets discriminate between the odours of oestrous and anoestrous females. Ferrets were more attracted to the odours of the opposite sex than to those of their own sex. When faced by an opponent, male ferrets were more aggressive in the presence of their own rather than their opponent's odour, and less aggressive with their opponent's odour than with that of a known, dominant animal's odour. These results are consistent with both a sex attraction role and a territorial defence role for anal sac odours. A scent-matching mechanism for territorial defence is supported, although a neighbour recognition/avoidance mechanism cannot be rejected. Gas chromatography revealed sexually and individually distinct profiles of volatile compounds in anal sac extracts, but no consistent seasonal trends. Females had high concentrations of 2,3-dimethylthietane and/or 3,4-dimethyl-1,2-dithiolane. Males usually had high concentrations of indole. 2-Propylthietane was an important constituent in most individuals. These differences in concentrations were significant and could provide an olfactory recognition system of sex and individual identity.

Anim. Behav., 36, 2, 541-553.
6 tables, 6 figs., 48 references.

Authors' abstract.

Food habits of Wyoming Black-footed ferrets.

Thomas B. Campbell, Tim W. Clark, Louise Richardson, Steven C. Forrest, Brent R. Houston.

Eighty-six scats were analyzed to determine food habits of wild black-footed ferrets (*Mustela nigripes*). Most scats were collected during winter (N = 27) and spring (N = 27); scats from summer (N = 2), autumn (N = 2) and from undetermined seasons (N = 28) accounted for the remainder. White-tailed prairie dog remains occurred in 87% of all scats. Mouse remains were found in 6% and lagomorph remains in 3% of scats.

American Midland Naturalist, 117, 1, 208-210, 1987.
17 references.

Authors' abstract.

Martes Martes Linnaeus, 1758, in the Balearic Islands.

J.A. Alcover, M. Delibes, J. Gosalbez, J. Nadal.

Samples of *Martes martes* from Majorca

and Minorca, have been studied using of the Cantabrian population of the species as a reference material. The Mallorcan population is characterized by its pale colouring and by being slightly smaller than the Cantabrian population and similar in size to the central European populations of the species. Its subspecific designation has not been determined. The Menorcan population is distinguished by its large size, its dimensions being greater than that of any previously known population. This population is described as a new subspecies: *Martes martes minoricensis n. ssp.*

Miscellania Zoologica, Spain, 10, 323-333, 1986.
In SPAN. Su. ENGL.
5 tables, 3 figs., 32 references.

Authors' abstract.

The stone marten Martes foina (Erxleben, 1777) (mammalia, carnivora) from Ibiza (Pitiusic, Balearic Islands).

Miquel Delibes, Francisco Amores.

One skin and 38 skulls of martens from Ibiza have been studied. The results confirm the specific identity of these martens as *Martes foina (Erxleben, 1777).* On average, Ibiza Stone Martens are smaller than the European ones, with the exception of some teeth measurements. There is a sexual dimorphism in size, males being bigger than females. Craniometrically, Ibiza martens seems to be similar to those from Crete, Crimea and the Middle East. The species has probably become extinct in the island within the last fifteen years.

Miscellania Zoologica, Spain, 10, 335-345, 1986.
In SPAN. Su. ENGL.
2 tables, 7 figs., 26 references.

Authors' abstract.

Social interactions and marking (olfactory communications) in the pine marten (Martes martes).

M. de Monte.

Behavioural studies on two female martens (*Martes martes*) have shown that scent marking was mainly performed by means of abdominal glands. The dominant of the two females had a higher marking rate than the subordinate. Both individuals increased their marking frequencies in reaction to environmental changes. It is suggested that in martens the main function of scent marking could be familiarize on an animal with its environment.

Organisation sociale cheq les vertebres, Toulouse, 12-13-14 decembre 1985. INRA, Paris, 1987 (Les Colloques de l'INRA no. 38).
In FREN. Su. ENGL.
2 figs., 6 references.

Author's summary.

The fauna of Cumberland Island. I. On the occurrence of the opossum and gray fox.

Carol Ruckdeschel, C. Robert Shoop.

Although reported by writers of the 19th and 20th centuries, the opossum and gray fox were probably not members of the Cumberland Island fauna at that time. Literary licence, lack of critial review of the literature and ignorance of the fauna have led to perpetuation of the early erroneous reports. The letters of mammal collector W.W. Brown to Outram Bangs in the 1890's help to substantiate the absence of these species on the island. The finding of only a single opossum bone in an Indian midden and none in a slave cabin site strongly suggest that the opossum had not been a member of the island fauna for a least several hundred years. No data support the reported sighting of a gray fox. The question of why certain common mammals do no occur on Cumberland Island remains.

Georgia Journ. of Science, 44, 3, 90-95, 1986.
19 references.

Authors' summary.

Original report

Immunogenetic studies of mink. 1. Comparison of IgG allotypes of Danish and Siberian mink.

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Abstract.
The frequencies of three IgG light chain allotypes (L1, L3, and L4) and six IgG heavy chain allotypes (H2, H3, H4, H6, H7, and H8) were determined for 97 mink with Aleutian disease (AD) and 168 without. A qualitative and quantitative similarity in allotypic IgG polymorphism was established between the previously studied Novosibirsk populations and the present from Denmark. The AD-negative Danish population differed from the Novosibirsk with a lower frequency of L1 and L3 and a higher one of H7.

Fixed combinations of the C-gamma-allotypes were found to be absent in the Danish population as in the one from Novosibirsk. Taken together the immunochemical and frequence distibution data for the Novosibirsk and Danish populations indicate, that IgG polymorphism is a stable feature of the mink as a species.

From comparison of allotype frequencies for AD-negative mink and mink with Aleutian disease (AD), it was found that the AD mink from Denmark expressed allotypes H3 and H4 with higher frequencies than those without AD.

Introduction.
Allotype polymorphism of the immune system in man and animals is species specific. Six allotypes of the constant regions of the gamma-chains (the C-gamma-allotypes H2,H3, H4, H6, H7, and H8) and two allotypes of the light chains (L1 and L3) have been described for the American mink (*Baranov et al. 1984; Belyaev et al. 1986a, 1986b*). Both Danish and Siberian mink originate from American mink (Mustela vison). It has been found that the genetic control and/or the expression of the C-gamma-allotypes in mink sera has a number of features distinguishing it from the other mammals so far studied (man, rabbit, and mouse), which makes identification of individual linked allotypes genes (allogroups), and allelism of the C-gamma-allotypic markers in mink more difficult (*Belyaev et al., 1986b*). Data concering the interspecies distribution of mink IgG allotypes in the Mustelidae family and other representatives of mammals have been obtained (*Baranov et al., 1981*). A limitation in the interpretation of the mink allotype literature is that the data concerns only the mink in the USSR. A broader basis for assessment of the genetic polymorphism of immunoglobulins in the mink as a species was clearly needed. Studies of IgG polymorphism in mink populations from distinct regions of Eurasia would contribute to the development of the applied genetics of mink and to the genetics of immunoglobulins of mammals in general terms. With this in mind, a comparative study of immunoglobulin allotypes was undertaken

in mink from farms in Novosibirsk and Denmark. Because some of the mink had Aleutian disease (AD), which is characterized by plasmacytosis and hypergammaglobulinemia, the association between AD and the IgG allotypes was also examined.

Materials and Methods.
Sera were collected from AD-negative standard mink from a single Danish farm. The number of these donors was 68 in 1982 and 100 in 1984. Sera were also collected in 1986 from 97 standard mink with AD from various fur farms in Denmark. Thus the total number of sera sampled was 265. Since the AD-negative donors were all from the same Danish farm and since the entire set of allotypes were not detected in each sample, data from the two AD-negative groups were pooled, thus bringing the number of these individuals to 168.

The methods used for preparation of the alloantisera have been described previously (*Belyaev et al., 1986b*). In 1982 the sera were tested for eight allotypes (L1, L3, H2-H4, H6-H8), while in 1984 the number of allotypes tested was reduced to six. Anti-L3, anti-H2, and anti-H7 were not used in 1986, because of difficulties encountered in raising further quantities of these antisera, but we included an additional antiserum against the newly identified light chain allotype L4 (anti-L4).

The data previously obtained for the distribution of allotypes and phenotypes in the Novosibirsk population (Experimental farm of the Institute of Cytology and Genetics, *Belyaev et al., 1986a*) were compared with the present data. 1084 random samples were taken from the AD-negative Novosibirsk mink population. Most of the Novosibirsk mink were adult Standard.

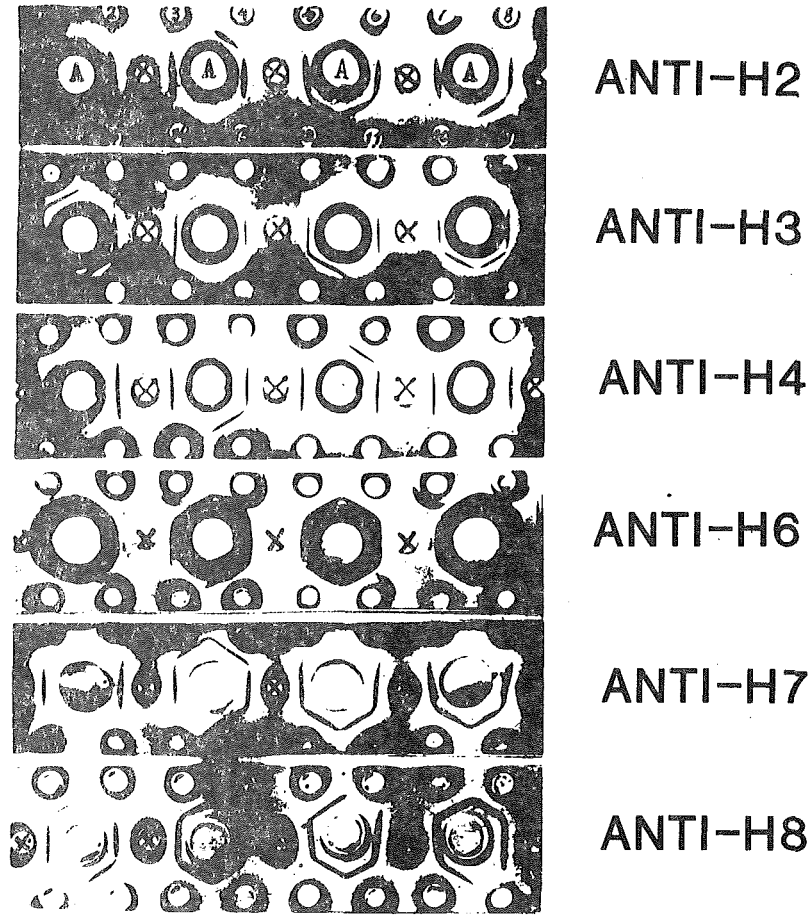

Fig. 1.
Panel of 16 mink sera tested with 6 different alloantisera.
A = Mink alloantisera against 1gG allotypes,
1-16 = Mink sera tested; x = control sera.

Allotyping was performed by Ouchterlony double immunodiffusion. For the gel diffusion, 1.2% agar (Difco) in 0.15M NaCl containing 3% polyethylene glycol (m.w. 6000) was used. Fig. 1 presents the results for the allotyping of 16 mink samples.

Results.
No qualitative differences between the alloimmunoprecipitates formed by the sera collected in Denmark and Novosibirsk were observed (see fig. 1). They showed immunochemical identity in the reactions with standard reagents.

No allogroups (individual sets of allotypes) were revealed among the mink from Denmark that have not previously been described for other populations.

The IgG allotypes and corresponding gene frequencies of mink from Denmark are given in Table 1.

The AD-negative mink from Denmark sampled in 1982 and 1984 were found to be very similar in distribution of frequencies. The only exception was H4, the antigen frequencies being 0.41 in 1982 and 0.21 in 1984. This discrepancy was probably due to the chance variations in H4 frequency in the small samples. According to the present results, the allotypes L1 and L3 have almost the same distribution of frequency in the Novosibirsk population (0.45 and 0.46), and the genes responsible for them are closely linked (*Baranov et al., 1984*). All those positive for L1 were also positive for L3. When the samples of AD-negative Danish and Novosibirsk populations were compared (Table 1) it was found that the frequencies of L1 and L3 are significantly lower (0.13 versus 0.45, and 0.09 versus 0.46, respectively) and the frequency of H7 significantly higher (0.96 and 0.74, respectively). The differences for H2, H3, H4, and H6 are insignificant as well as those for L4; the frequency of H8 is almost the same in both samples.

Table 1. A comparison of the frequencies of IgG antigens and genes in mink populations from Denmark and Novosibirsk.

Allo-type	Population from Denmark AD-neg. (168) antigen	gene	with AD (97) antigen	gene	Novosibirsk AD-neg. (1084) antigen	gene
L1	0.13	0.07	0.29	0.16	0.45	0.26*
L3	0.09	0.05**	n.a.	n.a.	0.46	0.27*
L4	0.91	0.70***	0.95	0.77	0.80	0.56****
H2	0.15	0.08**	n.a.	n.a.	0.25	0.14
H3	0.46	0.27	0.79	0.55	0.40	0.23
H4	0.29	0.16	0.55	0.33	0.36	0.20
H6	0.98	0.87	0.96	0.80	0.90	0.68
H7	0.96	0.79**	n.a.	n.a.	0.74	0.49
H8	0.98	0.87	0.99	0.90	0.95	0.79

n.a. - not allotypes
* - allotyped in 186 mink
** - allotyped in 68 mink
*** - allotyped in 100 mink
**** - allotyped in 441 mink

Table 2 shows how the IgG groups of allotypes (allogroups) are distributed in the Danish mink. Also the data

Table 2. A comparison of the distribution of IgG allogroups in AD-negative minks from Novosibirsk and Danmark and in mink with AD from Denmark.

Allogroup	AD-negative minks Novosibirsk No of mink	Freq.	Denmark No of mink	Freq.	Minks with AD Denmark No of mink	Freq.	P
- - - -	1	0.001	0	0	0	0	
H3 - - -	2	0.002	1	0.006	1	0.010	
- H4 - -	0	0	0	0	0	0	
- - H6 -	4	0.004	0	0	0	0	
- - - H8	34	0.031	0	0	0	0	
H3 H4 - -	2	0.002	0	0	0	0	
H3 - H6 -	31	0.029	2	0.012	0	0	
H3 - - H8	10	0.009	2	0.012	1	0.010	
- H4 H6 -	2	0.002	0	0	0	0	
- H4 - H8	44	0.041	0	0	1	0.010	
- - H6 H8	377	0.348	65	0.387	11	0.113	<0.001
H3 H4 H6 -	7	0.006	0	0	0	0	
H3 H4 - H8	19	0.018	0	0	1	0.010	
H3 - H6 H8	230	0.212	49	0.292	31	0.320	
- H4 H6 H8	189	0.174	26	0.155	8	0.082	
H3 H4 H6 H8	132	0.122	23	0.137	43	0.443	<0.001
Total	1084		168		97		

for the Novosibirsk population are included for comparison. The allogroups occurring at higher frequencies among the AD-negative mink from Denmark were H6, H8; H3, H6, H8 and H3, H4, H6, H8.

