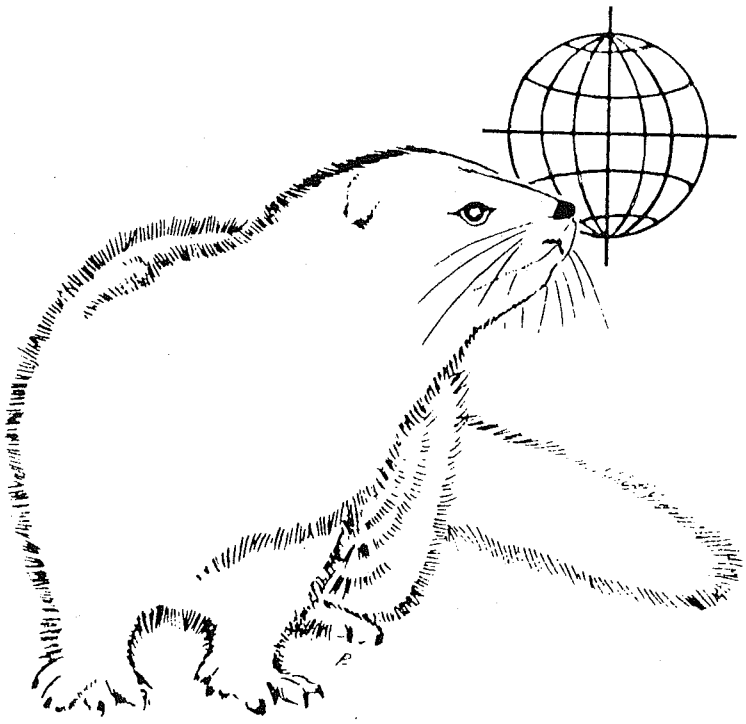

SCIENTIFUR
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6. REPRODUCTION

10. COMMUNICATION

4TH INTERNATIONAL SCIENTIFIC CONGRESS IN FUR ANIMAL PRODUCTION

Toronto, Canada & Wisconsin, U.S.A.

August 21 to August 28, 1988

NOTES

SCIENTIFUR, VOL. 11, NO. 4, 1987.

Here we are again. It is surprising for the staff of SCIENTIFUR - but unfortunately, not for you - that we have been able to produce SCIENTIFUR this time with less than one month delay. Of course, we regret and apologize the delay - but hope that your appetite to the very important information obtained from SCIENTIFUR has grown even stronger.

Read it, enjoy it, and think about how to make the conditions for SCIENTIFURs future in such a way that its production should not continue as a left hand work waiting for that the right hand do its duty.

At the beginning of the new year the Board of the fur animal division of The Scandinavian Association of Agricultural Scientists are to take stock of the future of SCIENTIFUR. This decision can be very thin and meaningless, if new ideas should not turn up on the horizon.

How to make a future for a journal - or whatever it is called - which during eleven years fight has only reached a number of 450 subscribers in spite of the fact that 700 subscribtions and 10 announcements are the minimum economical level for a self-financed journal of the wellknown plain appearence.

Here at the borderline to the future, it is hard to realize that only the Scandinavian countries (The Saga-countries) have tried seriously to get SCIENTIFUR as a valuable partner in the daily life for securing the progress in the fur animal production.

I think that every fur producing country has growing understanding for the fact that international cooperation has at least two aspects, namely to give and to receive. Until today many countries have not shown the willingness to give.

If you in the future wish to receive that service you must include SCIENTIFUR in your future disposition in relation to the international cooperation.

These few words are written as a special regard to every local and international breeders organization.

Another very important information in this issue of SCIENTIFUR is the FINAL INVITATION TO THE 4TH INTERNATIONAL SCIENTIFIC CONGRESS IN FUR PRODUCTION in CANADA and U.S.A., AUGUST 21. to 28., 1988.

PLEASE, cut the formula and send it to the secretary of the congress as soon as possible. latest February 1st, 1988, if you want to participate.

From Scandinavia different alternative possibilities for transportation to the congress will be arranged. Further information regarding this will surely be given in SCIENTIFUR, but information can also be given by direct contact to SCIENTIFUR or the Scandinavian Breeders Organizations.

As advertised in former issue of SCIENTIFUR The Scandinavian Scientific Meeting regarding fur animal production, NJF-seminarium No. 128, took place in Tromsø, Norway, September 28-30. This meeting was attended by more than 160 participants. It was also the event for celebrating the 40 years anniversary for the Fur Animal Division of the Scandinavian Association of Agricultural Scientists.

At this occasion a jubilee publication was prepared telling about the first 40 years of this association. This pblication has been edited by Dr. Einar J. Einarsson, Norway. The main authors, Profesor Per Slagsvold, Norway, and Director £ke Qvist, Finland, (both former chairmen of the division) have done a very good work, and SCIENTIFUR had the pleasure of being the producer of this nice milestone in the successful road of the NJF's Division of Fur Animals.

As advertised in SCIENTIFUR, VOL. 11, NO. 3, a Jubilee Fund was established in occasion of the jubilee. This Fund will be able to give scholarships to young scintists. The Fund has already been granted with a lot of money from companies and organizations in Scandinavia with relation to fur animal production. During the celebration the chairman, Dr. Ejnar J. Einarsson, handed the first prize to our common friend, Dr. Outi Lohi, and stated why she was selected to receive the first donation and acknowledgement from the Fund. We are sure that everybody with us congratulate Outi Lohi with this honour and agree with the committee that she more than everyone deserved it.

Take this as a good end of the Tromsø meeting and of this notes. By this we thank all subscribers, contributors, advertisers, and cooperators for the year 1987 and send all of you the best wishes for a Merry Christmas and a Happy New Year.

Your Editor

Gunnar Jørgensen

Original Report

Relationships between fur quality parameters and chemical body composition in farmed mink and polecats

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Summary
Dependence of parameters describing fur quality on chemical body composition was studied in farmed, scanbrown wild minks (Mustela vison) and polecats (Mustela putorius). Several statistically significant, systematic cross correlations were found. However, differences between the sexes or species were mainly non-significant. Skin weight was significantly depended on body weight of the animals. The subjectively estimated fur quality can be often derived directly from its weight. The amount of carcass protein or fat in itself was not an indicator of fur quality.

Introduction

Fur quality in domestic fur animals depends on many more or less known factors which often have numerous interactions *(c.f. Korhonen and Harri, 1985)*. Two important factors affecting fur quality of the animals are chemical composition and amount of the feed *(Mink Production, 1985)*. Particularly intensive feeding is often considered necessary for producing fur animals with good pelt quality and long skins. This often, however, means that some of the animals are extremely fat at pelting time.

While we were able to determine chemical body composition of animals, we decided to evaluate to a which extent parameters describing fur quality depend on chemical body composition of farmed minks *(Mustela vison)* and polecats *(Mustela putorius)*. The present paper shortly summarizes such data.

Materials and Methods

General procedures
The experiments were carried out on the research fur farm of Kuopio University, in east-central Finland. Animals used were born in April-May and reared in standard rearing cages *(40cm wide x 60cm long x40cm high)*. Both females and males were used. Each group consisted of 40 polecats *(fitch)* and 40 minks *(scanbrown wild)*. Basal ready-mixed mink feed was offered them according to standards of the Finnish Fur Breeders' Association *(Berg, 1986)*. Water was available continuosly from an automatic watering system.

Body composition and chemical analyses
The animals were weighed at pelting time. Then they were slaughtered and skinned. The carcasses were stored at

-20 C in plastic bags until further procedures. Whole carcasses were cut into small pieces and ground twice with a meat grinder *(LM-42/A, Koneteollisuus Oy, Helsinki, disc hole: 10mm)*. The randomly selected subsamples were air-dried to a constant weight at +100 C and ground with a Moulinette grinder *(Moulinex, France)*.