The distribution of allogroups in the Danish AD-negative and AD-positive mink is also compared in Table 2. There was a significantly lower frequency of H6, H8 and a significantly higher frequency of H3, H4, H6, H8 for the AD mink from Denmark.

According to the data from the Danish mink, the frequencies of allotypes H3 and H4 are significantly ($p < 0.001$) higher in the AD mink. (Table 3).

Table 3. X^2 test for association between allotypes H3 and H4 and Aleutian disease in the mink population from Denmark.

Characters	Combinations +,+	+,-	-,+	-,-	Total	P
H3, AD	77	77	20	91	265	<0.001
H4, AD	53	49	44	119	265	<0.001

Discussion

The polymorphic features of IgG, which we have previously identified in the Novosibirsk population, were also observed in the Danish mink. The immunochemical identity and the distribution similarity of the IgG allotypes in the two populations remote from one another give credence to the belief, that IgG polymorphism reflects a feature unique to mink as a species. It would be pertinent to recall that in all species so far studied, the immunoglobulin light and heavy chains are encoded by distinct gene clusters localized on different chromosomes. The heavy chain genes are closely linked and the corresponding allotypes are inherited in definite sets as allogroups.

Among the mink from Novosibirsk close linkage has been demonstrated only for the light chain allotypes (*Baranov et al., 1984*) and no limitations were found to prevent the heavy chain allotypes from combining freely (*Belyaev et al.,* 1986b).

In the previously studied populations of mink from different fur farms of Siberia, the frequencies of the IgG allotypes were found to be similar (*Belyaev et al., 1986b*). From the results of the present study it was concluded that the Danish and Novosibirsk populations share common frequency characteristics of IgG polymorphism, in spite of remoteness and absence of gene pool exchange. True, the Danish sample was small, and more extensive analyses are needed. The basis for this stability in the frequencies of the IgG allotypes and their genes in distinct populations of the American mink may be that the distribution pattern of the IgG genes has been established under the pressure of the epizootic conditions at fur farms, and that it is optimal under modern conditions of maintenance of the mink as a species. Whatever the cause, it seems unlikely that the agreement between the distribution pattern of different genes in distant populations such as Novosibirsk and Denmark occurs by chance.

Previously, in three Siberian mink populations with AD, the frequency of H3 was estimated to be significantly higher in the AD herds than in the AD-negative ones (*Kochlashvili et al., 1987; Fomicheva et al., 1986*) This difference was due to only two allogroups of which H3 was a member, namely H3, H6, H8, and L1, H3, H6, H8; their frequencies were almost double in the diseased mink. The frequencies of H6, H8 and L1, H6, H8 (i.e. in the same combinations of allotypes without H3) were less than half in the group with AD. The same difference in the frequency of H3 was found in the mink from Denmark with AD (0.79 versus 0.46 in healty mink). This was associated with a significantly higher frequency of H4 (0.55 versus 0.29 in the AD-negative mink). This allotype has not been tested previously in mink with AD. The testing of H4 in the AD mink allowed us to reveal differences in the frequencies of allogroups marked with H3 in a more discriminating manner. As may be judged from the Danish samples, only the frequencies of allogroups comprising H3 and H4 together were higher in individuals with AD. These were allogroups H3, H4, H6,H8 and L1, H3, H4, H6, H8. The frequency of H3, H6, H8 (without H4) was not different in the Danish sample. (Table 2). As in the Siberian populations with AD, the frequency of allogroup H6, H8 was lower in the AD Danish mink.

The results obtained from the Danish mink sample is a fourth case of documented difference in frequency of a particular C-gamma-allotype (H3) observed in mink with AD. This difference occurs at the expense of a higher frequency of merely one combination of C-gamma-markers: H3, H6, H8 (H4 was not tested) in the three Siberian populations or H3, H4, H6, H8 in the Danish population. Thus there was possibly a parallel higher frequency of H3 and H4 in AD mink. Further studies are needed to clarify this point.

One cannot discount the possibility that the frequency of the C-gamma-allotypes might have decreased under the pressure of natural selection, for

example under the effect of the differential susceptibility of mink with different Ig genotypes to the viral agent, resulting in a different course of the disease and its outcome. Therefore a decrease in the number of mink H6, H8 may be considered as a consequence of the preferential elimination of this particular group of mink.

Another explanation could be that the H3 and H4 allotypes may express themselves in the serum in minor (latent) concentrations detectable only by immunoenzyme methods. It cannot be excluded that the hitherto "latent" clones of B-lymphocytes, which can synthesize the IgG molecules with H3 and H4 markers, would be stimulated into active proliferation in AD infection. As a result, the number of individuals with normal quantitative expression of H3 and H4 (together with H6 and H8) among the AD mink is higher and there is a concomittant lower frequency in mink with allogroup H6, H8.

Many genetic studies relating immunoglobulin allotypes with diseases in human populations have been published. The combinations of IgG allotypes were found to be associated with pathology in various populations (*Van Loghem, 1984*). Of relevance here is the evidence of the G3m(g5) in the Gm system of American negroes being associated with multiple myeloma, and hence, being a marker of the hereditary susceptibility to this diesase (*Leech et al. 1985*). Further studies may bring a better understanding of the nature of the association between disease and immunoglobulin allotypes in mink.

Acknowledgement.
The authors are grateful to Mrs. A. Fadeeva for translating this paper from Russian into English.

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Original report

Immunogenetic studies of mink 2. Comparison of Lpm allotypes of Danish and Siberian Mink.

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Abstract.
The data for the allotypes of the polymorphic Lpm-system were compared in two geographically remote mink populations, one from Denmark, the other from Novosibirsk (USSR). All the ten tested Lpm-allotypes in the Danish population were found to be antigenically identical to those occurring in the Novosibirsk and other mink populations of the USSR. All the allotypes of the Lpm-system of the populations from Denmark and USSR have common major polymorphic features, they are inherited as allogroups and coded by haplotypes. Some of the Lpm-haplotypes present in the Novosibirsk population were found to be absent from the Danish population. The small size of the Danish sample and the extensive polymorphism of the Lpm-system make it difficult to judge whether the observations made are in fact features specific to mink bred in Denmark.

Introduction.

The mink Lpm-system is a complex allotypic system of proteins belonging to the serum alpha-macroglobulins. Fourteen Lpm-allotypes have so far been identified, and their genetic control described (*Baranov et al., 1984a; 1984b; Kutyavina et al., 1987; Yermolaev et al., 1988*).

The Lpm-allotypes are inherited as fixed combinations known as allogroups. Each allogroup is encoded by a set of closely linked structural genes known as Lpm-haplotypes (*Baranov 1981; Baranov et al., 1984a*). As a result of the Mendelian behaviour of the eleven identified Lpm-haplotypes there are 66 Lpm-genotypes and 42 Lpm-phenotypes *(Kutyavina et al., 1987; Kochlashvili et al., 1985). The Lpm-locus has been located on chromosome 9 (Yermolaev et al., 1988*).

The Lpm-allotypes have been tested in several mink populations in the USSR *(Kutyavina et al., 1987; Baranov, 1981; Kochlashvili et al., 1985)*. Our concept of the structure of the complex Lpm-locus with its unusual extensive polymorphism derives from studies of a large mink population from the experimental fur farm of the Institute of Cytology and Genetics of the Siberian Branch of the USSR Academy of Sciences (the Novosibirsk population).

This paper presents the results of the allotyping of ten (Lpm1...Lpm10) of the fourteen known Lpm-markers in serum samples from Danish mink. Allotyping of Lpm1, Lpm2,... Lpm10 allowed us to identify eight major Lpm-haplotypes. Their paired com-

binations gave rise to 36 genotypes and 22 phenotypes at the Lpm-locus. The present data for lpm-allotyping of Danish mink are compared to the data previously obtained for the Novosibirsk mink population *(Baranov et al., 1984b)*.

Materials and methods.
Serum samples were collected from Danish and Siberian mink. IgG allotype data were described in a preceding publication *(Fomicheva et al.)*. Because of the small volumes of some of the samples, the number subjected to Lpm and IgG allotyping (see preceding communication) was slightly different *(Fomicheva et al.)*.

Sera from 152 AD-negative mink, (A): 61 from 1982 and (B): 91 from 1984 were tested together with (C): 101 sera from mink with Aleutian disease (AD). A comparative population analysis of the extremely polymorphic Lpm-system based on such a small number of samples is hardly warranted. For this reason all the 253 serum samples were treated as one group, which will be designated as the Danish mink population (DP). The statistical and the tabulated data will concern the DP and also a Novosibirsk population (NP) consisting of 1404 sera. Some of the distributive features of the Lpm-markers in samples (A), (B), and (C) will also be considered in the text.

Mink antisera against Lpm-allotypes 1-10 were used in this study *(Baranov et al., 1984b)*. Lpm7 was tested only in group (A). Lpm-allotyping was performed by double immunodiffusion *(Baranov et al., 1984a; Fomicheva et al., 1988)*. The calculations used for estimating the frequencies of the individual Lpm-genes and Lpm-haplotypes have previously been described *(Baranov, 1981; Baranov et al., 1984a)*.

Results.
All the ten tested Lpm-allotypes were identified in the DP. No qualitative differences were found in the precipitation patterns of the DP and control (NP) mink sera. The frequencies of the Lpm-allotypes and genes are given in Table 1. The frequency of allotype Lpm 1 was found to be higher in the NP than in the DP ($p < 0.05$).

Table 1. Frequencies of the individual Lpm-allotypes and their genes in mink from the populations from Denmark (DP) and Novosibirsk (NP).

Allotype	Danish population		Novosibirsk population	
	Antigen	Gene	Antigen	Gene
Lpm1	0.05*	0.03	0.32	0.18
Lpm2	0.20	0.11	0.28	0.15
Lpm3	0.32	0.18	0.44	0.25
Lpm4	0.99*	0.90	0.91	0.70
Lpm5	0.15*	0.08	0.04	0.02
Lpm6	0.98	0.86	0.98	0.86
Lpm7	0.23**	0.12	0.37	0.21
Lpm8	0.93	0.74	0.90	0.68
Lpm9	0.99	0.90	0.97	0.83
Lpm10	0.98	0.86	0.99	0.90

* The differences in the frequencies between the DP and NP are significant by the chi square test. In all other cases the differences are not statistically significant.

** Lpm7 was not tested in some of the DP. For this reason, the corresponding values are probably underestimated.

By contrast Lpm4 and Lpm5 were encountered more frequently in the DP ($p < 0.05$). The frequencies for Lpm2, Lpm3, Lpm6, Lpm8, Lpm9, and Lpm10 were about the same in the DP and the NP.

Of the 22 Lpm-phenotypes identifiable by means of the markers Lpm1-10, only 13 were detected in the DP (Table 2). It should be noted that no new Lpm-phenotype was revealed in the DP.

Table 2. The distribution of Lpm-phenotypes in the mink populations from Denmark (DP) and Novosibirsk (NP).

No.	Lpm-phenotype	Danish population: Number of mink	Danish population: Frequency of phenotype	Novosibirsk population: Number of mink	Novosibirsk population: Frequency of phenotype
1.	- - - - - 6 - 8 9 10	-	-	26	0.0185
2.	- - - 4 - - - - 9 -	5	0.0198	17	0.0121
3.	- - - 4 - 6 7 - 9 10	4	0.0158	20	0.0142
4.	- - - 4 - 6 - 8 9 10	(31)*		292	0.2080
		124	0.4901	351	0.2501
5.	- - - 4 - 6 7 8 9 10	(4)		59	0.0421
6.	- - 3 4 - 6 - 8 9 10	(15)		451	0.3213
		69	0.2727	494	0.3519
7.	- - 3 4 - 6 7 8 9 10	(0)		43	0.0306
8.	- 2 - 4 5 6 7 - 9 10	7	0.0277	4	0.0028
9.	- 2 - 4 5 - 7 - 9 10	-	-	12	0.0085
10.	- 2 - 4 5 6 7 8 9 10	26	0.1028	30	0.0214
11.	- 2 3 4 5 6 7 8 9 10	6	0.0237	7	0.0050
12.	1 - - - - 6 - 8 9 10	-	-	29	0.0206
13.	1 - - 4 - 6 - 8 9 10	-	-	45	0.0321
14.	1 - - 4 - 6 7 8 9 10	-	-	9	0.0064
15.	1 - 3 4 - 6 - 8 9 10	-	-	18	0.0128
16.	1 2 - - - 6 7 - - 10	1	0.0039	45	0.0321
17.	1 2 - - - 6 7 8 9 10	-	-	28	0.0200
18.	1 2 - 4 - 6 7 - 9 10	1	0.0039	34	0.0242
19.	1 2 - 4 - 6 7 8 9 10	3	0.0119	131	0.0933
20.	1 2 - 4 5 6 7 - 9 10	-	-	2	0.0014
21.	1 2 - 4 5 6 7 8 9 10	-	-	2	0.0014
22.	1 2 3 4 - 6 7 8 9 10	7	0.0277	100	0.0712
Total		253	1.0000	1404	1.0000

*) The number of individuals with corresponding phenotypes in the group of (A) 61 mink (DP).

The Lpm-haplotype frequencies are compared in table 3. Haplotype 6, 8, 9, 10, and 1,6,8,9,10 were not identified in the DP samples. The frequency of haplotype 1, 2, 6, 7, 10 was significantly higher in the NP than in the DP, while those of haplotypes, 2, 4, 5, 7, 9, 10 and 4, 6, 8, 9, 10 were significantly lower (as judged by students t-test).

Discussion.

Studies on mink from Novosibirsk have been carried out for more than 10 years *(Baranov et al., 1984a; 1984b; Kutyavina et al., 1987)*. Data have been obtained for the freely reproducing part of the herd (more than 4,000 individuals) and on those mink involved in experimental crosses (more than 1,500 offspring). Taken together, these

Table 3. Frequencies of Lpm-haplotypes in the mink populations from Denmark and Novosibirsk.

Haplotype	Danish population	Novosibirsk population	
1, 2, 6, 7, 10	0.03*	0.12	
1, 6, 8, 9, 10	-	0.09	
2, 4, 5, 7, 9, 10	0.08*	0.02	
4, 9	0.14	0.12	
4, 6, 7, 9, 10	0.57*	0.04	0.29
4, 6, 8, 9, 10		0.25	
3, 4, 6, 8, 9, 10	0.18	0.25	
6, 8, 9, 10	-	0.17	

* The frequencies are significantly different.

data indicate to us that almost all, if not all, of the various Lpm-phenotypes, genotypes, and haplotypes detectable by means of ten (Lpm1-10) markers, have been identified. The NP is characterized by rather constant values of the Lpm-allotype, Lpm-phenotype, and Lpm-genotype frequencies through all the generations studied (*Baranov et al., 1984b*).

All the 10 studied allotypes were observed in the DP. As judged by double immunodiffusion, the Lpm-allotypes of Danish and Novosibirsk mink were immunochemically identical.

The differences between the DP and NP allotype and genotype frequencies were minor. Significantly different values were only found for Lpm1, Lpm4, and Lpm5 (Table 1). Analysis of the distribution of Lpm-phenotypes brings out more sharply the differences between the two populations (Table 2). The DP lacked a group of Lpm-phenotypes common to the USSR herds. It should be emphasized that some of the phenotypes are very rare in the DP.

The most likely explanation for the observed differences in Lpm-allotypes, phenotypes, genes and haplotypes between the two studied mink populations is that the size of the DP mink populations was 2-3 times smaller than needed for studying such an extremely polymorphic system as Lpm (see the corresponding phenotype frequencies, No. 8, 11, 20, and 21, among the 1,404 mink from Novosibirsk, Table 2.). For this reason emphasis is not placed on the differences observed between the AD-negative mink and mink with viral plasmacytosis. In preliminary studies on Siberian mink, no clear-cut association was found between the Lpm-markers and viral plasmacytosis (*Kochlashvili et al., 1985*).

Acknowledgement.

The authors are grateful to Mrs. A. Fadeeva for translating this paper from Russian into English.

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Baranov, O.K., D.K. Belyaev, M.A. Savina, & V.I. Yermolaev. 1984a. Genetics and evolution of the mink Lpm system. I. Identification and genetic analysis of the Lpm6 allotype. Genetica (USSR), 20, 114-127.

Baranov, O.K., D.K. Belyaev, V.I. Yermolaev, V.V. Filippov & M.A. Savina. 1984b. Genetics and evolution of the mink Lpm system. IV. Genetic control of evolutionary "conservative" allotypes Lpm9 and Lpm10. Genetica (USSR), 20, 1024-1035.

Fomicheva, I.I., O. Yu. Volkova, B. Aasted & O.K. Baranov. 1989. Immunogenetic studies of mink. 1. Comparison of IgG allotypes of Danish and Siberian mink. Scientifur, Vol. 13, No. 1 (this issue).

Kochlashvili, T.I., O.K. Baranov & V.I. Yermolaev. 1985. Studies on the Lpm system of mink allotypes in the context of Aleutian disease. Genetica (USSR), 21, 1896-1903.

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Yermolaev, V.I., M.R. Mullakandov, E.G. Mirtskhulava, S.M. Miroshnichenko, O.L. Serov & O.K. Baranov. 1988. Localization of the multigenic Lpm-locus on chromosome 9 of American mink. Genetica (USSR), 24, 922-927.

Reprints may be requested from: Bent Aasted, The Royal Veterinary and Agricultural University of Copenhagen, Department of Veterinary Virology and Immunology, Bülowsvej 13, DK 1870 Frederiksberg C, Denmark.

Immunogenetics of immunoglobulins of the American mink.
VI. Deviations from Mendelian segregation according to C-τ-allotypes H2, H3, and H4.

I.I. Fomicheva, O.K. Baranov.

Deviations from mendelian segregation according to American mink C-τ-allotypes H2, H3, and H4 are described in the article of the F_1 progeny of monohybrid test crosses. In some families a segregation of phenotypes of 0:1 was noted instead of the expected 1:1. Deviations from normal expression of the allotype in serum carry both a qualitative and quantitative character; they do not depend on direction of crossing, and they can disappear and appear again in subsequent generations. Sometimes an allotype is expressed in progeny which was not predicted according to genealogies. Instability of expression and inheritance in a considerable number of mink genealogies may mask allelic or linked interrelationships of these genetic markers.

Translated from: Genetika, 23, 8, 1491-1998, 1987. (Plenum Publishing Corporation, 1988. 0038-5409/87/2308-047).
In ENGL.
4 tables, 1 fig., 23 references.

Authors' summary.

New strategy for obtaining chromosome libraries based on the X-chromosome.

M.V. Lavrent'eva, M.I. Rivkin, A.G. Shilov, G.I. Karasik, A.A. Gradov, V.P. Kumarev, O.L. Serov.

The method was developed by cloning DNA from mink X Chinese hamster somatic hybrid cells. These contained a mink X-chromosome on a background of hamster chromosomes. The DNA library was screened using a labelled mink DNA probe in the presence of an excess of unlabelled DNA from cells lacking the mink X-chromosome. Using this method, 25% of the clones carrying X-chromosome DNA were detected.

Translated from: Doklady Akademii Nauk SSSR, 290, 4, 982-984, 1986.
(Plenum Publishing Corporation, 1987, 0012-4966/86/0910-0547).
In ENGL.
1 fig., 10 references.

Animal Breeding Abstr.

Silver fox gene mapping.
I. Assignment of eight silver fox genes and search for homologous regions on fox and human chromosomes.

N.B. Rubtsov, A.S. Graphodatsky, V.G. Matheeva, T.B. Nesterova, N.A. Kulbakina, S.M. Zakian.

Twenty-three silver fox - Chinese hamster somatic cell hybrids were analysed for the expression of fox enzyme loci and the segregation of fox chromosomes. This analysis made it possible to assign the gene PGD to chromosome 2, MDH2 to chromosome 3, NP to chromosome 10, APRT, ENO1, PGM1 to chromosome 12, MDH1 and IDH1 to chromosome 16. Possible use of the above-mentioned clone pannel for fox gene mapping is analysed. An attempt to reveal homologous regions on fox and human chromosomes was made by comparative analysis of prometaphase fox and human chromosomes containing the homologous genes. The means and perspectives of verification of the hypothesis proposed are discussed.

Genetika, USSR, 24,1, 69-79, 1988.
In RUSS. Su. ENGL.
2 tables, 3 figs., 22 references.

Authors' summary.

The amino acid sequence of serum amyloid A (SAA) protein in mink.

V. Syversen, K. Sletten, G. Harhaug, G. Husby, B. Lium.

The amino acid sequence of serum amyloid A (SAA) protein from mink was established by characterization of peptides derived from digestion of the protein with trypsin and from cleavage with BNPS-skatole. In three positions, two amino acid residues were found, showing that the protein is polymorphic. In

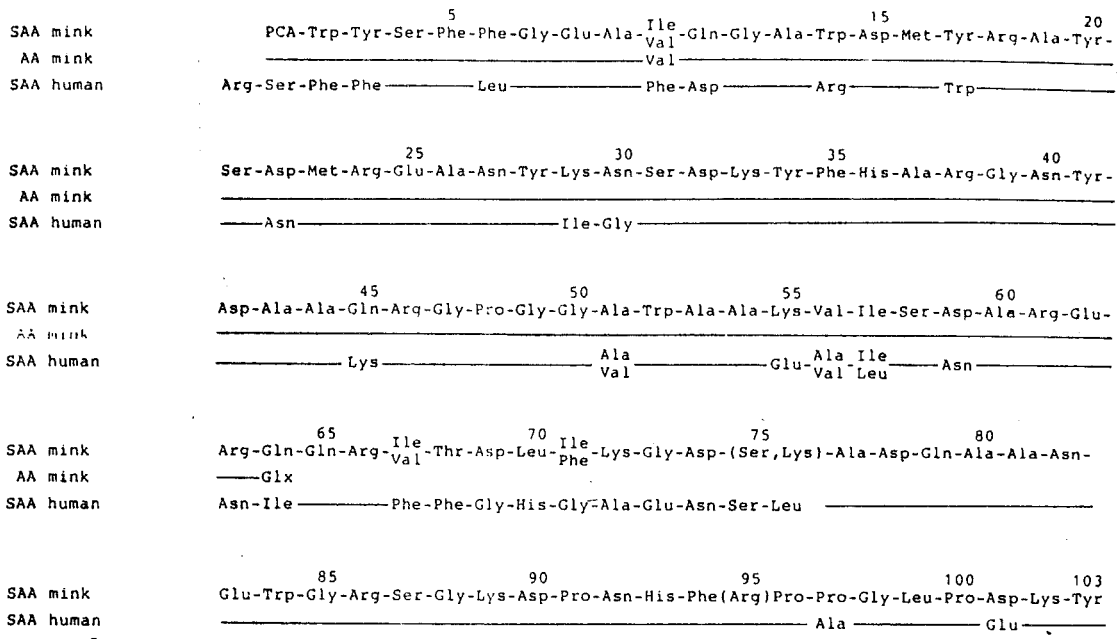


FIG. 1. Amino acid sequence of protein SAA from mink compared with the corresponding amyloid fibril protein AA and human protein SAA. Amino acid residues that differ from protein SAA from mink are shown. Human protein SAA is from Refs 14 and 17. PCA, pyrrolidone carboxylic acid.

position 10 both valine and isoleucine were found, while only valine was observed in protein AA. Prominent sequence homologies with protein SAA and protein AA from other species were seen, particularly corresponding to the segment between positions 31 and 54, but also in the C-terminal part of protein SAA, which is not shared by protein AA.

Scand. J. Immunol. 26, 6, 763-767, 1987.
2 tables, 1 fig., 21 references.

Authors' abstract.

Comparative cytogenetics of Chinese and Japanese raccoon dogs, Nyctereutes procyonoides.

O.G. Ward, D.H. Wurster-Hill, F.J. Ratty, Y. Song.

We investigated the relationships between subspecies of *Nyctereutes procyonoides* from China (2n = 54 + B Chromosomes) and Japan (2n = 38 + B chromosomes). The chromosomes of Chinese and Japanese raccoon dogs were compared by means of conventional staining, G- and C-banding, and silver nitrate staining of NORs Extensive G-banding homologies revealed karyotype evolution through chromosomal fusion. We believe the reduced diploid number in the Japanese raccoon dog was achieved by fusion of 16 acrocentrics to form eight metacentric and submetacentric elements. Ten pairs of autosomes appeared to be identical in these subspecies and were presumed to have occurred as auch in a common ancestor. G-band patterns of the sex chromosomes were similar in the two subspecies, but differences were noted with other banding and staining techniques. B chromosomes were present in varying numbers and sizes in all animals examined, but the morphology of the B chromosomes differed in the two subspecies. It was concluded from chromosomal an paleontological evidence that the two subspecies were derived from a common mainland ancestor and that the Japanese raccoon dog is a relatively recent form.

Cytogenet. Cell. Gent. 45, 177-186, 1987.
5 tables, 6 fig., 43 references.

Authors' abstract.

Studies on the inheritance of the centric fusion in the blue fox, Alopex lagopus.

M. Switonski.

The inheritance of a centric fusion in the blue fox, *Alopex lagopus* was investigated in 38 litters (258 animals) originated from matings of parents (64 animals) with all possible diploid number of chromosomes (2n = 50, 49 and 48). In general, the robertsonian translocation was inherited in accordance with the Mendelian principle. However, in the matings of females with 2n = 49 and males with 2n = 50 a significantly higher number of animals with 2n = 50 was observed in the progeny. Moreover, observations on two litters indicated the *de novo* occurrence of the centric fusion and fission.

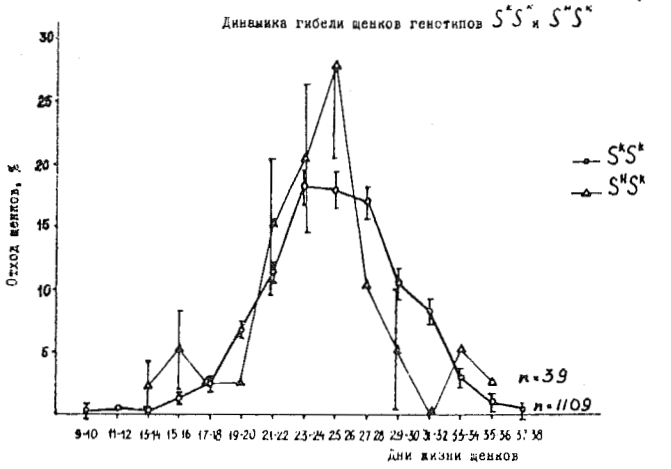
Genetika, 68, 1, 65-68, 1985.
In ENGL.
2 tables, 1 fig., 16 references.
Authors' abstract.

The effect of the gene for the Karelian colour on viability of compound genotypes containing SK SK and SH SK.

E.K. Matysko, G.M. Diveeva.

Spotted Karelian mink of the genotype SKSK (1109 animals) died within 9 to 40 days after birth. When Spotted Karelian mink were mated with Silverblue animals, the SHSK offspring (39 animals) died within the same time limits as the SKSK animals, whereas SHSH offspring die prenatally.

Рисунок



Nauch. Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 181-185, 1984.
In RUSS.
1 fig., 6 references.

CAB-abstract.

White spotting in zable.

E.G. Snytko, L.G. Utkin.

Data are tabulated on the incidence of white legs (40.8%), white tail (42.9%), white legs and tail (6.2%), white mouth, legs and tail (4.8%), white legs, tail and forehead (1.0%), and other combinations of white markings (0.7-1.0%) in 289 sables. For matings of animals with white legs, white legs with white tail, white legs with no markings, white tail with no markings, and of animals without markings (28, 8, 458, 389 and 16,582 offspring), the percentage of offspring with white markings was 35.7, 25.0, 12.7, 1.3 and 1.3 resp. For the offspring of males with white markings mated with females without markings, and of males without markings mated with females with markings, the percentage with markings was 8.6 and 6.2 resp. For animals with white legs, white tails, and white legs plus white tail, the percentage of animals without a white patch on the throat and chest was 7.0, 11.0 and 0 resp. Litter size of females with white markings averaged 2.10 vs. 3.37 for females without white markings.

Nauch. Trudy Nauchno-Issledovetal'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 128-131, 1984.
In RUSS.
5 tables, 7 references.

CAB-abstract

Coat characteristics in sable-type mink.

N.M. Tsepkov.

For 283 female and 320 male sable-type brown mink and 45 female and 59 male standard-haired brown mink, guard hair length averaged 29.6, 32.6, 23.7 and 26.0 mm resp., undercoat fibre length 19.6, 21.3, 13.2 and 14.2 mm, guard hair diameter

51.6, 53.9, 48.4 and 50.4 mum at the base and 133.9, 129.6, 134.5 and 138.7 mum at mid-length, undercoat diameter 12.5, 12.4, 11.6 and < <.9 mum, guard hair density per cm2 345, 241, 480 and 780, and undercoat density per cm2 16,717, 15,364, 20.750 and 18,000.

Nauchn.Trudy, Nauchno Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 3-7, 1984.
In RUSS.
4 tables, 2 references.

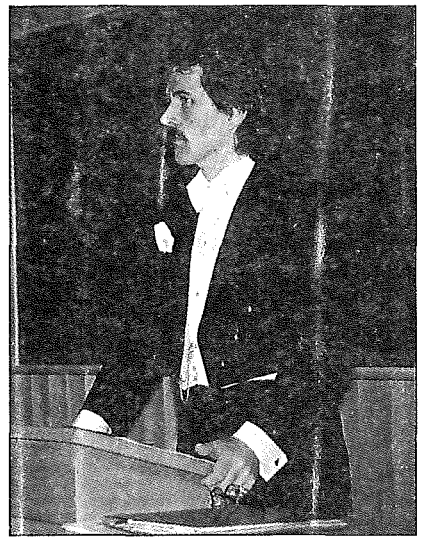
CAB-abstract.

New Doctor in the Family.

On the 21st of October 1988 Einar J. Einarsson defended his Dr. agric. - thesis "Selection for litter size in mink". The well known scientist, chairman of the Fur Animal Division of the Scandinavian Association of Agricultural Scientists, chairman of International Fur Animals Scientific Association (in foundation), General secretary of the Norwegian Poultry Association, etc. are now able to add the title of Dr. Agric. to his list.