Chemical analyses were performed in duplicate. Gross energy content was determined by gradient layer calorimetry *(Calorimeter Automatic MK 2000, FRG)* and protein *(N x 6.25)* content with a Kjeltec System Apparatus *(Tecator, Höganäs, Sveden)* according to the Kjeldahl method *(Nordic Committee on Food Analysis, 1970)*. Ash content was measured after ignition at +600 C. Fat and carbohydrate concentrations were then calculated from the abovementioned data using 38.9, 22.6 and 17.2 KJ/G as the energy value of fat, protein and carbohydrate, respectively.

Fur quality
Pelts were graded subjectively by professional fur graders of the Finnish Fur Sales Ltd. on a 10-point scale *(1=poorest, 10=best)* according to mass, quality, overall impression, cover and color purity.

Statistics
The data for both sexes were treated separately. Correlations were made by using Pearson product moment correlation and scattergram figures. The data were processed by the VAX 11/780 computer and the SPSS *(Statistical Package for Social Sciences)* program.

Results and Discussion
Statistically significant correlation coefficients between different parameters are presented for minks and polecats in tables 1 and 2, respectively. Because of sexual dimorphism in these species, the data for both sexes are given separately.

Table 1: Calculation of cross-correlation between different parameters in scanbrown wild minks. Only statiscally significant correlation coefficients are marked.

		Skin weight	Fur quality	Fur mass	Fur cover	Fur impression	Fur purity	Body wight	Body protein	Body fat	Body energy
Skin weight	mal.	1	-	-	-.45[a]	-.45[a]	-	.53[a]	-	-	-
	fem.	1	-	-	-	-	-	.77[c]	-	-	-
Fur quality	mal.		1	.49[a]	-	.65[c]	-	-	-	-	-
	fem.		1	.47[a]	-	-	-	-	-	-	-
Fur mass	mal.			1	.58[a]	-	-	-	-.79[c]	-.47[a]	-.50[a]
	fem.			1	-	.87[c]	-	-	-	-	-
Fur cover	mal.				1	.52[a]	-	-	-.52[a]	-	-
	fem.				1	-	-	-	-	-.47[a]	-
Fur impression	mal.					1	-	-	-.52[a]	-	-
	fem.					1	-	-	-	-	-
Fur purity	mal.						1	-	-	-	-
	fem.						1	-	-	-	-
Body weight	mal.							1	.87[c]	.92[c]	.93[c]
	fem.							1	.42a	.67[b]	.44[a]
Body protein	mal.								1	.66[b]	.67[b]
	fem.								1	.61[b]	.50[a]
Body fat	mal.									1	.99[c]
	fem.									1	.82[c]
Body energy	mal.										1
	fem.										1

Significance: [a]p<0.05, [b]p<0.01, [c]p<0.001 (Pearson product moment correlation)

Table 2: Calculation of cross-correlation between different parameters in polecats. Only statiscally significant correlation coefficients are marked.

		Skin weight	Fur quality	Fur mass	Fur cover	Fur impression	Fur purity	Body weight	Body protein	Body fat	Body energy
Skin weight	mal.	1	-	-	.47[a]	-	-	.51[b]	-	-	-
	fem.	1	-	-	-	-	-	.57[b]	.61[b]	-	-
Fur quality	mal.		1	.58[b]	.44[a]	.92[c]	-	-	-	-	-
	fem.		1	.76[c]	.63[b]	.65[c]	-	-	-	-.52[b]	-.53[b]
Fur mass	mal.			1	-	.58[b]	-	-	-	-	-
	fem.			1	.53[b]	.61[b]	-	-	-	-.50[b]	-.47[b]
Fur cover	mal.				1	.53[b]	-	-	.53[b]	-	-
	fem.				1	.60[b]	-	-	-	-.64[c]	-.64[c]
Fur impression	mal.					1	-	-	.43[a]	-	-
	fem.					1	-	-	-	-.64[c]	-.55[b]
Fur purity	mal.						1	-	-	-	-
	fem.						1	-	-	-	-
Body weight	mal.							1	.50[b]	.53[b]	.58[b]
	fem.							1	.52[b]	.39[a]	.40[a]
Body protein	mal.								1	-	-
	fem.								1	-	-
Body fat	mal.									1	.99[c]
	fem.									1	.97[c]
Body energy	mal										1
	fem.										1

Significance: [a]p<0.05, [b]p<0.01, [c]p<0.001 (Pearson product moment correlation)

Generally the statistically significant cross-correlations were similar for both sexes, although some differences were evident. The differences between the species were basically non-significant and not totally conclusive.

Skin weight correlated significantly with body weight of the animals, i.e., the bigger the animal, the heavier the skin. The same trend was observed for both minks and polecats. This agrees with previous observations for scanblack minks *(Harri et al., 1984)*. That study showed a significant relationship between fresh weight of the pelt and live weight of the animals. They further noticed that the weight of fresh pelt was a constant fraction, 12 %, of animal's body weight.

It is interesting to note that the quality of fur seems not to depend on the body weight and carcass protein, fat or energy content. Often it is believed that the bigger the animal is, the better quality of its fur. According to present data this not necessarily holds true. In polecats, furthermore, the quality of fur was even negatively correlated with the amount of carcass protein, fat and energy, i.e., the larger *(Fatter)* the animals were, the poorer quality of fur they also had. Accordingly, grossly obese raccoon dogs did not necessarily produce furs of better quality, and the amount of carcas protein or fat in itself was not a useful indicator of fur quality *(Korhonen, 1987)*.

Fur quality and fur mass showed statistically significant cross-correlations. Thus the quality of fur, as it is generally believed, was better in furs with good fur mass.

As already previously concluded with

raccoon dogs *(Korhonen and Harri, 1985)*, subjectively estimated fur quality can be thus often derived directly from its weight *(mass)*.

Acknowledgements
The author would like to thank Miss Riitta Tirkkonen for willing co-operation throughout this study. Financial support for this investigation was provided by the Finnish Research Council for Natural Sciences, the Alfred Kordelin Foundation, the Finnish Cultural Foundation and the Oskar Öflund Foundation.

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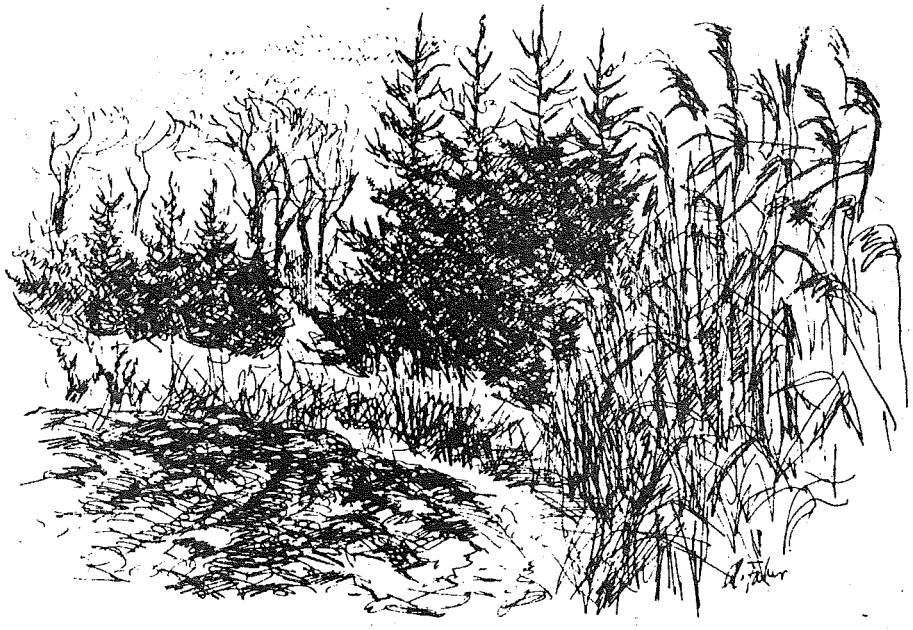

Original Report

Cessation of social competition: Effects on Growth performance and fur quality in farmed raccoon dogs

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Summary

To test whether or not separation of rearing groups influences body weight gain and fur quality characteristics of growing, farm-raised raccoon dogs *(Nyctereutes procyonoides, Gray 1834)*, animals were housed in pairs and by threes from June until mid-August, after which the smallest ones in the cages were removed singly into new cages.