Congratulations from your collagues and friends!

Gunnar Jørgensen.



Einar J. Einarsson forsvarte sin landbruksvitenskaplige doktorgrad ved Norges Landbrukshøyskole 21. oktober.

The work presented consists of five papers published in "Norwegian Journals of Agricultural Sciences" under the common heading "Selection for litter size in mink".

Selection for litter size in mink.
I. Background, analyses of the base population and design of the experiment.

Einar J. Einarsson.

In 1978, a selection experiment on litter size in dark mink was started at the experimental farm and lasted for six generations. In addition to the trait of selection, litter size at birth, the study included other reproductive traits, kit postweaning traits, body size and pelt characterics. Divergent selection, based on an index, was practised for high (H) and low (L) litter size at birth, while a randomly selected line was kept as a control (C). The general selection procedure is described together with analyses of traits from the base population. Predicted selection response per generation in litter size at birth was calculated at 0.12, -0.08 and 0.00 kits in the H-, L- and C-lines, respectively. The expected inbreeding per generation was calculated at about 1.1 percent in the selection lines and 0.7 percent in the C-line. The aim of the experiment was to observe how intensive divergent selection for litter size at birth affect trait itself and to determine correlated responses in other economically important traits.

Norw. J. Agric. Sci., 1, 131-153, 1988.
9 tables, 4 figs., 94 references.
Author's summary.

Selection for litter size in mink. II. Direct response in litter size at birth.

Einar J. Einarsson.

This paper presents the direct response from a six-generation selection experiment for litter size at birth in dark mink. A significant difference in litter size at birth was observed between the high and low lines during the last year of the experiment. The selection response in these two divergent selection lines, expressed as deviation from the control line, was asymmetric and though to be caused by instability in the control line. The cumulative effective selection differential in the last year was about -4 kits, 2 kits and 12 kits in the L-, C- and H-lines, respectively. The estimated realized heritability for litter size at birth was 0.11, which was underestimated because of the effects of inbreeding and natural selection. It is postulated that some developmental defect in the embryo and early kit life could affect the subsequent oogenesis, which could result in reduced reproductive capacity of the female.

Norw. J.Agric. Sci., 1, 155-178, 1988.
5 tables, 7 figs., 51 references.
Author's summary.

Selection for litter size in mink. III. Prepartum and preweaning observations.

Einar J. Einarsson.

The paper presents the correlated responses in prepartum and preweaning traits a six-generation selection experiment for litter size at birth in dark mink. In the last generation a significant difference of 1.07 kits at birth was observed between the two divergent selection lines. This difference favouring the line selected for increased litter size at birth, increased at later periods and was 1.37 kits at weaning per whelped female. Embryonic mortality and kit mortality were highest in the line selected for increased litter size at the beginning of the experiment but decreased to lowest in the last generation: the opposite effect was observed in the line selected for decreased litter size. Preweaning kit body weight was not significantly affected by the selection for litter size, but higher kit mortality was observed with low kit body weight, especially with low birth weight.

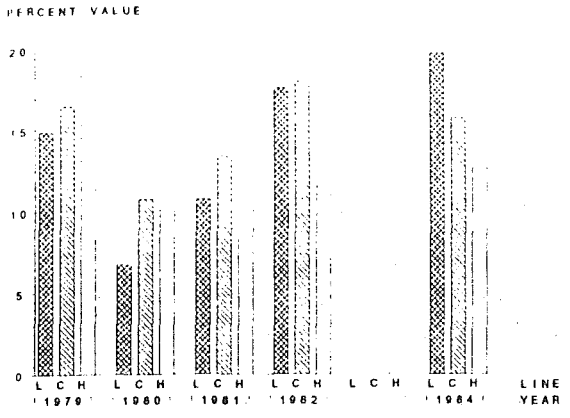


Figure 3. Prenatal mortality, calculated as the difference between the number of implantation zones and the total number of kits born to the autopsied females. This expresses the average prenatal mortality during the last 23 days of the pregnancy, approximately.

Norw. J. Agric. Sci., 1, 179-204, 1988.
12 tables, 5 figs., 49 references.
Author's summary.

Selection for litter size in mink. IV. Effect of postweaning growth and fur characteristics.

Einar J. Einarsson.

The correlated responses in postweaning growth of males and females and the fur characteristics of male skins are presented from a six generation selection experiment for litter size in dark mink. No general trend in body length, skin size or fur characteristics could be observed resulting from divergent selection for litter size at birth. However, during the last two generations, most of the fur traits favoured the line selected for increased litter size at birth, when the traits were expressed as deviations from the control line. In the last generation, significantly lower average body weight at pelting was observed in both males and females in the high line compared to the low line; 85 grams and 68 grams, respectively. A significantly lower average in hair quality and in general fur quality was observed

for male skins in the low line during the last generation. The length of both guard fur and underfur increased in all lines during the experiment, while body length at pelting decreased. Heritability and genetic correlations were estimated for the traits recorded.

Norw.J.Agric. Sci., 2, 1-20, 1988.
9 tables, 3 figs., 24 references.
Author's summary.

Selection for litter size in mink.
V. Development of applied selection index.

Einar J. Einarsson, L. Elofson.

A selection index for litter size in mink has been developed for applications in a selection programme. The selection index includes information for litter size at about three weeks postpartum based on defined relatives and is calculated separately for dam and sire. The pedigree index is half the sum of the parental indices and is standardized to a mean value of 100 with a standard deviation of 10. Adjustment to allow for systematic environmental factors are discussed.

The reliability for the index is calculated and the genetic gain by using the index is estimated at about 0.1 kits per year in commercial farming. By using the selection index for litter size in mink, farmers will be able to practise an effective between-litter selection for litter size, as one of the stages in the complete selection programme.

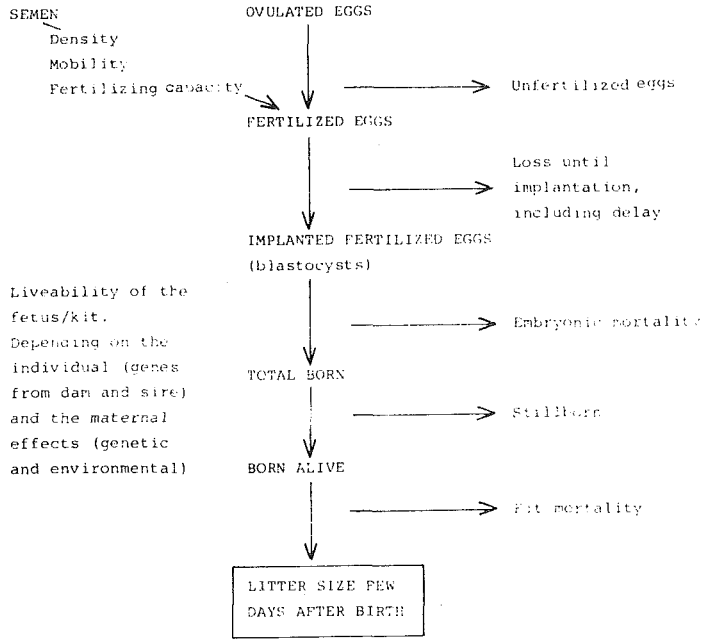
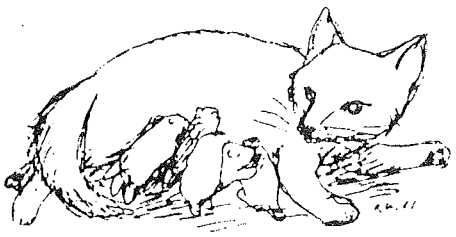


Fig. 1. Factors determing the litter size in mink.

Norw.J. Agric. Sci., 2, 21-37, 1988.
4 tables, 4 figs., 39 references.
Authors' summary.



REPRODUCTION

Reproductive physiology of the mink.

Ulla Lindquist

Mink are seasonal breeders with a breeding season from early March to late March - early April in the northern hemisphere. The reproductive cycle is related to day-light conditions.

Females can be mated at least twice during oestrus. Ovulation is induced by mating and the implantation of the blastulae is delayed. The length of gestation varies between 42 and 75 days due to the delay of implantation.

Female reproductive performance.
The reproductive performance is dependent on several factors. The most important factors are mating system, pre-mating live weight and condition, flushing and male fertility. Also the age of females affects litter size.

Mink diets may effect reproductive performance due to nutrient content, bacteriological quality and/or content of toxins and antimetabolites.

Reproductive performance can be improved by selection for litter size. Other factors involved in the reproductive performance of mink are the colour type, environment, animal health and the welfare of the animals.

Thus, to achieve a good reproductive result a thorough knowledge of the reproductive physiology of the mink and other mentioned factors affecting reproductive performance are of utmost importantance.

Seminarieuppsats No. 175, Sveriges Lantbruksuniversitet, Sweden, 1988.
In SWED. Su. ENGL.
1 fig., 48 references, 18 pp.

Author's summary.

Reproductive activity and some behavioural responses of sables in autumn and winter and during lactation.

S.V. Pavlynchenko, N.I. Kadinc.

628 females in the foundation population, 195 replacement females and 314 lactating females were classified for their relationship with attendants, and their defensive-/investigative response to a strange object. In all groups, females which had exhibited a balanced behavioural pattern without excesses of aggression or timidity averaged the highest percentage mated, the largest litters, and the largest number of pups produced in 3 yr. Phlegmatic females averaged the poorest results.

Nauch.Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Averovodstva i Krolikovodstva, 31, 135-141, 1984.
In RUSS.
2 tables, 6 figs.

CAB-abstract.

The possibility of wider use of polygamy for young mink males.

T.M. Demina.

Data were obtained on 135 males chosen for breeding on conformation and coat quality (traditional criteria), plus birth weight and condition of testes (additional criteria), and on 68 controls chosen only on the basis of conformation and coat quality. The experimental males were each allocated 7, 6 or 5 females, and the controls 5 females. For the 4 mating ratios resp., the percentage of males which recorded more than or equal to 15 matings was 100, 61, 42 and 15, and the percentage of males which did not mate 0, 0, 1 and 3; the number of females mated by each male averaged 7, 5.9, 5 and 2.9, the number of matings 19.7, 16.0, 13.4 and 10.0, the

percentage of females mated 100, 98.3, 100 and 76, the percentage of females whelping 82, 86, 86 and 81, litter size at birth 6.6, 6.6, 6.5 and 6.4 and litter size at weaning 4.9, 4.8, 4.9 and 3.7.

Nauch. Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 103-107, 1984.
In RUSS.
1 table, 5 references.
CAB-abstract.

The organization of mating in polecats.

G.P. Kazakova, N.I. Kunina, T.V. Barmotina.

For females (32 per group) which had been mated at the stage of max. reddening and swelling of the vulva, or when swelling and reddening was subsiding, the percentage not conceiving was 9.4 and 0 resp., and the percentage aborting 3.1 and 6.2. Pregnancy duration averaged 44.5 and 44.0, and litter size 9.1 and 10.2 at birth and 7.1 and 7.8 at weaning. For females mated once, twice during the same day or twice in 2 days, the percentage not conceiving was 66, 4 and 0 resp.; pregnancy duration averaged 42.0, 44.3 and 43.8 days, and litter size 10.0, 9.2 and 9.1 at birth and 2.9, 7.4 and 7.9 at weaning. For 824 females mated twice in 2 days, 128 females mated twice on 1 day, 6 females mated thrice (on the 1st, 2nd and 4th day of oestrus), and 29 females mated thrice (on the 1st, 2nd and 3rd days), pregnancy duration averaged 44.0, 44.3, 43.7 and 44.2 days resp., the percentage not conceiving was 2.7, 55, 0 and 0, the percentage aborting 2.9, 0.8, 0 and 0, and litter size averaged 10.4, 0.1, 9.3 and 9.9.

Nauch.Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 124-128, 1984.
In RUSS.
3 tables, 5 references.

CAB-abstract.

The prediction of reproductive ability of arctic foxes from the sex hormone ration.

T.G. Novikova, A.V. Sobol', G.A. Diveeva, V.N. Naumova.

The ratio of oestradiol to progesterone in the blood at the beginning of Sep. was determined over a 3-yr period for 17 females in the 1st yr, 57 females in the 2nd, and 28 females in the 3rd. The concentration of the 2 hormones averaged 63 and 683 pg/ml resp. for females whelping, and 49 and 152 pg/mg for those which did not whelp following mating in Feb. The largest litter size at weaning (7.7, 8.5 and 7.6 in the 3 yr) was obtained for females with an oestradiol:progesterone ratio of 1:5, 1:10, and the smallest (3.2 and 1.7 in the last 2 yr) for females with a ratio of 1:21 to 1:80.

Nauch.Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 94-98, 1984.
In RUSS.
1 table, 1 fig., 3 references.

CAB-abstract.

Effect of birth on plasma testosterone, brain aromatase activity, and hypothalamic estradiol in male and female ferrets.

M.S. Erskine, S.A. Tobet, M.J. Baum.

The present studies examined the patterns of circulating testosterone (T) within 0-24 h after birth in male and female ferrets along with concomitant changes in neural aromatase activity and hypothalamic concentrations of estradiol (E_2). Plasma and brain samples were obtained 0 and 2 h (cesarean delivery) or 0, 2, 12, and 24 h (natural delivery) after birth. Plasma T levels were significantly higher in male neonates 2 h after birth than at 0 h in both cesarean-delivered (9.48 +/- 1.25 vs. 3.37 +/- 0.60 ng/ml) and naturally delivered (19.28 +/- 2.94 vs. 5.13 +/- 1.93 ng/ml) ferrets, while female neonates showed no significant changes in T over these sampling times. T levels had returned to 0 h levels by 12 h in naturally delivered males. T was significantly lower in

females than in males 0, 2 and 24 h after natural delivery, whereas T levels were equivalent in males and females immediately after cesarean delivery. Male kits kept on a heating pad for 2 h after natural delivery had lower plasma T levels than males that were left with

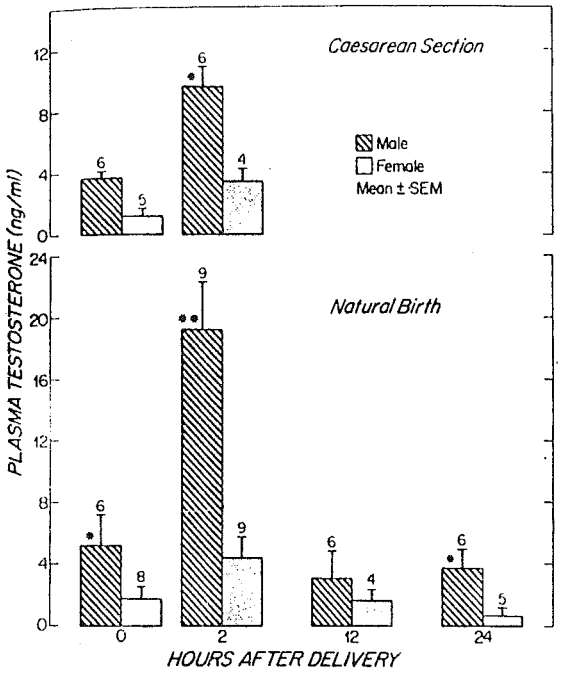


FIG. 1. Plasma T concentrations in male and female ferrets at indicated times after cesarean (*top panel*) and natural (*bottom panel*) delivery. The number of plasma pools contributing to each mean is indicated *above each bar*. *Asterisks* indicate a significant difference between sexes at a given sampling time. (*, $P < 0.05$; **, $P < 0.01$).

t heir mothers over this same period. Brain aromatase activity in anterior hypothalamus-preoptic area, medial basal hypothalamus (MBH), temporal lobe, and cerebral cortex was equivalent in males and females at all postpartum ages, regardless of whether delivery occurred by cesarean section or naturally. However, in naturally delivered kits of both sexes significant elevations in aromatase activity occurred in MBH and temporal lobe 24 h postpartum. Finally, E_2 concentrations in anterior hypohalamus-preoptic area and MBH were equivalent 0 and 2 h postpartum in males and females, regardless of whether they were delivered naturally or by cesarean section. The observed postnatal elevation in T may contribute to braian and behavioral sexual differentiation of male ferrets. It is unclear, however, whether such an effect of T depends on its neural aromatization to E_2.

Endocrinology, 122, 2, 524-530, 1988.
1 table, 3 figs., 26 references. *Authors' abstract.*

Use of equine chorionic gonadotrophin in female mink.

B.D. Murphy, D.B. Hunter, D.K. Onderka, J. Hazelwood.

This study was comprised to three trials to determine the effects of equine chorionic gonadotrophin (eCG) on induction of sexual receptivity in female mink that had failed to mate by late in the breeding season. In the first trial on ovary was removed from unmated mink, which were then injected with 100 IU eCG. This treatment induced ovarian activity, including ovulation in the remaining ovary. In the second experiment, mink that had not been observed to mate were treated with 100 IU eCG or saline, resulting in mating of 10/11 of the eCG-treated animals, compared to 5/11 controls. Litter sizes were larger in mink in the control group, suggesting that eCG infered with some phase of the reproductive process. In the third trial, 226 mink that had failed to mate until late in the breeding season were treated with 100 IU eCG. Of the 191 that subsequently mated, 99 produced litters, but litter sizes were reduced slightly from those observed in the remainder of the herd that bred without hormone treatment prior to March 20. Neonatal kit loss per female whelping was greater in mink treated with eCG. It is concluded that eCG treatment will induce mating in mink that refuse to mate, but this treatment results in reduced whelping success and greater neonatal kit loss. Its utility may be restricted to salvage situations where large numbers of mink fail to mate.

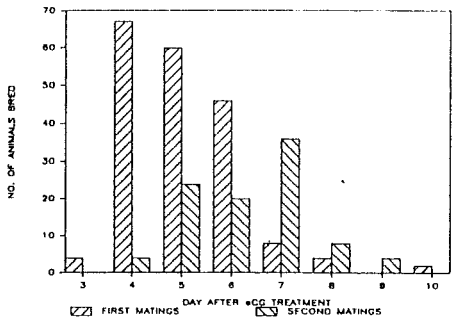


Figure 1. Mink bred following eCG treatment on March 20 (Day 0) and numbers of female mink remated during the next 10 d.

Theriogenology, 28, 5, 667-674. 1987.
3 tables, 1 fig., 16 references.
Authors' abstract.

The use of HCG in the stimulation of reproductive activity of young sable females.

V.G. Bernatskii, A.B. Kulikov.

107 one-yr-old females were each given 50 IU HCG after the 1st mating, and were remated at all subsequent oestrous periods during the breeding season. 107 controls were not treated, and were mated in the same way as the experimental group. For the 2 groups resp., the percentage of females whelping was 39 and 13, and litter size averaged 2.7 and 2.4 at birth and 0.9 and 0.3 at weaning, the differences between groups being significant.

Nauch.Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 107-112, 1984.
In RUSS.
2 tables, 7 references.

CAB-abstract.

Reproductive ability of mink in the year following treatment with HCG.

V.G. Bernatskii.

For 671 Socklot-Pastel females which had been treated with HCG during the previous breeding season to increase litter size, and for 113 controls which had not been treated with HCG, the percentage whelping in the current season was 91 and 88 resp., and litter size averaged 6.2 and 6.1 at birth and 5.5 and 5.3 at weaning. For 285 females which had been treated with HCG during 2 consecutive breeding seasons, and for 121 untreated controls, litter size averaged 7.0 and 6.6 resp. at birth and 6.2 and 6.2 at weaning in the 1st yr, and 6.6 and 6.8 at birth and 5.6 and 5.5 t weaning in the 2nd yr.

Nauch.Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, No. 31, 112-115, 1984.
In RUSS.
3 tables, 2 references.

CAB-abstract.

Influence of selection for behavior and early embryonic development of silver-black foxes.

D.K. Belyaev, G.K. Isakova, L.N. Trut.

36 domesticated female silver foxes (i.e. selected for approx. 25 generations for tameness) and unselected female silver foxes from a commerial population were killed 6 or 7 days after mating, and the preimplantation embryos were recovered. The number of cells in recovered embryos and the percentage of embryos found in the uterine horns averaged 27.7 plus or minus 4.0 and 63.3 resp. in domesticated females killed 6 days after mating, 15.7 plus or minus 2.6 and 18.8 in unselected females killed after 6 days, 46.2 plus or minus 5.5 and 85.7 in domesticated females killed after 7 days, and 29.3 plus of minus 3.9 and 62.5 in unselected females killed after 7 days. Domestication and days after mating did not significantly affect the percentage of embryos at each stage of early embryogenesis.

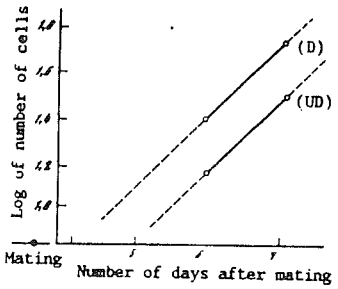


Fig. 1. Increase in number of cells in embryos of undomesticated (UD) and domesticated (D) foxes between sixth and seventh days after mating.

Doklady Biological Sciences, 290, 1-6, 565-567, 1987.
(Translation from Russian). In ENGL.
1 table, 1 fig., 3 references.

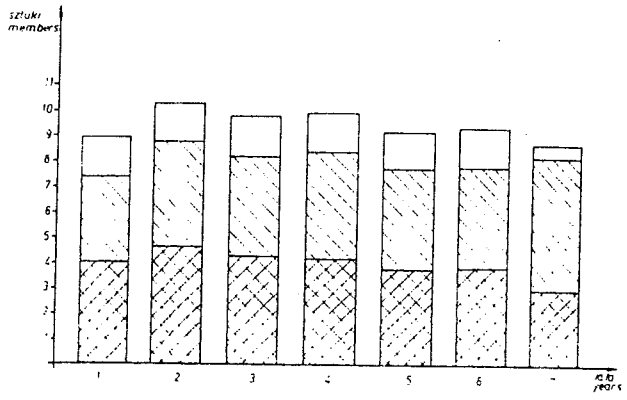
Animal Breeding Abstract

The dependence of size of litters and proportions of sex of blue polar fox offspring upon the age of females.

Janusz Kuzniewicz.

The studies on dependence of size of

litters and proportions of sex upon the age of females have been carried out in the farm of furred animals in Pietrzykowice. The observations conducted in three years from 1979 to 1981 covered 1,030 litters, which gave 9,730 born and 8,090 pups. In the studies there are considered year of utilization of females, number of born and reared pups, numbers of females and males in the litters.



Rys. 1. Średnia liczba szczeniąt w miocie w zależności od wieku matki

Fig. 1. Mean number of puppies in a litter depending on the age of mather

It has been found, that age of females has significant influence on size and on sex ratio of litters.

Zeszyty Naukove Akademii Rolniczej we Wroclawiu Zootechnika, 162 (Zootechnika 29) 169-176, 1986.
In POLH. Su. ENGL.
3 tables, 2 figs., 8 references.

Author's summary.

Changes in endometrial vascular permeability during the periimplantation period in the ferret (Mustela putorius).

R.A. Mead, S. Bremner, B.D. Murphy.

A highly localized increase in permeability of uterine blood vessels in the immediate vicinity of implanting blastocysts was first detected on the morning of the 12 day of pregnancy (290 h post coitum). The amount of extravasated dye which accumulated implantation sites continued to increase through the evening of Day 13 (321 h *p.c.*). Blastocyst expansion, as indicated by small uterine swellings, preceded a detectable change in vascular permeability by about 10 h, suggesting that the timing of increased permeability is closely associated with initial blastocyst attachment to the uterine epithelium.

The results do not support the hypothesis that prostaglandins are required for increased uterine vascular permeability as two doses of indomethacin (4 and 8 mg/kg body wt) administered 5 times/day failed to decrease endometrial vascular permeability. However, the 8 mg dose did cause a significant reduction in size and number of uterine swellings and delayed or inhibited attachment of the trophoblast to the uterine epithelium in 2 of 5 ferrets. These findings suggest that prostaglandins play an important role in the process of implantation that is unrelated to decidual formation as the ferrets is an adeciduate species.

J. Reprod., 82, 293-298, 1988.
32 references.

Authors' summary.

Evaluation of reproductive performance of male blue polar foxes on Wiartel Farm.

Luboslawa Nowaczyk, Henryka Bernacka.

550 male blue polar foxes were tested on the Wiartel Farm over the years 1975-1980. Length of the copulation season, number of matings in the season related with the males age breeding efficiency, males reproductive value and litter sizes of the cubs born depending on the males age were analysed. The mating period averaged 13-18 days, the breeding efficiency index was the highest in the first three years of use (0.912-0.944) and the reproductive value index showed an increase

up to the fourth year of use (29.64-35.01). Amid the whole group of the individuals examined, 20% of them (fifth year of use) and 42.5% (fourth year of use) served 6 times in the season. The most numerous litters were obtained from one-year-old males and 2-7 years of age females (10 specimen) and from two-year-old males and 2-7 years of age females (10.4 specimen).

Akademia Techniczno-Rolnicza, Bydgoszczy, No. 151, Zootechnika, 16, 1988.
In POLH. Su. ENGL, RUSS.
4 tables, 10 references.

Authors' summary.

The normal breeding season and gestation period of martens.

Frank G. Ashbrook, Karl B. Hanson.

The normal breeding season in martens occurs during the summer months, usually between the middle of July and the third week in August, and not during the winter months.

From these experiments it has been definitely determined that the gestation period ranges from approximately 8 1/2 to 9 months (259 to 275 days), instead of 60 to 102 days as has been heretofore generally accepted to be the case.

Washington, D.C., U.S. Dept. of Agriculture, Circular no. 107, 1930.
6 pp.

Authors' summary.

Reproductive effort in the red fox, Vulpes vulpes, and future supply of a fluctuating prey.

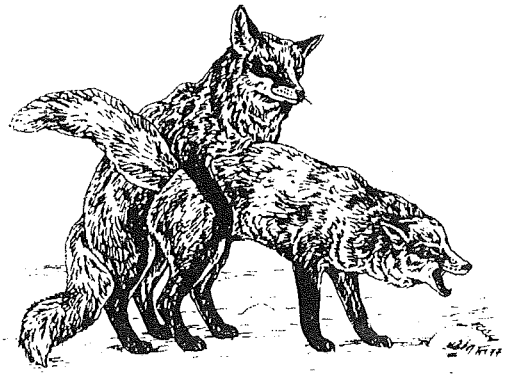
Erik Lindström.

The red fox *Vulpes vulpes L.* in boreal Sweden is for several reasons likely to exhibit adaptive adjustment of reproductive effort to future abundance of prey. Mean litter size at birth in late April is adjusted to ambient vole (food) supply through variations in ovulation rate two months earlier. Yearly ovulation rate correlates better with vole supply at the birth of young than with average vole supply during winter, amount of voles ingested during January-March or condition of females during the same period. Hence, foxes seem to be able to anticipate future food supply. I discuss three explanations for this trait: 1) an inherited knowledge of the normal vole cycle, 2) a capacity to detect the direction of change in the availability of voles irrespective of the absolute level; and 3) a reaction to the presence of reproducing voles in winter during increase years. For different reasons I find the third explanation the most likely; either as an adaptation to smell and taste of the voles or as a physiological by-product of the gonadotropic hormones provided by the ingested voles.

OIKOS, 52, 115-119, 1988.
4 tables, 2 figs., 25 references.

Author's summary.

CAB-abstract.



Original report

Preliminary studies on lysozyme utilization in mink nutrition.

Franco Valfre, Nicola Giovanni Lacetera**, Andrea Verinisupplizi**, Camillo Pieramati**, Alessandro Iacozzilli**.*

* *Institutu di Zootechnia Generale, Facolta di Medicina Veterinaria, Via Celoria 10, 20122 Milano, Italy.*
** *Instituto di Produzioni Animali, Facolta di Medicina Veterinaria, Via S. Costanzo 4, 06100 Perugia, Italy.*

Summary.

The authors examine the effects of 25 mg/head/day of lysozyme added to the Dark mink female standard diet on some reproductive parameters.

The comparison with a control group fed without lysozyme shows significant differences ($p < 0.1$) in favour of the treated group for the wean/born ratio.

A sample of newborn minks from the two groups of females were weighed at weaning time. The statistical analysis showed weight significant differences ($p < 0.0002$) in favour of minks born within the experimental group, compared to the control group. The increased body weight of minks born of treated females is preserved until the slaughtering, disregarding lysozyme integration in the post-weaning diet.

Key words: lysozyme, mink, nutrition, reproduction.

Introduction.

Many studies have shown how several stressing factors, as unsuitable temperatures, food deficiency or excess, insufficient water supply, over-crowding, life in captivity, disturbing noises, etc., can induce disreactivity towards different sorts of diseases (*Kelley, 1980*).

Bearing in mind that genetic factors can play an important role in this context we have to consider that the effects of stressing agents are not always quantifyable; in fact, there could be different interactions among the stressing agents themselves and between the stressing agents and other such as genotype and pathogen agents (*Hamori, 1983; Gershwin et al., 1965*).

The effects of deficient diets on animal performances have been widely studied (*Nathan et al., 1977; Phillips and Baetz, 1981*), whereas the effects of some excessive nutrient contents and the role played by natural substances added to the feed but not naturally present or present only in small quantitites are not yet very clear (*Tengerdy and Nockels, 1975; Chang et al., 1974*).

Considering that infectious and parasitic diseases represent the main cause of mink mortality especially from birth to the weaning period (*Kukla and Dohnalova, 1975*), and that minks are highly susceptible

to stressing agents, we tried to verify the effects of lysozyme (polypetide with hydrolasic activity) (*Barbara and Pellegrini, 1975*) on female reproductive activity and offspring growth.

Materials and Methods.

The experiment was carried out on 1202 Dark mink females, 593 of which were treated thorughout pregnancy with 25 mg/head/day of lysozyme mixed with feed. The diet was mainly composed of slaughterhouse offal, fish, cereals, vitamins and minerals, and balanced according to N.R.C. (1982).

Recorded the number of newborns and weaned for each females, we made a statistical analysis using the X^2 test.