Separation of the smallest animals from their rearing groups did not speed up their growth rate. The final body weight was the same whether the initial group size was two or three. Fur quality parameters like mass, cover, overall impression and quality were significantly better for the animals caged alone after mid-August than for the animals kept in groups. It is recommended to seperate animals from their initial groups at the beginning of the development of winter fur.

Introduction

If more than one animal are enclosed into a small, limited area, which is a common situation in animal production of all kinds, there exists a possibility that the stronger animal would eat more than the weaker one(s). In this situation it is the social competition which may limit the feed intake of the weaker animal below that determined by the genetic growth potential. In the case of limited food supply the strongest animal might eat a major part of the supplied feed so that the weaker partner still more suffers from malnutrition. On the other hand, it has been claimed that social competition for feed persuades the stronger animal to eat more than it would eat without competition.

In our previous works *(Korhonen and Harri, 1985; Korhonen et al., 1986)* social competition for feed were studied in farm-raised raccoon dogs *(Nyctereutes procyonoides, Gray 1834)*. However, those studies do not support the hypothesis that there exist social competition between animals caged in limited cage space. The smallest half of the group with competition was not smaller than the smallest half of the animals caged alone. However, this result does not necessarily exclude the possibility that the smallest part of the grouped animals would have grown bigger in the absence of competition. To test this possibility we in the present study excluded the smallest animal from the groups of two or three raccoon dogs. This separation was carried out before the length growth of the animals had ceased *(Korhonen and Harri, 1983)* thus allowing them a possibility for a catsh up growth. The catch up growth means a speeded growth rate after a period of limited feed intake for one reason or another *(Miller and Wise, 1976)*. Furthermore, separation of the weaker competitor from the group would also decrease the possible requirement for overeating by the stronger one, thus decreasing the threat of its pelt deterioration.

Material and Method

General procedures
The experiments were carried out on the research fur farm of Kuopio University, in eastern Finland, during the period June-November in 1986. All animals were born during April-May, and caged in standard rearing cages *(105 cm wide x 60 cm long x 60 cm high)*. Before the experiments began, all animals were fed basal fresh feed *ad libitum*. The feed was manufactured by a local central feed kitchen. It was mainly composed of slaughter-house offals, fish and cereals *(c.f. Korhonen and Harri, 1985)*. The feed was given twice a day in June-August, and once a day during the other months. The diet was formulated, as far as possible, according to the standards of the Finnish Fur Breeders' Association. Water was freely supplied by automatic water system.

Experimental arrangements
Altogether 64 raccoon dog whelps were used in the experiments. The animals were weaned on June 30 and divided randomly into the experimental groups presented in Table 1. On August 12 part of the animals caged in pairs and the smallest animals from the groups of three animals were separated and caged alone thereafter until Nov 21 when the animals were killed and pelted. If more than one animal was kept in one cage the situation was judged as the presence of social competition. Bigger or biggest one in the group was definied as the winner and the smallest one as the loser. In the group of three animals there also were the medium-sized animals whose social status was definied as the loser.

Statistics
The results are expressed as the mean ±SD. Since there were no differences between the sexes for any of the parameters measured the values of both sexes were pooled. Statistical analyses were computed by analysis of variance. Data were processed by the VAX 11/780 computer and the SPSS *(Social Package for Social Sciences)* program.

Results and Discussion

At the beginning of the experiments body weights in all groups were similar and normal *(Fig.1.)*. As in our previous study *(Korhonen et al., 1986)* there were no significant differences in the mean growth rate or the final body weight whether or not the groupmembers were separated on August 12 or kept in their initial groups for the whole growing period. Separation of the smallest animals from the groups of two or three animals did not speed up their growth rate in comparison to the smallest half of the GROUP-2 or GROUP-3 animals kept

Table 1: Characterization of experimental groups.

		Jun 30-Aug 12			Aug 13-Nov 21		
Group	N	Social status	Presence of competition	No. of Animals Per cage	Social status	Presence of competition	No. of Animals Per cage
Group-2/big	7	Winner	yes	2	Winner	yes	2
Group-2/small	7	Loser	yes	2	Loser	yes	2
Sep-2/big	13	Winner	yes	2	Winner	no	1
Sep-2/small	12	Loser	yes	2	Winner	no	1
Group-3/big	8	Winner	yes	3	Winner	yes	2
Group-3/medium	8	Loser	yes	3	Loser	yes	2
Sep-3/small	9	Loser	yes	3	Winner	no	1

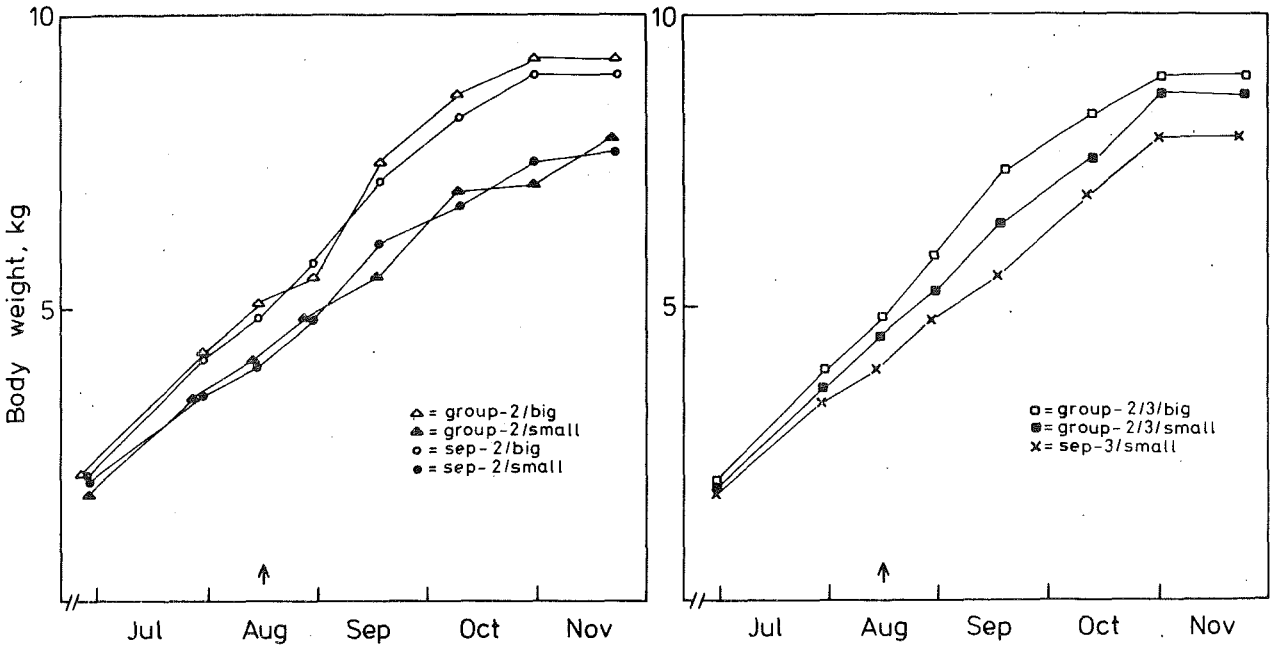

Figure 1: Live weight curves of experimental groups and subgroups with data points when th weights were measured. For further explanation see Table 1.

together. According to the work hypothesis presented in the introduction the growth rate of the smallest group members should have speeded up while the growth rate of the strongest member should have slowed down after cessation of the competition. This should have led to a diminution in the interindividual weight differences. No such trend was observed, however. Rather the differences in body weight, already significant ($p<0.05$) by mid-August, further increased. The result was the same whether the initial group size was two or three. Thus the body weight gain of the raccoon dogs is neither influenced by the presence or absence of social competition nor by the successfullness in this competition, i.e. whether the animal in question belong to the winners or losers. Or at least a change in the social situation by mid-August cannot any more affect the growth rate already fixed.

The situation for the fur quality parameters seems different. The guard hair of the winter pelage of the raccoon dog is already ready by mid-August while the growth of underfur only beginns after that time *(Korhonen et al., 1984)*. Thus a change in the social situation could influence the development of underfur which, in fact, is the main determinant of the quality of the whole skin *(c.f. Korhonen and Harri, 1985)*.

The present results show that many of the parameters describing fur quality were significantly better for the animals caged alone after mid-August than for the animals kept in groups of two animals (Table 2). On the other hand, the successfulness in the competition, i.e. whether or not the animals were characterized as the winners or losers in the competition, was of no importance. This result is in accordance with the finding of Moss *(1983)*. He caged blue foxes by fours until mid-September after which the animals were caged alone. The mass and quality of the fur of the separated foxes were significantly better than that of the foxes caged in groups. It is interesting to note that the winter fur of the blue fox is prime already by the end of October. Thus by mid-September the development of winter fur was already running with full force. The mechanism(s) by which cessation of social competition improves fur quality is still obscure. One factor is cleanliness of the hair; the hair certainly keeps clean more easily if the animals are kept alone. Or it is the stress of the social competition that hampers the development of the fur. Assuming that the latter explanation is correct, then the

Table2: Fur quality characterization of experimental groups.

Variable Measured	Group-2	Sep-2/big	Sep-2/small	Group-3	Sep-3/small	S_1	S_2
Purity	5.3 ± 1.3	6.4 ± 1.3	5.1 ± 1.1	4.9 ± 1.1	4.6 ± 1.1	NS	NS
Mass	6.8 ± 1.1	8.3 ± 1.1	7.4 ± 1.2	7.4 ± 0.9	7.8 ± 1.3	*	NS
Cover	6.5 ± 0.8	8.1 ± 1.1	8.7 ± 1.2	7.0 ± 1.1	8.2 ± 1.2	*	***
Overall impression	5.9 ± 1.4	8.1 ± 1.3	7.6 ± 0.8	7.6 ± 1.3	8.2 ± 0.9	**	*
Quality	7.9 ± 1.1	8.6 ± 0.9	8.0 ± 1.1	7.7 ± 1.1	8.6 ± 0.9	*	**

Significance: *p<0.05, **p<0.01, ***p<0.001, NS=not significant (analysis of variance)

S_1 : Significance between Group-2 versus all others, S_2 : Significance between Group - 2 and Group - 3 versus all others.

fur quality is more sensitive than body weight gain as an indication of the stress.

Irrespectively of the reason of the phenomenon, our finding has practical importance in the commercial fur farming. It seems advantageous to separate the animals from their initial groups at the beginning of the development of winter fur. Although this procedure does not influence the final size of the animals, and their pelts, it seems to improve the quality and, accordingly, the prize of the fur. It also makes possible a more individual feed supply to the animals. In grouped animals the feed supply must be fitted in excess in order to guarantee sufficiency of the feed to all groupmembers. This easily leads to overfeeding of the biggest animal. Since big and fatty animals tend to sit more than the leaner ones their buttocks easily deteriote *(Korhonen and Harri, 1986; Korhonen, 1987)*. This deterioration then dramatically decreases the quality of the fur *(Finnish Fur Breeders' Association, statistics 1986)*. This defect can also be avoided by housing and feeding the animals individually *(Korhonen et al., 1986)*

Acknowledgements

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Hematology and biochemistry reference values for the ranch fox.

D.M. Benn; D.B. McKeown; J.H. Lumsden

Reference hematology and biochemistry values are presented from a mixed population of 30 silver and red foxes of both sexes, reared and living under fox-farming conditions in southern Ontario.

Based on history and physical examination, the animals in this study were clinically healthy at the time of blood collection and maintained under similar husbandry practices.

The observations were examined for outliers and Gaussian distribution before and after one of three transformations. Parametric analysis was used to determine lower and upper reference limits. Where observations were not Gaussian, minimum and maximum values are given.

These reference values are presented as a usable first approximation of population reference values to assist clinicians and researchers in their interpretation of observations obtained from foxes of similar populations.

Can J Vet Res 1986; 50:54-58.
3 tables, 20 references.

Authors abstract

Factors influencing blood chemistry in nutria *

Paul R. Ramsey; Robert M. Edmunds; Noel W. Kinler.

Serum samples were taken from 200 nutria *(Myocastor coypus)* at 4 localities in Louisiana. Results from essays for calsium, phosphorus, sodium, potassium, glucose, uric acid, urea nitrogen (BUN), cholesterol, triglycerides, total protein, albumin, alkaline phosphates (AKB), and glutamic oxalacetic transaminase (GOT) were examined for variation due to sex, pregnancy, 2 age classes, 3 capture methods, 2 seasons, and 3 habitat types. Males had higher mean levels of uric acid, and lower mean cholesterol than females. Sexually immature animals had lower total protein and albumin, but higher serum enzymatic activities than nonpregnant females, although cholesterol and triglycerides varied seasonally. All serum values were affected to some extent by the capture methods of shooting, cage trapping, and leg-hold trapping. Calsium, uric acid, glucose, cholesterol, and GOT differed seasonally. Freshwater habitats yielded samples with higher means for calsium and sodium and lower values for BUN and phosphorus compared to more saline habitats. Blood parameters were effective indicators of habitat deterioration, especially through interactions of main effects. Management efforts for nutria population should receive input from regular monitoring of physiological response to fluctuations in habitat quality.

Worldwide Furbearer Conf. Proc., Vol. I. Worldwide Furbearer Conf., Inc., Annapolis, Maryland, pp. 325-342.

5 tables, 30 references.
Authors abstract

Seasonal changes in hepatic activity of G-6-phosphate and Alfa-glycerophosphate dehydrogenase in farmed polecats and raccoon dogs.

Hannu Korhonen, Ilpo Jääskeläinen

1. Liver weight of both male and female polecats was significantly higher in winter than in summer. There were no seasonal or sex differences in the liver weight of raccoon dogs.
2. Body weight of male polecats was highest in winter. No marked seasonal changes in body weight of female polecats, or raccoon dogs of both sexes were found.
3. Total hepatic glucose-6-phosphate dehydrogenase activity of polecats and raccoon dogs was higher in winter than in summer.

4. Specific activity of Alfa-glycero-phosphate dehydrogenase was highest in summer, but total hepatic activity did not show any seasonal changes.

Comp. Biochem. Physiol. Vol. 86B, No. 1 pp. 117-121, 1987.
4 tabels, 21 references.

Authors abstract

Changeabillity of haemogramme components in hybrids of the skunk and ferrets in postanatal period.

Szymeczko R.; Bieguszewski H.

The objective of the experiments was to study variations in the haemogramme components in hybrids of the skunk and ferrets of various age. The number of red blood cells, erythroblasts and reticulocyte content, erythrogramme, the mean erythrocyte diameter. HB and haemato-crite value, osmotic resistance and the red blood cells sedimentation rate were determined in 182 skunk and ferrets. The following red blood cells indices were calculated: MCV, MCH and MCHC. Physiological blood anaemia was ascer-tained, which was manifested by a characteristic quantity and quality "break down" in the red blood cells picture. Postnatal anaemia was accompanied by intensive erythroblastic system activity. This anaemia characterised by an increased amount of erythroblasts and reticulocytes in peripheral blood and by the lowest with the narrowest osmotic resistance scope. The rate of the red blood cells sedimentation was the highest in the skunk and ferrets in the first two months of postnatal life.