At weaning time 884 animals were weighed, of which 454 born of 100 treated females and 430 born of 100 untreated females, randomly chosen among broods.

All the 884 animals were divided into 4 groups as follows: 227 minks born of treated females and 215 born of untreated females were fed with a mixture containing lysozyme (25 mg/head/day), while the other minks, of which 227 born of treated females and 215 born of untreated ones, were fed with a mixture without lysozyme. Before slaughtering all the animals were individually weighted.

The weights at weaning and slaughtering time were analyzed using the following models (the interactions, resulted not significant and have therefore been omitted):

$$1) \quad y_{ijk} = \mu + \alpha + \beta_j + \Sigma_{ijk}$$

where y_{ijk} = weight at weaning, μ = mean,

α_i = sex, β_j = female treatment, and Σ_{ijk} = error;

$$2) \quad y_{ijkl} = \mu = \alpha_i + \beta_j + \tau_k + \Sigma_{ijkl}$$

where y_{ijkl} = weight at slaugtering, μ = mean, α_i = sex, β_j = offspring treatment, τ_k = female treatment and $\Sigma_{ijk}l$ = error.

Results.

In tables 1, 2 and 3, respectively, are reported the relative results of reproductive performances, weight at weaning and at slaughtering. The weaned/born ratio was positively affected by lysozyme treatment of the females ($p < 0.1$) (tab. 1).

Significant differences were also observed at weaning time, where the weight of mink born of treated females resulted higher ($p < 0.0002$) (tab. 2).

Table 3 shows the weights at slaughtering: significant differences exist between the minks born of treated females and the ones born of untreated females in favour of the first ones ($p < 0.0027$), regardless the offspring treatment. Disregarding the mother treatment significant differences between treated and untreated offspring weight have been not observed. Obviously males resulted heavier than females at all weighing times.

Discussion.

During the first 4-5 days of the minks life, the estimated mortality rate was around 12-66%, and it was principally due to offspring constitutional deficiences and milk dearth from mother (*Mühl and Löliger, 1978*).

The mortality rate from birth to weaning was around 5.7-25% and it was principally due to traumas (3-16%), cannibalism (9-36%), unblanced diets (7-13%) and diseases (5-53%) (*Kukla and Dohnalova, 1975*). On the basis of our experimental results, we can say that lysozyme integration to the diet of Dark mink pregnant females reduces mortality during suckling period and promotes offspring growth.

This could be explained with an increased milk nutritive value, with a better feed conversion possibly due to microbic flora modulation, with reduction of cannibalism events and with the antibacterial and antivirotic properties of lysozyme. Potentially all these effects could have a very important and precise role in achieving these results (*Rosenthal and Lieberman, 1931; Ferlazzo et al., 1959; Schwarz Tiene, 1959; Sereni and De Ritis, 1959; Shahani*

Table 1. Number of born and weaned minks and born/weaned ratio.

	females	borns	weaneds	weaneds/borns
Lyzozyme	593	2920	2609	0.893
Control	609	3111	2650	0.852
Differences		n.s.	n.s.	P<0.1
Total	1202	6031	5259	0.872

Table 2. Mink weight (g) at weaning.

	R^2 of model = 0.7191 $\mu \pm o$	Significance level
Males	1172.49 ± 5.92	P < 0.00005
Females	771.89 ± 5.71	
untrated females	956.91 ± 5.76	P < 0.0002
treated females	987.44 ± 5.87	

Table 3: Mink weight (g) at slaugthering.

	R^2 of model = 0.8785 $\mu \pm o$	Significance level
Males	2087.80 ± 19.36	P < 0.00005
Females	1010.30 ± 18.54	
untreated females	1492.79 ± 19.00	P < 0.0027
treated females	1574.31 ± 18.90	
untreated newborns	1523.81 ± 18.82	P < 0.04682
treated newborns	1543.29 ± 19.09	

et al., 1962; Chandan et al., 1964; Deragna and Cocciate, 1964).

Acknowledgements.

The authors acknowledge the generous gifts of lysozyme from Prodotti Antibiotici S.p.A. (Milan-Italy) and Dr. Ernani Dell-'Acqua for his expert technical assistance. The language of the manuscript was kindly checked by Miss Ilaria Capua.

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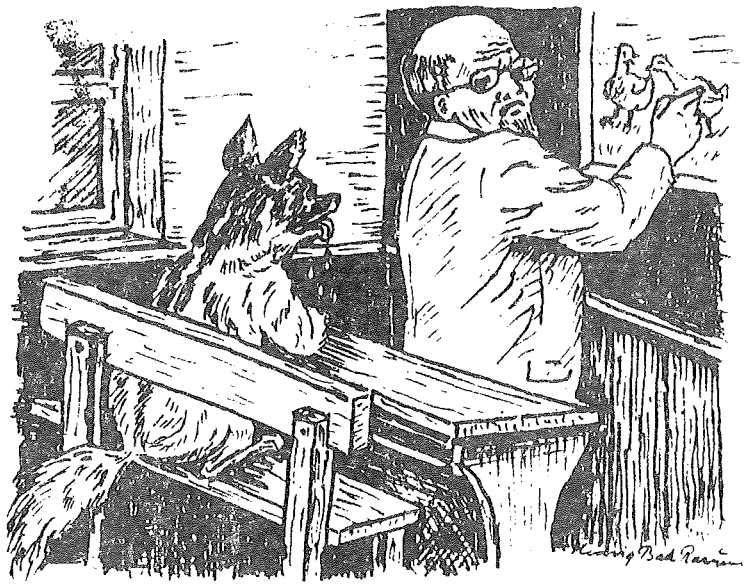

Energy metabolism of mustela vison during pregnancy and lactation.

Peichao Wang, Louji Lu, Wenlang Zhao.

1. The paper reports determining of the energy requirements during the pregnancy (0-48 days) and lactation (0-30 days) in minks, *Mustela vison.*

2. The caloric values of the daily food consumption and daily feces excretion samples of female minks were determined in calorimetric bomb.

3. The resting respiratory consumed energy of the female minks was measured under a simple closed system respirometer at 22 +/- 0.5 ^{o}C of ambient temperature.

4. Daily food consumption quantum (dry weight) and value of ingested energy of the female minks average 49.6506 +/- 5.2614 g/ind./day and 256.9105 +/- 30.2469 Kcal-/ind./day during pregnancy, being higher by 8.03% ($P<0.001$) and 11.70% ($P<0.001$) respectively, as compared with those of the non-reproductive female minks.

5. During lactation, daily food consumption and ingestion energy exhibited three time phases: 1) a poor appetite and level of minimizing ingestion for female minks during 0-9 days after parturition; 2) a revival appetite and ingestion energy growing back to level of nonreproducing female during 10-15 days after parturition; 3) a good appetite and maximizing level of ingestion energy from 15 to 30 days after parturition.

6. The resting respiratory energy of the female minks average 98.3594 +/-26.5087 Kcal/ind./day during lactation, and they are 49.29 ($P<0.001$) and 78.73% ($P<0.001$) higher respectively, as compared with those of the nonreproducing female minks.

The resting respiratory energy of the female minks exhibited the positive correlation with both body weight and duration of pregnancy and the latter is probably the most important controlling factor. And during lactation the resting respiratory energy showed the negative correlation with duration of lactation and it showed a positive correlation with body weight.

7. The body weight of female minks during reproduction period exhibited two time phases, viz, the body weights is of the positive correlation with growth of pregnancy time (days), and of the negative with growth of lactation.

8. The body weight of female minks during reproduction period changed with the balance of daily energy, viz, when assimilating is over expenditure energy resulting in growth of total weight, and conversely, decreasing.

Acta Theriologica Sinica, 8, 2, 39-145, 1988.
In CHIN. Su. ENGL.
Only abstract received.

Authors' abstract.

Voluntary regulation of energy balance in farmed raccoon dogs.

Hannu Korhonen.

1. Seasonal changes in body mass and voluntary feed intake were studied in juvenile raccoon dogs (*Nyctereutes procyonoides,* Gray 1834) under farm conditions.

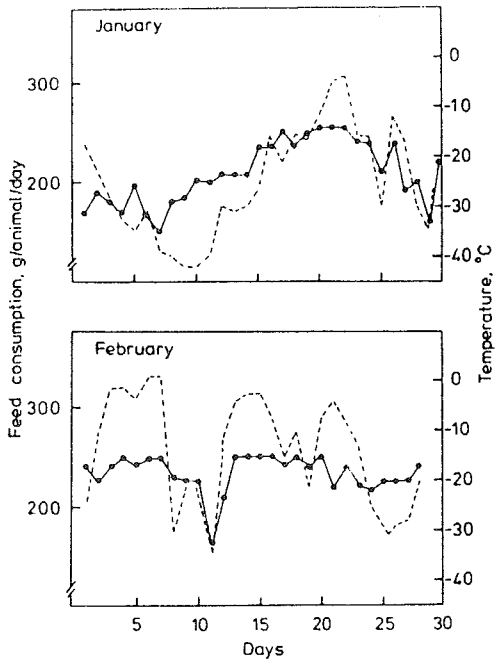

Fig. 3. Voluntary feed intake of raccoon dogs during winter. Values are given as mean ± SD. Broken line indicates mean ambient air temperature at noon.

2. The body weight maximum was achieved in mid-November. Thereafter, body weight gradually declined towards summer. This pattern was closely connected to voluntary regulation of feed consumption. During autumn, appetite of the animals was good enhanching gradual deposition of excessive fat reserves.

3. Excessive adiposity itself, together with factors like shortening daylength and decreasing air temperature, seemed to play as a trigger for starting of winter rest.

4. The results support the endogenic nature of energy balance regulation.

Comp. Biochem. Physiol., Vol. 89A, 2, 219-222, 1988.
3 figs., 22 references.

Author's abstract.

Slaughterhouse by-products preserved by Lactobacillus plantarum fermentation as feed for mink and foxes.

Anders Skrede, Ingolf F. Nes.

Lactic acid fermentation was evaluated as a method to preserve abattoir waste for use in fur animal diets. The method used involved grinding, acidifying to pH 5-5.2 by formic acid and propionic acid, addition of 6% molasses as a carbohydrate source and a starter culture of *Lactobacillus plantarum*. Fermentation was completed after 2-3 days at 25 °C. The final pH of the fermented product was 3.8-4.1.

Storage experiments revealed satisfactory stability. The fermented products could be kept for weeks at room temperature (20 °C) and for months in a cold room (4 °C).

The amino acid composition of the 4 types of abattoir waste tested was not significantly changed by fementation. Digestibility studies with mink revealed slight, but significant ($P < 0.05$), effects of fermentation. The digestibility of cystine and threonine was reduced and that of glycine and proline increased.

Two types of fermented abattoir waste were investigated in 2 long-term feeding experiments with mink and blue foxes. In the trial, diets with 10 or 20% fermented abattoir waste supported normal reproduction, kit mortality and body growth. In one experiment, there was a significant reduction in mink kit body weights with 20%, but not with 10% fermented abattoir waste in the diet. In the fox trial, litter size and kit viability tented to improve with 20% fermented abattoir waste, while kit body weights were unaffected. It is concluded that fermentation could be an acceptable process for the preservation of abattoir waste intented for the feeding of fur animals.

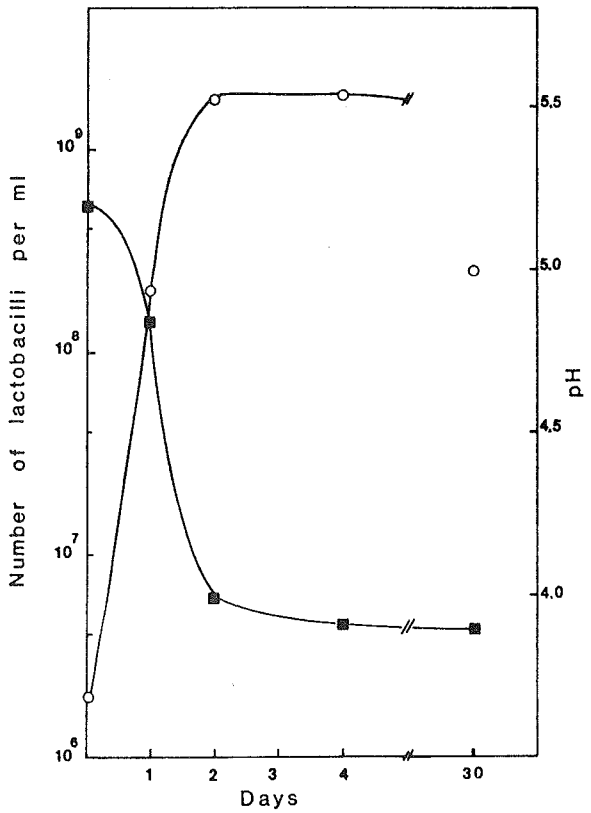

Fig. 2. Growth of *Lactobacillus plantarum* (O—O) and the development of pH (■—■) in fer- mented abattoir waste.

Animal Feed Sci. and Techn., 20, 287-298, 1988.
8 tables, 3 figs., 13 references.

Authors' abstract.

The biomass of hydrogen-oxidizing bacteria in food rations for mink.

D.N. Perel'dik.

42 pastel females were given rations containing microbial biomass as a substitute for 20% of animal protein, and 74 control females were given rations containing only protein of animal origin. For the 2 groups resp., the percentage whelping was 88 and 77, and litter size averaged 5.7 and 6.1 at birth and 4.4 and 4.4 at weaning. When similar rations were given to young females (39 and 38 in the 2 groups), the percentage whelping was 77 and 82 resp., and litter size averaged 5.6 and 5.8 at birth and 3.4 and 4.4 at weaning. The females from these litters were reared on rations similar to those for their parents, and for these females, the percentage whelping was 72 and 72, and litter size averaged 6.1 and 6.4 at birth and 3.7 and 4.4 at weaning.

Nauch.Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 67-75, 1984.
In RUSS.
7 tables, 3 references.

CAB-abstract.

Reproduction of nutria and the quality of their skins when fed on pelleted feed without animal protein.

V.F. Kladovshchikov, L.S. Verevkina.

Data were obtained on animals (46 males and 60 females per group) given a diet without animal protein but containing yeast, or with animal protein but without yeast. The content of crude protein in the 2 types of diet was 14.1 and 18.7% resp., and the content of digestible protein was 10.6 and 14.0. For the 2 types of diet, the conception rate was 64 and 69 resp., the number of females whelping as a percentage of those pregnant 78 and 77, litter size averaged 6.5 and 6.0, survival of the young to weaning was 92 and 93%, and the production of young per female mated averaged 2.5 and 2.6.

Nauch.Trudy, Nauchno-Issledovatel'skii Inst. Pushnogo Zverovodstva i Krolikovodstva, 31, 20-27, 1984.
In RUSS.
3 tables, 2 references.

CAB-abstract.

Food intake and struvite crystalluria in ferrets.

W.P. Palmore, K.D. Bartos.