Medycyna Weterynaryjna: 42(7): 436-439, 1986.
2 tabels,, 1 fig., 39 references
In POLH. Su. ENGL, RUSS.

Authors abstract

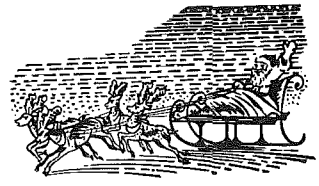
Chelators depigment and increace elasticity of mink skin.

Nelly Blumenkrantz; Leena Blomstedt.

The effect of subcutaneous injection of four Cu^{2+} and Fe^{2+} ion chelators was studied in scanblack minks. The pattern of macromolecular connective tissue components, histology and biochemistry of the skin were analyzed. The purpose of the two experiments performed was to try to establish the influence of age and the interrelationship of skin and hair depigmentation occasionally observed in minks.Further determinations included levels and pattern of serum proteins, copper, iron and zincs as well as level of various enzymes in serum. Adrenaline and the higher dose of sodium diethyldithio-carbamate are shown to produce skin and hair depigmentation, increase elasticity of mink skin and also to disturb hair growth. All chelators produced increased levels of copper, iron and zinc in serum. Urinary excretion of a glycosaminoglycan fraction more cationic than sulfated glycosaminoglycans and suggested to be related to the unsulfated hyaluronic acid and/or chondroitin by the skin are discussed, assuming alteration/inhibition of two metalloenzymes, having copper present in the protein structure and requiring Cu^{2+}/Fe^{2+} ions as cofactors, i.e. tyrosine hydroxylase and lysyl oxidase. The observed increased elasticity of the skin may be equivalent to the same phenomenon noticed in type V Ehlers-Danlos' syndrome with deficiency of lysyl oxidase and decreased collagen cross-links formation.

Acta Agric. Scand. 37:375-395, 1987.
8 tabels, 8 fig., 35 references.

Authors abstract



Acta Agric. Scand 37 (1987)

Effect of chelators on mink skin

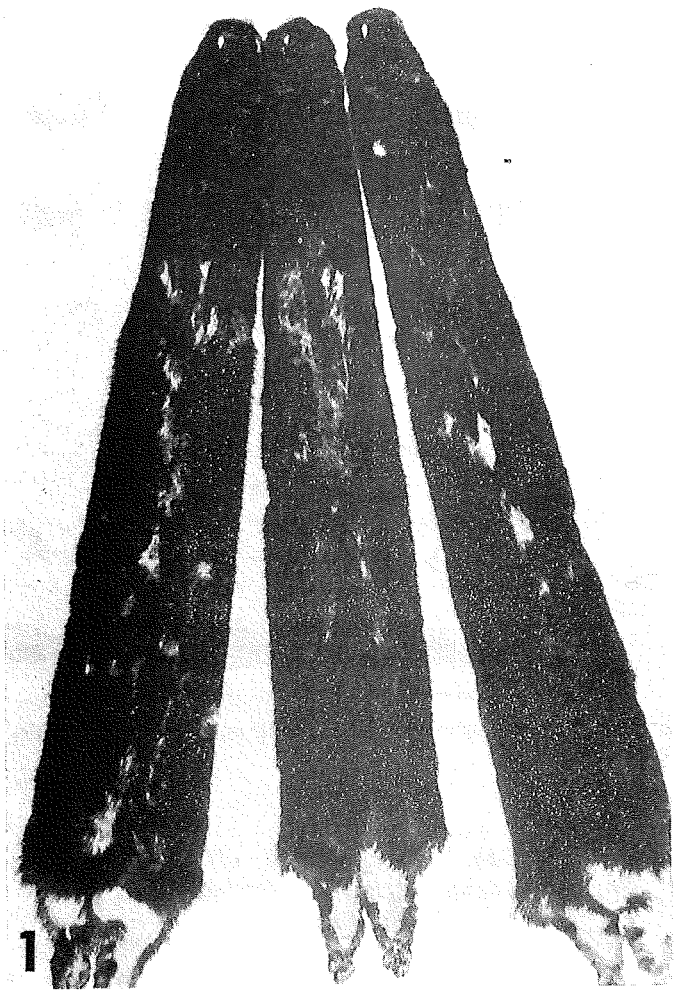


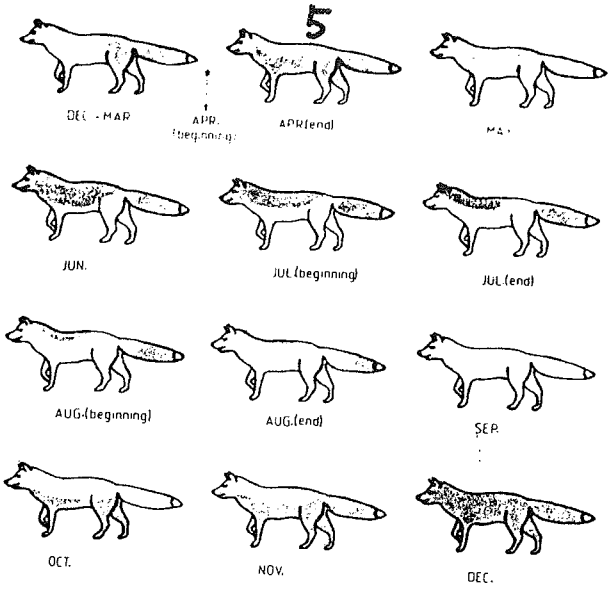
Fig. 1. Depigmented patches on the skin of scanblack mink after adrenaline treatment.

Seasonal moulting patterns in three fur bearing mammals: the European badger (Meles meles L.), the red fox (Vulpes vulpes L.), and the mink (Mustela vison). A morphological and histological study.

Daniel Maurel; Christian Coutant; Line Boissin-Agasse; Jean Boissin.

Seasonal changes in the fur of three species of mammals at the adult stage, the European badger, the red fox, and the mink, were studied in the field. The badger had only one seasonal change of pelage during the summer and the fall (from July to December), and there was no seasonal variation of hair density. The fox moulted in the spring (between the end of April and the end of August) and again in the fall, but the fall change consisted only in the regrowth of a new fine undercoat that combined with the summer fur to form a denser winter coat. In the mink, the spring and fall moults were very destinct and gave rise to characteristic summer and winter coats that differed in density and number of fine hairs per surface unit. The histological study revealed a similarity in skin composition among the three species, but the relative importance of the different components (sebaceous glands, adipose tissue, keratine layer) varied with each species' way of life. Seasonal follicular activity was correlated with seasonal regrowth of the pelage; the active anagen

FIG. 5. Seasonal moult pattern in the red fox. Light stippling indicates the progression of the summer coat and the darkly stippled areas show the progression of the winter coat. ★, the first time that hair is shed.



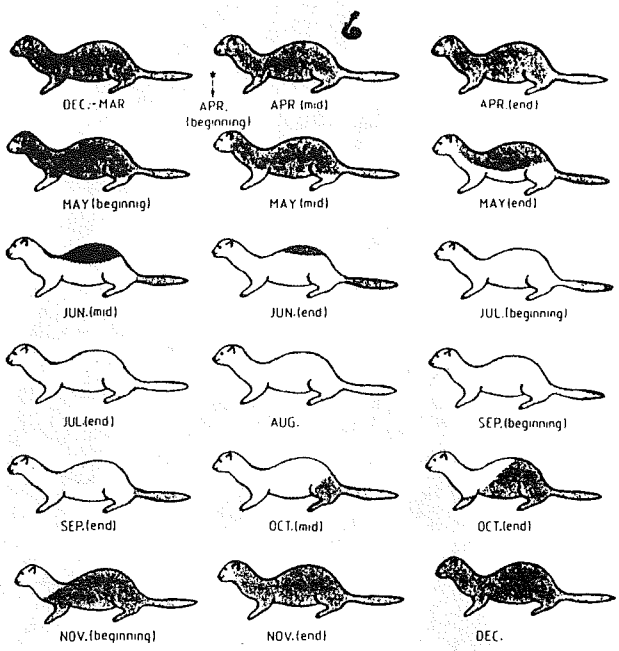


FIG. 6. Seasonal moult pattern in the mink. Light stippling indicates the progression of the summer coat and the darkly stippled areas show the progression of the winter coat. ★, the first time that hair is shed.

phase was very long (badger, 5 months; fox, 4 months; mink, 2 months in the spring and 3 months in the fall). During the part of the annual cycle, telogen, the hair follicles were in a resting phase. Differences in the annual moulting processes between the three species are discussed in terms of adaptive characteristics.

Can. J. Zool.64: 1757-1764.
1 tabels, 7 fig., 27 references.
In ENGL Su. FREN

Authors abstract

An anatomical adaption to different living areas by representatives of the family Mustelidae.

Heidi Zimmermann.

Morphological adaptions enable the carnivorous family of mustelidae to lead various modes of life.

The elongated body shape, very flexible spine, short legs and powerful bite permit the terrestrial members of the subfamily Mustela a successful pursuit in burrows and other confined spaces.

Other subfamilies, e.g. badgers and skunks, show adaptions to a fossorial mode of life. A robust skeleton, the specific development of muscles of limbs and body provide powerful rather than rapid movements. The interspecific degree of paw modification varies. The highest specialisation is found with shovellike feet in badgers. Adapted to their partly vegetarianism the tooth pattern bears omnivorous character.

The flexibility of their spine, elasticity of the elongated limbs and their rapidity enable the members of the genus Martes and some close relatives to pursue their prey even on trees.

Otters, above all the sea-otters, are highly specialised to an aquatic mode of life. Body shape, musculature, skeleton, eyes, lungs etc. Show anatomical adaptions to swimming and diving. Conspicuous are the streamlined shape, the mighty musculature of bode and vertebral column and the feet formed like oars.

Hannover no publisher 1985, 103, (3) p.:
8 tabels, 23 fig., 99 references.
In GERM, Su. ENGL.

Authors abstract

Ophthalmology of exotic pets.

Michael G. Davidson.

The eyes of exotic small mammals, birds, and reptiles have developed uniquely as dictated by the environments of their ancestors. Disease processes that involve the eyes of exotics often reflect these unique characteristics; however, the eye responds to insult in a limited number of ways. This limitation is no less true in exotic species than in common domestic animals. with this concept and a general understanding of the principles of veterinary opthalmology, the clinician is equipped to manage ocular disorders of any species, including the exotics.

Continuing Eduacation Article no. 3. 8 fig., 65 references.

Authors summary

Characterization of the neutrophil defect in the Chediak-higashi syndrome mink using a chemiluminescense assay.

Carter, William Ellis.

A luminol chemiuminescence (CL) assay, which rapidly, nonsubjectively, measures the high energy antimicrobial oxygen species formed during the initial phagocytic event was adapted to CHS mink to characterize that animal's neutrophil defect.

The CHS mink latex induced, luminol enhanced (0.5×10^{-5}M) neutrophil CL measured in a liquid scintillation counter "incoincidence" produced 15.345 ± 6.471 counts per minute (CPM). This was significantly less ($p<0.05$) than the 196.440 ± 66.980 CPM observed with normal mink neutrophils.

The CHS neutrophil defect could be further amplitied *in vitro* by using a higher concentration of luminol (8×10^{-6}M). A similar significant deficit ($p<0.05$) of the CHS neutrophil CL response was observed using phorbol myristate acetate as the CL induser in the 8×10^{-6}M luminol enchanced assay compared to normal mink. Using the peak CPM of normal mink neutrophil CL as an index of phagocytic function it was also shown that the latex incuded CL response og CHS mink neutrophils was not enhanced by mixing normal with CHS neutrophils in ratios of 80:20, 50:50, and 20:80.

The time of onset of the peak CL response was documented by transmission electron microscopic examination of glutaraldehyde fixed CHS and normal mink neutrophils two minutes after the addition of latex particles. The subjective evaluation of the electron micrographs was that both groups of neutrophils were capabel of phagocytizing similar numbers of latex particles, and the time of onset of the peak CL response obtained during the CL assay was valid.

By using enzyme inhibitors of oxidative metabolism, superoxide dismutase and catalase, it was shown that the CHS-CL response, even though significantly less than the normal response, consisted of the same reactive oxygen species as the normal CL response because of the similar manner of CL inhibition.

These results demonstrate that the dual "in-coincidence" photomultiplier CL assay, is quick, reproducible, and effective in detection of the CHS neutrophil defect. The CHS neutrophil is not defective in its ability to phagocytize but is defective in its ability to generate the high energy antimicrobial oxygen species assessed by the luminol enhanced CL assay. This defective CL response partially explains the compromised host defense of CHS mink.

Dissertation Abstracts International, B: 47(2):447, 1986.
Only abstract received.

Authors abstract

The relationship of selection for behaviour with reproduction in American mink.

Belyaev, D.K.; Trapezov, O.V.

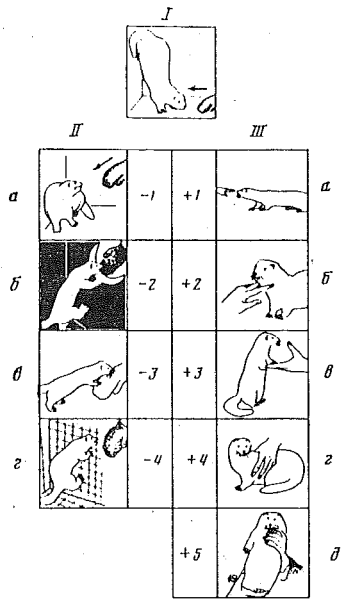
Among American mink, the percentages that were (1) aggressive, (2) timid, and (3) quiet and inquisitive toward man were 17.3, 78.5 and 4.2 resp. selection for aggression and for tameness were both effective. Tame females mated, on average, 3 days earlier in the breeding season than aggressive females. Reproduc-

tive performance was better in tame than in aggressive females.

Zhurnal Obshchei Biologii: 47(4):445-450, 1986.
5 fig., 5 references.
In RUSS

CAB - abstract

Рис. 1. Поведенческое разнообразие американской норки в ответ на действия человека. I — трусливое; II — агрессивное: *а* — демонстрация угрозы, *б* — контакт, нападение из укрытия, *в* — активное, нападение вне укрытия, *г* — атака на приближающегося к клетке человека; III — спокойное: *а* — демонстрация доверчивости, *б* — контакт, спокойная реакция на касание к передней части туловища, *в* — активный контакт, *г* — позволяет коснуться любой части тела, но сопротивляется при попытке взять в руки, *д* — позволяет взять себя в руки