Four adult, castrated, male ferrets were studied in two similar trials for effects of food intake on variables hypothesized to promote struvite (ammonium, magnesium, phosphate hexahydrate) crystal formation in urine. Struvite crystalluria occurred in three of the four ferrets. Urine pH (UpH) averaged 6.6 for these ferrets. UpH in the ferret without crystalluria was 6.0. By simple linear regression analysis, no relationship was found between the amount of food ingested and the urinary concentration and excretion of magnesium and phosphorus. However, urine osmolality and excretion of both protein and ammonium were correlated to food intake ($P < .05$). Ways in which these effects could promote struvite crystal formation are discussed.

Vet. Res. Comm., 11, 6, 519-526, 1987.
1 fig. 25 references.

Authors' abstract.

Use of propylene glycol, glycerol and sorbitol in feeding of mink.

A.P. Maksimov, M.B. Nikolaevskii.

For 60 days albino rats were fed freely on mink diet supplemented with pure propylene glycol (PG) at 0.0, 2.5, 5.0, 7.5 or 10.0% by weight. The rats given PG drank more water and gained weight faster than did the controls. The body weight at the end of feeding was 149, 185, 203, 215 and 251 g. At death histological examination indicated an adverse effect of PG on organs. In another trial lasting for 45 days, mink were in 5 groups and fed on a diet containing various amounts of a mixture of 50% PG, 35% glycerol and 15% sorbitol at 0.0, 2.5, 5.0,

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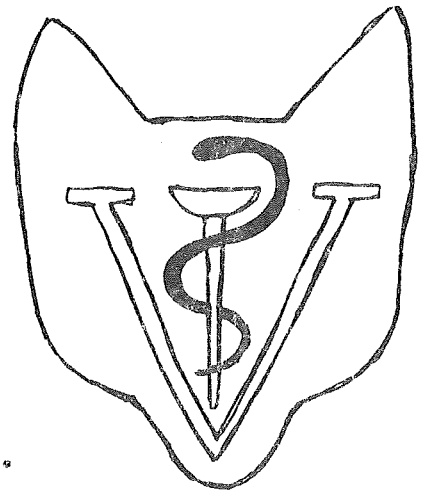


Studies on the sarcocyst morphology and life cycles of six species of sarcocystis from reindeer (Rangifer tarandus tarandus).

Bjørn Kåre Gjerde.

*The thesis are based on the following reports of which *-marked have been abstracted in SCIENTIFUR.*

Paper 1. The domestic reindeer (Rangifer tarandus) from northern Norway as intermediate host for three species of Sarcocystis.

Paper 2. A light microscopic comparison of the cysts of four species of Sarcocystis infecting the domestic reindeer (Rangifer tarandus tarandus) in northern Norway.

Paper 3. Sarcocystis infection in wild reindeer (Rangifer tarandus) from Hardangervidda in southern Norway: With a description of the cysts of Sarcocystis hardangeri n. sp.

Paper 4. The fox as definite host
* for Sarcocystis sp. Gjerde 1984 from skeletal muscle of reindeer (Rangifer tarandus. With a proposal for Sarcocystis tarandivulpes n. sp. as replacement name.
(Scientifur Vol. 9. No.4)

Paper 5. Sarcocystis hardangeri and Sarcosystis rangi n. sp. from the domestic reindeer (Rangifer tarandus) in northern Norway.

Paper 6. The raccoon dog (Nyctereutes
* procyonoides) as definitive host for Sarcocystis spp. of reindeer Rangifer tarandus.
(Scientifur, Vol. 10, No.1).

Paper 7. The fox as a definitive host
* for Sarcocystis rangi from reindeer (Rangifer tarandus tarandus).
(Scientifur, Vol. 10, No.4).

Paper 8. Ultrastructure of the cysts of sarcocystis grueneri from cardiac muscle of reindeer (Rangifer tarandus tarandus).

Paper 9. Ultrastructure of the cysts of Sarcocystis tarandivulpes from skeletal muscle of reindeer (Rangifer tarandus tarandus).

Paper 10. Ultrastructure of the cysts of Sarcocystis rangiferi from skeletal muscle of reindeer (Rangifer tarandus tarandus).

Paper 11. Ultrastructure of the cysts of Sarcocystis hardangeri from skeletal muscle of reindeer (Rangifer tarandus tarandus).

Paper 12. Ultrastructure of the cysts of Sarcocystis tarandi from skeletal muscle of reindeer (Rangifer tarandus tarandus).

Paper 13. Ultrastructure of the cysts of Sarcocystis rangi from skeletal muscle of reindeer (Rangifer tarandus tarandus).

Paper 14. Scanning electron microscopy of the sarcocysts of six species of Sarcocystis from reindeer (Rangifer tarandus tarandus).

Thesis, Div. of Parasitology, Dept. of Internal Med. I, Norwegian College of Vet. Medicine, Oslo; Norway, 1985.

Review of the papers consist of 15 papers and 24 references.

Hosts of two Canid genera, the red fox and the dog, as alternate vectors in the transmission of Sarcocystis tenella from sheep.

G.E. Ford.

Miscroscopic sarcocysts recovered from naturally infected sheep were infective to both the domestic dog (*Canis familiaris*) and the red fox (*Vulpes vulpes*). The parasite was passaged through experimental specific-parasite-free (SPF) sheep three times: infection was transmitted twice with sporocysts from foxes and subsequently with sporocysts from dogs. The sarcosysts from sheep muscle were infective to both dogs and foxes on each occasion. A cat was not infected. The prepatent period in individual canids ranged from 7 to 15 days. Sporocysts excretion was still detectable 60 days post infection. This study establishes that canids of two genera may act as vectors for a single isolate of the same *Sarcocystis* species from sheep.

Vet. Parasitology, 26, 13-20, 1987.
1 fig., 23 references.

Author's abstract.

Treatment of Sarcoptic mange in farmed foxes with Invermectin.

J. Mouka, B. Hartmannova, J. Konrad.

Three groups of 5, 7 and 10 white or blue arctic foxes of both sexes kept on 3 fur farms received Ivermectin solution subcutaneously at 0.2 ml/kg of body weight against Sarcoptic or Otodectic mange. Microscopic examination confirmed the clinical diagnosis before treatment. All animals present on each farm were treated. The treatment of Sarcoptic mange was fully effective, no mites being found when foxes were examined clinically and microscopically 10, 20 and 30 days after treatment. The treatment of Otodectic mange was less effective, because ear mites were found after treatment twice in one group and once in another group. No doubt the ear mites were out of contact with body fluids, as they live only on the surface of the ear canal. One fox with advanced Otodectic mange in group 3 died. Pregnant females treated in group 1 showed no complications and delivered healthy pups. In groups 2 and 3 mange occurred again 3 months later, because of incomplete disinfection.

Veterinarstvi, 37, 3, 127-129, 1987.
In CZEC.
1 table, 2 figs.

CAB-abstract.

Pedal Sarcoptes scabiei infestation in ferrets (Mustela putorius furo).

P.H. Phillips, M.G. O'Callaghan, E. Moore.

Information is given on the clinical symptoms and treatment of multiple infestations of Sarcoptes scabiei on the feet of ferrets in South Australia during 1984. Treatment consisted of weekly washes with Maldison (malathion) for 3 weeks and twice daily applications of benzene hexachloride (HCH) ointment for the same period. No toxic side effects were noticed.

Australian Vet. Journ., 64, 9, 289-290, 1987.
1 fig., 1 reference.

CAB-abstract.

Sarcoptic and otodectic mange i red foxes.

M.V. Shustrova.

Simultaneous infestation with Sarcoptes scabiei and Otodectes cynotis was diagnosed in 18 red foxes on a "hunting farm" in the Leningrad region. Half of the foxes were treated with aerosol of "Psoroptol", and half with a 0.3% aqueous solution of Dursban (chlorpyrifos) repeated at 10-day intervals for 2 months. The treated foxes recovered and no further case was seen.

Veterinarya, Moscow, USSR, 6, 40, 1987.
In RUSS.

CAB-abstract.

Detection of Aleutian Disease Virus DNA in tissues of naturally infected mink.

L. Haas, M. Löchelt, Oskar-Rüger Kaaden.

Organs of naturally infected mink were examind for presence of Aleutian disease virus (ADV) DNA by *in situ* hybridization. Spleen, lymph nodes, thymus, bone marrow, kidney, liver, lung and small intestine were found to be positive for ADV to different extents. Infected lymphoid organs showed a focal distribution of pospositive cells. Southern blot analysis of DNA extracted from infected organs revealed replicative forms of viral DNA in spleen and bone marrow samples only. These findings are consistent with a lymphotropism of ADV *in vivo*. Compared to the situation after exprimental infection of mink these results indicate additional sites of virus replication and/or persistence of the naturally occurring disease.

J. Gen. Virol. 69, 705-710, 1988.
1 table, 2 figs., 27 references.

Authors' summary.

Preparation and application of counter-immunoelectrophoresis antigen for the diagnosis of Aleutian disease in minks.

Guan Zhongxiang et al.

A local strain of Aleutian Disease (AD) virus of mink, designated "Lou-Ging ADV 81-02" strain, was isolated from infected blue mink in Ging-Zhou mink ranches. This strain of virus produced experimental AD of typical acute form in various strains of mink and its full virulence could be maintained by successive passages through susceptible minks of 8 months of age.

We harvested the infective spleen, liver and mesenteric lymph nodes from artificially infected minks 9 days after inoculation and used as stock virus matrials. From these enriched ADV containing tissues, a highly potent counter-immunoelectrophoresis (CIEP) antigen was prepared and used for AD antibody detection. The antigen was prepared according to the published methods but with many modifications. Virus antigen was first extracted from crude virus tissue preparation by fluorcarbon and then concentrated through repeated supercentrifugations. Thereafter the partially purified antigen was further treated by HCl-Glycine activation and tested for antigenic activity with reference antigen and serum in CIEP test.

Activated CIEP antigen is available to detect precipitating AD antibody in minks 7 days after experimental infection. We confirmed that the CIEP test is reliable and specific for AD virus and antibody, and is much more specific and sensitive than the iodine agglutination test (IAT). We used our CIEP antigens in Ging-Zhou mink ranches for herd AD inspection and 1,500 animals have so far been detected.

The results were fully identical with those of pathological examinations. A dependable CIEP antigen is valuable in the eradication of AD from infected mink ranches.

Acta Vet. Zootechn. Sinica, 18, 1, 35-40, 1987.
In CHIN. Su. ENGL.

Author's abstract.

Correlation of antibody to Aleutian Disease Virus (ADV) and hepatopathy in ferrets.

Z. Zhao, J.G. Fox, M.E. Pecquet-Goad, J.C. Murphy, P.B. Kimsey.

Aleutian Disease is a persistent, viral infection of ferrets that has been reported to cause mild, immune-mediated lesions and hypergammaglobulinemia. The purpose of this study was to determine if the extent of liver and kidney lesions and the presence of ADV antibody correlated. In the last two years over 80 ferrets have been submitted to our laboratory for diagnostic evaluation. Liver lesions have varied from mild, periportal, lymphoid cell infiltrates to marked chronic, active, lymphoplasmacytic, periportal hepatitis. Membranous glomerulonephropathy is observed occasionally. Counter immunoelectrophoresis proved very useful in diagnosis of AD in mink, but this test is not as sensitive in ferrets. An indirect immunofluorescent test was set up in our laboratory (courtesy of Dr. D. Porter) using the CRFK cell line and the ADV-G

strain. To date, 20% of serum samples tested positive for ADV antibody. Only a mild periportal, lymphoid cell infiltrate was seen in ferrets with ADV antibody. Use of ferrets with persistent ADV infections can complicate interpretation of experimental results when using this animal in biomedical research.

Journ. of Virology, 37, 4, 545. 1987.
Only abstract received.

Authors'abstract.

Molecular comparisons of in vivo- and in vitro-derived strains of Aleutian Disease of Mink Parvovirus.

Marshall E. Bloom, Oskar Rüger-Kaaden, Eric Huggans, Anders Cohn, James B. Wolfinbarger.

DNA from one cell culture-adapted and two pathogenic strains of Aleutian disease of mink parvovirus (ADV) was molecularly cloned into the vectors pUC18 and pUC19. The DNA from the two pathogenic strains (ADV-Utah I and ADV-Pullman) was obtained from virus purified directly from the organs of infected mink, whereas the DNA from the nonpathogenic aCDV-G was derived from cell culture material. The cloned segment from all three viruses represented a 3.55-kilobase-pair B*am*HI (15 map units) to H*ind*III (88 map units) fragment. Detailed physical mapping studies indicated that all three viruses strains and 5 sites unique to ADV-G were clustered in the portion of the genome expected to code for structural proteins. Clones from all three viruses directed the synthesis of two ADV-specific polypeptides with molecular weight of approximately 57 and 34 kilodaltons. Both species reacted with sera from infected mink as well as with a monoclonal antibody specific for ADV structural proteins. Because production of these ADV antigens was detected in both pUC18 and pUC19 and was not influenced by isopropyl-β-D-thiogalactopyranoside (IPTG) induction, their expression was not regulated by the *lac* promotor of the pUC vector, but presumably by promoterlike sequences found within the ADV DNA. The proteins specified by the clones of ADV-G were 2 to 3 kilodaltons smaller than those of the two pathogenic strains, although the DNA segments were identical in size. This difference in protein molecular weights may correlate with pathogenicity, because capsid proteins of pathogenic and nonpathogenic strains of ADV exhibit a similar difference.

Journ. of Virology, 62, 1, 132-138, 1988.
6 figs., 44 references.

Authors' summary.

Studies into occurrence of bacterial infectious diseases in nutria (Myocastor coypus Molina, 1782).

B. Wendland, B. Köhler, H. Kühn, W. Rabsch, U. Tornow, G. Conrad.

The findings obtained from post-mortem examination of 283 nutrias from 23 stocks were evaluated for bacterial infectious diseases. Such diseases had caused the deaths of 186 animals, that is about two thirds of the above total. Seventy nutrias had died of salmonellosis, and other pathogens in addition to Salmonella were isolated from another 13. Hence, this infectious disease was on top of the list. Differentiation of 83 isolated strains revealed *Salmonella (S.) typhimurium* in '80 cases, *S.thompson* in two cases, and *S. choleaesuis* in one case.

S. typhimurium was detected in five out of 180 faecal samples taken from clinically intact animals and in four of 30 water samples of contaminated stock.

Predisposing factors were found to play an important role in causing clinically manifest diseases, for example, heat loss due to wer and cold weather as well as concentration of Salmonella in habitats of nutrias in the warm season. Freshly weaned young animals were more vulnerable than others.

For effective control, emphasis should be laid on disrupting by observance of good hygiene standards the major chains of infection which are nutria -water - nutria or nutria to nutria.
Arch. exper. Vet. Med., Leipzig, 41, 3, 420-438, 1987.
In GERM. Su. ENGL, RUSS, GERM.
6 tables, 2 figs., 20 references. Authors' summary.

Studies into occurrence of bacterial infectious diseases in nutria (myocastor coypus Molina, 1782).
2. Erysipelothrix rhusiopathia Infections.