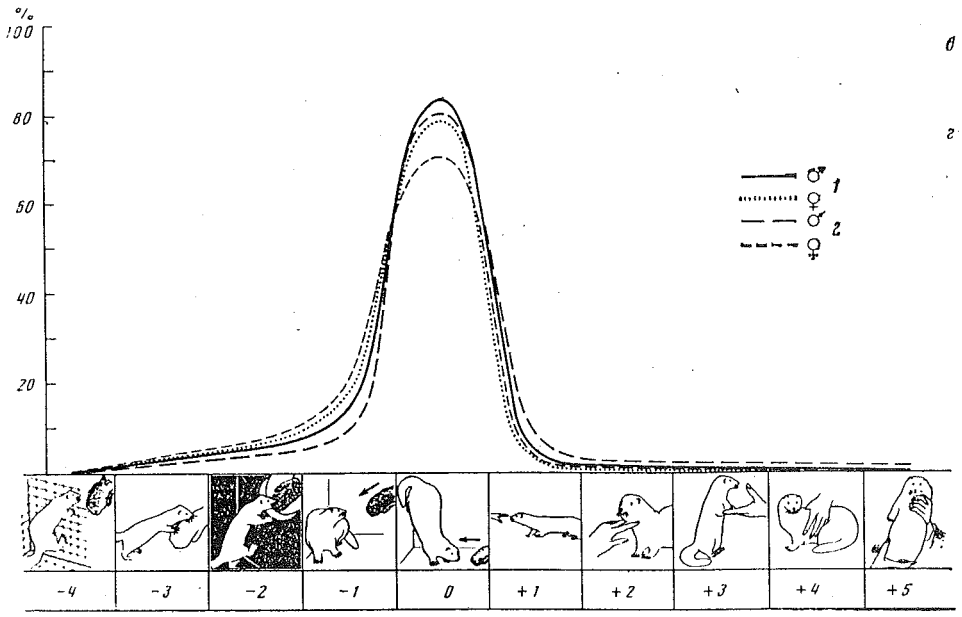


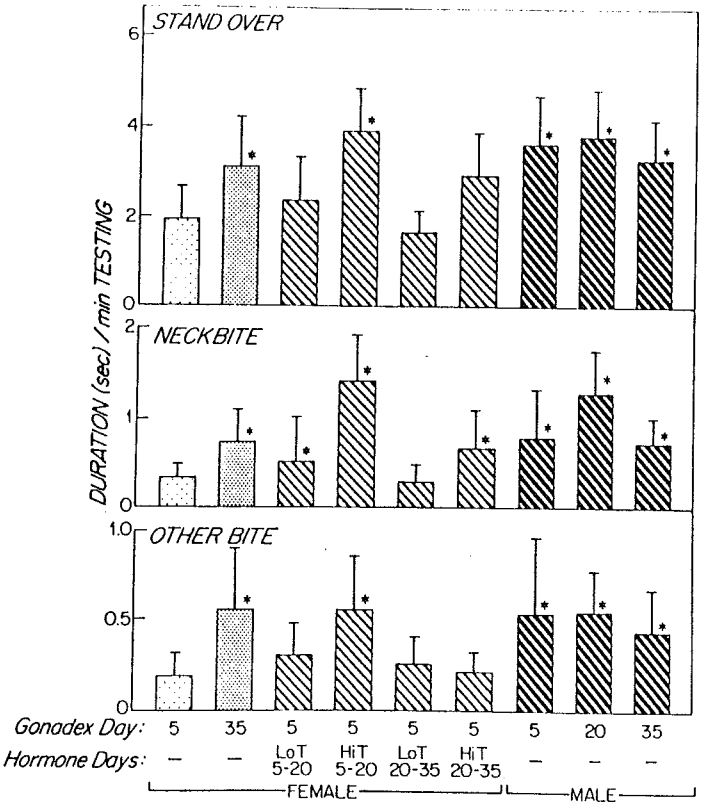
Рис. 2. Кривые распределения частот поведенческих типов. *1* — стандарт, *2* — сапфир

Sexual differentiation of play behavior in the ferret.

E.R. Stockman; R.S. Callaghan; M.J. Baum.

Three experiments were performed to elucidate the endocrine mechanisms responsible for sex differences in the prepubertal play behavior of ferrets. In Experiment 1, gonadally intact adolescent males exhibited higher levels of "stand-over" behavior than females did in tests between 63 and 123 days of age with gonadally intact female partners of the same age. In Experiment 2, ferrets exposed to androgen or to ovarian steroids over Days 5-20 of postnatal life subsequently exhibited significantly higher levels of stand-over behavior in tests with female partners than did control females gonadectomized on Day 5 and not subsequently given any steroids. Hovever, none of the subjects in Experiment 2 exhibited levels of stand-over behavior comparable to those of the gonadally intact males in Experiment 1. In Experiment 3, males gonadectomized and implanted subcutaneously with testosterone capsules on Day 70 and tested with female partners at 84-96 days of age exhibited levels of stand-over behavior comparable to those observed in Experiment 1 in gonadally intact males of the same age *(Weeks 12-14)*. Males gonadectomized on Day 70 and given no hormone at the time of testing exhibited significantly lower levels of this behavior. Significantly lower levels of this behavior were also exhibited by males gonadectomized on Day 35 and females gonadectomized on Day 70 regardless of whether they were tested with testosterone present after Day 70. Sex differences in the expression of prepubertal play behavior of

Figure 1. Play behavior (means ± *SE*) exhibited by male and female ferrets gonadectomized (gonadex) at different postnatal ages (Day 5, 20, or 35), given either a high (Hi) or a low (Lo) dose of testosterone (T) by sc Silastic capsules over Postnatal Days 5–20 or 20–35 (hormone days), and tested over Days 53–123 in the absence of any concurrent hormone. (*Significantly different from the control group, females gonadectomized on Day 5 and given no hormone replacement, $p < .05$, analysis of variance followed by t test for differences among several means.)



ferrets apparently result from differential exposure of males and females to androgen over an extended postnatal period.

Behavioral Neuroscience 1986. Vol. 100. No. 4. 563-568.
3 tabels, 1 fig., 23 references.

Authors summary

Effectiveness of neuroleptics in preventing and treating transport stress in mink.

Nabiev F.G.; Volodyagin A.N.

Intramuscular injection of 0.5 or 1 mg clorpromazine hydrocloride was recommended 30 min. before transport of mink by road vehicle.

Sbornik Nauchnykh Trudov Kazanskogo Veterinarnogo Instituta: 34-38, 1984. In RUSS.

CAB - abstract

Significance of sleeping plate as a thermal protection for farmed raccoon dogs (Nyctereutes procyonoides)

Korhonen H.

1. Both living and model animals were used to evaluate the significance of a sleeping plate as a thermal protection for the farmed raccoon dog *(Nyctereutes procyonoides, Gray, 1834)*, its use by the animals and its cleanliness while used.

2. A dry sleeping plate effectively prevented heat loss from the model animal while a wet plate was less effective. The degree of heat transfer was highest when the plate was ice-covered. Heat loss in windy conditions was significantly higher than in calm conditions.

3. The use of a sleeping plate did not depend on ambient air temperature; in spite of the cold weather (about -25°C) only one in four animals preferred to lie on plate. Animals which did not prefer to use sleeping plates most eagerly messed them up.

Comp. Biochem. Psysiol. Vol. 87A, No. 3, pp. 631-633, 1987
2 tabels, 6 references.
Authors abstract

Relationship between seasonal energy economy and thyroid activity in farm-raised raccoon dogs.

Korhonen, H.

1. The levels of thyroid hormones (T_3, T_4), total lipids and urea in blood serum of adult farmed raccoon dogs (*Nyctereutes procyonoides* Gray 1834) were monitored year round, and compared with seasonal changes in body weight and feed consumption during intense, maintenance and restricted fasting feeding.

2. Thyroid hormone levels tended to be low during winter whereas during the rest of the year no marked seasonal differences were observed. That thyroid hormone levels were influenced by altering feed intake suggests the hypothesis that the winter hypothyroidism observed was a result of a decreased level of voluntary feed intake.

3. The colder the temperature was during winter, the less the animals consumed the feed supplied.

4. Neither season nor feed intake level affected serum levels of total lipids or urea.

5. Marked seasonal changes in body weight of the animals were found. From maximum values occurring in early winter their body weight genrally dropped about 30% reaching the minimum values in mid-summer. This marked seasonal change was mainly the result of changes in subcutaneous fat reserves.