B. Köhler, B. Wendland, U. Tornow, M. Michael.

In the GDR, *Erysipelothrix rhusiopathiae* infection of nutria by serotype 6 was observed for the first time. The morbidity on the affected nutria farm amounted to 40 per cent and mortality about 25 per cent. The disease was recorded from 36 dead animals, that is 12.7 per cent of all animals received for pathomorphological and bacteriological examination by the regional veterinary testing centre, between 1980 and 1984. Animals with clinical manifestations received subcutaneous injections of 50,000 to 10,000 I.U. of penicillin on two to three successive days. Animals without symptoms were prophylactically immunised, using "Dessau" erysipelas live vaccine. The disease was brought under effective control by the above treatment in conjunction with thorough cleaning of enclosure sand disinfection before any new occupancy.

Arch. exper. Vet. med., Leipzig, 41, 3, 442-446, 1987.
In GERM. Su. ENGL, RUSS, GERM.
13 references.

Authors' summary.

Morphological manifestation of acute congenital toxoplasmosis in fox cubs.

U.T. Iglmanov.

An outbreak of toxoplasmosis affected about one third of the foxes at a fur farm in Kazakhstan (USSR) in 1982. 31.3% of the sick vixens gave birth to diseased cubs that died within 3 days from birth; 1.9% had defects of foetal development. Resorption of foetuses occurred in 66.7% of vixens and 2% had stillbirths. Autopsy of 8 cubs revealed acute congenital toxoplasmosis. The histological changes observed in the brain, liver, lungs, hearth, kidney, intestines and in the skeletal muscles are described. The probable sources of infection were abattoir waste and carcasses of emaciated foxes that had been included uncooked into the foxes feed.

Vestnitk Sel'skokhozyaistvennoi Nauki Kazakhstana, 121, 91-93, 1987.
In RUSS.
1 reference.

CAB-abstract.

Strongyloides stercoralis infection in the ferret.

Richard A. Davidson.

The ferret (*Mustela putorius furo*) was evaluated as an animal model for infection with human strains of *Strongyloloides stercoralis.* Results indicate that such infections can be easily and reproducibly accomplished.

J. Parasit., 74, 1, 177-179, 1988.
2 figs.

Author's summary.

Epidemic of congenital toxoplasmosis in ferrets.

Ron Thornton.

Approximately 30% of kits on a local ferret farm died within days of birth. All of the adults had experienced a protracted period of anorexia approximately 1 month prior to mating. Examination of a number of kits showed acute multifocal coagulative hepatic cardiac and pulmonary necrosis in the presence of intracellular and extracellular *Toxoplasma* tachyzoite colonies. These observations established a diagnosis of congenital toxoplasmosis.

Surveillance, New Zealand, 13, 4, 1986.
2 references.

Author's summary.

Chordoma in two ferrets.

N. Allison, Pauline Rakich.

Chordomas, characterized by lobules of vacuolated cells lying in a mucinous matrix, are described in 2 ferrets. This is the first report of this rare tumour of notochordal remnant origin in the ferret.

J. Comp. Path., 98, 371-374, 1988.
2 figs., 21 references.

Authors' summary.

A solid-phase fluorescent immunoassay for detecting canine or mink enteritis parvoviruses in faecal samples.

E. Rivera, K.-A. Karlsson.

Mink enteritis virus (MEV) and canine parvovirus (CVP) were detected in faecal samples from experimentally or naturally infected minks and dogs, respectively, using antibody-coated polyacrylamide beads (immunobeads, IB) as the solid phase for immunofluorescence (IF) tests. The specificity and sensitivity of the immunobead assay (IBA) were studied by comparing it with an enzyme-linked immunoassay (ELISA), a haemagglutination (HA) test and an IF test using tissue cultures. The IBA was as sensitive as ELISA, but more sensitive than the HA test and the IF test. Furthermore, the use of IB as the matrix for the immunological reactions allows FITC- or enzyme-conjugated antibodies to be used as indicators of the reactions and a simultaneous investigation of several pathogenic agents.

Vet. Microbiology, 15, 1-9, 1987.
2 tables, 2 figs., 18 references.

Authors' summary.

Oral administration of an attenuated strain of canine adenovirus (type 2) to raccoons, foxes, skunk, and mongoose.

John W. Sumner, John H. Shaddock, Guangjer Wu, George M. Baer.

An attenuated strain of canine adenovirus type-2 (CAV 2) was administered orally to 2 foxes (*Vulpes fulva*), 6 raccoons (*Procyon lotor*), a skunk (*Mephitis mephitis*), and a mongoose (*Herpestus auropunctatus*). Blood was collected weekly from the animals to monitor CAV-2 virus-neutralizing antibody titers. All animals had increases in titers. Sera from 8 foxes, 30 mongooses, 52 raccoons, and 22 skunks trapped in the field had naturally occurring antibody to CAV-2.

Am. J. Vet. Res., 49, 2, 169-171, 1988.
4 tables, 22 references.

Authors' summary.

The growth of the attenuated strains of Canine Parvovirus, Mink Enteritis virus, Feline Panleucopenia virus and Canine Distemper virus on various kinds of cell cultures.

T. Zuffa.

The growth characteristics were studied in the attenuated strains of canine parvovirus CPVA-BN 80/82, mink enteritis virus MEVA-BN 63/82 and feline panleucopenia virus FPVA-BN 110/83 on the stable feline kidney cell line FE, and in the attenuated canine distemper virus CDV-F-BN 10/83 on chicken embryo cell cultures (KEB) and cultures of the stable cell line VERO. When the FE cultures were infected with different parvoviruses in cell suspension at MOI 2-4 TKID50 per cell, the first multiplication of the intracellular virus was recorded 20 hours p.i. In the canine parvovirus, the content of intracellular and extracellular virus continued increasing parallelly until the fourth day; then, from the fourth to the sixth day, the content of extracellular virus still increased whereas that of intracellular virus fell rapidly. In the case of the mink enteritis virus the release of the virus into the culture medium continued parallely with the production of the cellular virus until the sixth day. In the case of the feline panleucopenia virus the values concerning free virus and virus bound to cells wer lower,starting from the second day p.i. When KEBN or VERO cultures were infected in cell suspension with the canine distemper virus at MOI about 0.004 per 1 cell, the replicated intracellular

virus was first recorded in the KEB cultures five hours after infection but in the VERO cultures only 20 hours after infection, with af timely release of the virus into the culture medium in both kinds of tissue. In the KEB and VERO cultures the highest value of infection titres were recorded on the fourth day p.i., the course of virus multiplication on the cells being parallel with its release into the culture medium.

Vet. Medicina, 32, 10, 633-640, 1987.
In CZEC. Su. ENGL, RUSS.
5 figs., 19 references.

Authors' summary.

Evidence that transmissible mink encephalophathy agents is biologically inactive in mice.

D.M. Taylor, A.G. Dickinson, H. Fraser, R.F. March.

Transmissible mink encephalopathy (TME) is probably a form of the sheep disease, scrapie, introduced by accidentally feeding mink with scrapie-infected sheep tissues. Although no successful transmissions of TME to mice have been achieved previous work has involved various limitations. To maximize the possibility of transmissions, 176 mice, representing 14 different genotypes mostly not previously tested with TME, were injected with TME-infected mink brain from three sources with different histories. No scrapie-like disease was detected clinically or histologically in these mice or in a further 111 which were subsequently injected with brain or spleen material from 10 of the TME-injected mice killed when senile. Furthermore, a series of experiments involving seven strains of scrapie, demonstrated that prior injection of mice with TME failed to affect the normal progress of scrapie infection indicating that TME agent had not occupied scrapie replication sites or otherwise influenced the pathogenesis of scrapie.- The overall conclusion from these experiments is that TME is biologically inactive in mice. Although many strains of natural scrapie can be transmitted to laboratory mice, this has not been possible with all strains and it is concluded that one or more of such strains is likely to be the cause of TME in mink.

Neuropath. and Appl. Neurobiol., 12, 207-215, 1986.
2 tables, 31 references.
Authors' abstract.

Prevention of pneumococcal otitis media in chinchillas with human bacterial polysaccharide immune globulin.

Paul A. Shurin, G. Scott Giebink, Dara L. Wegman, Donna Ambrosine, James Rholl, Mary Overman, Thomas Bauer, George R. Siber.

Clinical and experimental observations suggest that immune globulin may prevent otitis meda (OM) in children. We performed experiments in chinchillas to test the hypothesis that human bacterial polysaccharide immune globulin (BPIG) might prevent OM caused by *Streptococcus pneumoniae*. Animals were given BPIG or saline intraperitoneally on day 0. On day 3 the epitympanic bulla was inoculated with *S. pneumoniae* type 7F, AII 12 saline-treated and none of 12 BPIG-treated animals developed pneumococcal OM by day 7 ($P < 0.0001$). Bacteremia developed in 6 to 12 saline- and 0 of 12 BPIG-treated animals ($P = 0.007$). Death with pneumococcal OM occured within 28 days in 5 og 12 saline- and 0 of 12 BPIG-injected animals ($P = 0.02$). A chinchilla-specific immunoassay was used to show that surviving saline-injected animals developed serum anticapsular antibody; BPIG-treated animals had no detectable response. At levels of anticapsular immunoglobulin G similar to those of human adults, BPIB given systemically prevented pneumococcal OM and disseminated infection in chinchillas. BPIG may be of value in preventing human bacterial infection and may also inhibit development of antibody if it affects local infection or colonization. Specific immunoglobulin G antibody may provide an important antibacterial defense of mucosal surfaces of the respiratory tract.

J. of Clinical Microbiology, 26, 4, 755-759, 1988.
3 tables, 2 figs., 26 references.

Authors' summary.

Pathological changes and organochlorine residues in tissues of wild otters (lutra lutra).

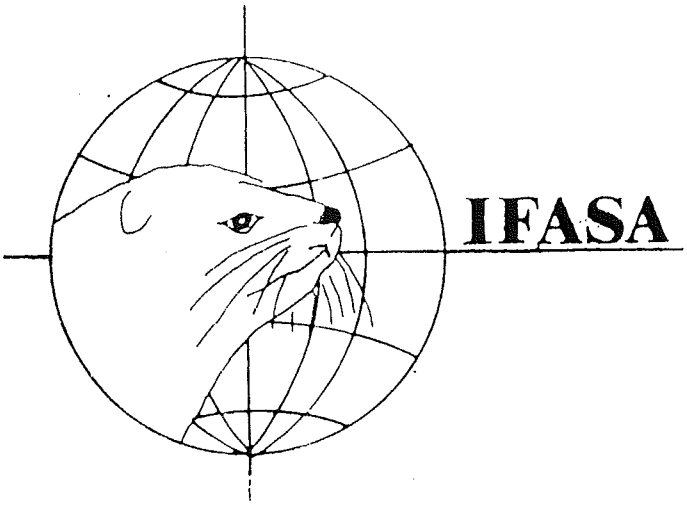
I.F. Keymer, G.A.H. Wells, C.F.Mason, S.M. Macdonal.

In 1984 two adult, wild otters *(Lutra lutra)* from north Norfolk were subjected to full post mortem examinations. One was found dead and the other sick. Both were thin. No evidence of infectious disease was found, but there were organochlorine concentrations of 433 and 75 mg/kg of fat (69 per cent poly-chlorinated biphenyls in both) in skeletal muscle. Leiomyoma of the reproductive tract and adrenocortical hyperplasia in one otter were similar to age associated changes in other mammals. Integumentary, including pedal, lesions were present in both otters. The possibility that the pedal lesions were caused by the toxic effects of polychlorinated biphenyls is discussed.

Vet. Record, 122, 7, 1988.
23 references.

Authors' abstract.

The board of IFASA has planned to held its 1st meeting in Spring 1989 with the intention to make a structural plan for establishing and running of the new journal: **"International Fur Animal Production".**



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МОСКВА ВО «АГРОПРОМИЗДАТ» 1987

КОРМЛЕНИЕ ПУШНЫХ ЗВЕРЕЙ

П27

Перельдик Н. Ш. и др.
Кормление пушных зверей/Н. Ш. Перельдик, Л. В. Милованов, А. Т. Ерин. — М.: Агропромиздат, 1987. — 351 с.

В книге приведены научно обоснованные данные о потребности пушных зверей в питательных и минеральных веществах, витаминах в разные периоды года. Даны примерные рационы, рекомендации по использованию кормов с учетом биологических особенностей зверей и их потребности в питании в разных зонах страны. Данное издание является оригинальным. В него включены материалы о кормлении норок, песцов и лисиц, соболей, гибридных хорей, енотов, нутрий.

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Moskva Agropromizdat, USSR (Russian SFSR) SF403.P38, 1987.
350 pp.

Diseases of fur-bearing animals.

S.I. Bratyukha, A.F. Evtushenko, A.A. Shevtsov, V.I. Bereza.

С. И. Братюха, А. Ф. Евтушенко, А. А. Шевцов, В. И. Береза

БОЛЕЗНИ ПУШНЫХ ЗВЕРЕЙ

Второе издание, переработанное и дополненное

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Болезни пушных зверей/Братюха С. И., Евтушенко А. Ф., Шевцов А. А., Береза В. И.— 2-е изд., перераб. и доп.— К.: Урожай, 1987.— 184 с.

В книге описаны общие ветеринарно-санитарные мероприятия при содержании зверей в неволе. В свете последних достижений науки и передовой практики описаны инфекционные, инвазионные и незаразные болезни. Освещены вопросы ветеринарно-санитарного надзора за кормами и кормлением.

В новом издании особое внимание уделяется борьбе с болезнями в условиях промышленного пушного звероводства.

Рассчитана на ветеринарных специалистов звероводческих хозяйств.

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This Russian account of the diseases of mink, sable, arctic fox, silver fox and coypu first appeared in 1980. Bacterial, viral and protozoal diseases are dealth with, as well as ectoparasitoses, helminthooses, and non-infectious diseases (including metabolic disorders and nutritionals deficiencies).

Kiev, USSR, Urozhai (Ed.2), 181 pp, 1987. Illustrated.
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CAB-abstract.

Old book.

Blue-Fox farming in Alaska.

Frank G. Ashbrook, Ernest P. Walker.

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BLUE-FOX FARMING IN ALASKA

By FRANK G. ASHBROOK, *In Charge Division of Fur Resources;* and ERNEST P. WALKER, *Administrative Officer for Alaska; Bureau of Biological Survey* [1]

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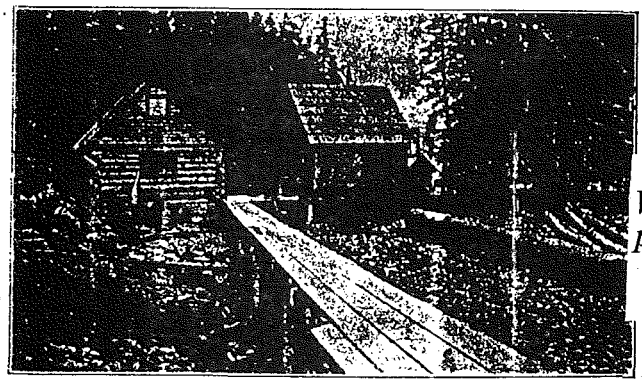

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FIG. 9.—Convenient arrangement of buildings for fox rancher. From left to right they are dwelling, woodshed, smokehouse, and feed-storage house

Washington D.C., U.S. Dept. of Agriculture, No. 1350, 3: pp, 28 illustrations, 1925.

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