Comp. Biochem. Physiol. Vol. 87A, No. 4, pp. 983-988, 1987.
1 tabel, 4 fig., 31 references.

Authors abstract

Morphostructural modifications of the fur at nutria and the influencing elements.

Nicolae Pastirnac; Romulus Gruia.

As it is known, the process of fur moulting differs very much at different species of fur animals, as a pure biological aspect linked to morphostuctural modifications of the fur, as well as linked to the multitude of elements influencing the respective process. In this context we consider convenient the attempts to elucidate the mechanisms of season modifications of the fur, especially at the species with moulting diffused all over the year, as it is the case of nutria.

The study proposes itself to synthetize a series of distinct aspects linked to the nutria furs, aspects which interfere and condition each other along the period of the fur evolution at this species.

There were described the moulting periods in function of the multitude of exogeneous and endogeneous elements, as well as aspects of fur structure, linked to the physiology and the quality requirements at nutria furs. All these were systematized in the following subchapters: age and season variability at adult nutria, variability of the fur at youth and general morphological aspects at nutria fur.

The paper underlines the fact that the adapting process at which nutria is still submitted and the consecutive changes that appear during moulting demonstrate that most quantitative indicators are not yet perfectly consolidated, these ones being easily liable to the variations of the medium conditions.

In contrast which nutria breeding under climatized conditions, where moulting takes place almost invariably all over the year identically to the original region of the respective species, the fur variability at animals bred under a traditional system changed in function of climate, being characterized by three distinct stages: spring moulting, fur formation at youth and autumn moulting.

The study also puts into evidence, as a general conclusion, the fact that nutria moulting is a complex physiological process, controlled by the neuro-endocrine system, especially through endocrine CNS and, respectively, through epyphysis and induced by a multitude of elements: season, age, sex, body region, light, humidity of the atmosphere, maintainance system, diet etc.

Productia animala - zootehnie si medicina veterinara, 7, 1987, 23-31.
7 fig., 14 references.
In ROMN, Su ENGL, FREN.

Authors summary

Physiologic and electrocardiographic responses of American river otters (Lutra Canadensis) during chemical immobilization and inhalation anesthesia.

John, P. Hoover; Eugene M. Jones

Rectal temperatures and heart rates of American river otters (*Lutra canadensis*) decreased significantly ($P < 0.05$) during chemical immobilization with i.m. ketamine hydrochloride in combination with xylazine hydrochloride and acepromazine and during induction and while dorsally recumbent, which was reflected by a respiratory acidosis on arterial blood gases. Declines in rectal temperatures and heart rates were not found to be a function of dosage (mg/kg) of the ketamine combination used except for rectal temperatures of otters in relatively poor body condition (inanition). The electrocardiograms of isoflurance-anesthetized otters were similar to those recorded on immobilized otters with the exception of an r' deflection in the ventricular depolarization complex (RSr'). Electrocardiographic criteria were not found which predicted the degree of right ventricular or generalized cardiac enlargement seen radiographically.

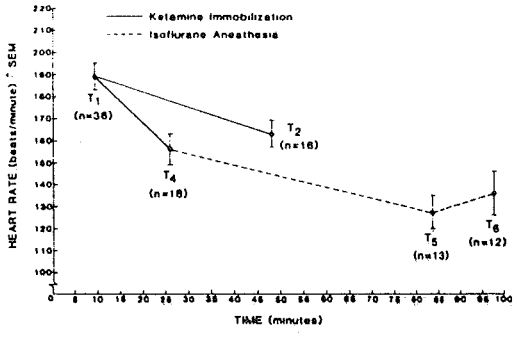


FIGURE 3. Heart rates of American river otters taken during immobilization by ketamine combination and isoflurane anesthesia.

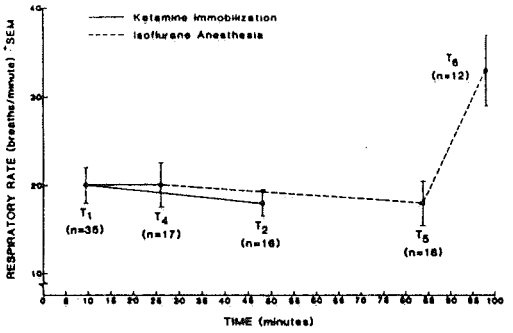


FIGURE 4. Respiratory rates of American river otters taken during immobilization by ketamine combination and isoflurane anesthesia.

Journal of wildlife Diseases, 22(4), 1986, pp. 557-563.
2 tables, 5 fig., 13 references.

Authors abstract

Renal function and fractional clearances of American river otters (Lutra canadensis).

John P. Hoover; Ronald D. Tyler.

The finely labulated kidneys of American river otters (*Lutra canadensis*) are not visualized on plain abdominal radiographs. Similar values for blood urea nitrogen (BUN), creatinine, and uric acid were obtained on different analytical systems used in 1984 and 1985. The mean ± SD for measured plasma osmolalities (309.80 ± 8.86 mOsmol/kg) of otters in 1985 was significantly ($P < 0.01$) less than that of calculated serum osmolalities in the same 1985 specimens (321.61 ± 5.64 mOsmol/kg) and in 1984 specimens (322.20 ± 7.16 mOsmol/kg). Urine specific gravities and osmolalities were highly correlated (r = 0.92). On routine urinalysis, protein and bilirubin were frequent chemical findings, and urobilinogen was present in all urine samples. White and red blood cells and epithelial cells were frequent findings on urine microscopic examinations. *Proteus mirabilis* was cultured from four of four female otters with genitourinary infections. The mean ± SD creatinine values for paired serum and urine samples (n = 13) were serum creatinine (Scr) 0.66 ± 0.09 mg/dl and urine creatinine (Ucr) 186.9 ± 55.6 mg/dl. Corresponding values for serum electrolytes (Se) and urine electrolytes (Ue) yielded mean ± SD

calculated renal fractional clearances (FC = Ue/Se x Scr/Ucr) of sodium 9.65 ± 5.81 x 10^{-4}, potassium 4.15 ± 2.01 x 10^{-2}, cloride 10.81 ± 5.33 x 10^{-4}, calcium 4.52 ± 4.46 x 10^{-3}, and phosphate 6.58 ± 3.44 x 10^{-3}.

Journal of Wildlife Diseases, 22(4), 1986, pp. 547-556.
3 tables, 3 fig., 18 references.

Authors abstract

Saffan Anesthesia in the raccoon: Apreliminary report.

R.E. Clutton; L.B. Duggan.

This combination of alfaxalone and alfadolone was injected i/m (after restraint by pole snare) into 18 raccoons (Procyon lotor) at 12-18 mg/kg. The anaesthesia produced by 15 mg/kg commenced after 15-36 min and lasted for 3-45 min.

J. Zoo An. Med. 17: 91-99, 1986
6 tables, 13 references.

CAB - abstract

A study on the use of fats from polar fox (Alopex lagopus), silver fox (Vulpes vulpes) and mink (Mustela vison schreber) for cosmetic and pharmaceutic purposes.

I. Kosko; J. Batura.

This objective of this work was to determine (a) the quantities of fat that can be secured from polar foxes, common foxes, and minks; (b) its physico-chemical properties; (c) the qualitative and quantitative composition of fatty acids of that fat; and the constancy optium, storage time, and melting efficiency of the adipose tissues in question.

Summing up the results of this work it should be stated that physico-chemical properties and the composition of fatty acids of polar fox fat are similar to those of mink fat, the latter being considered by cosmetologists the material of high dermatological value. A very good point of polar fox fat is the lack of unpleasant odour. The second good point of this fat is that its volume in this country runs high (nearly 18 times that from minks). The fat from polar foxes can be used on a large scale as a new valuable material for cosmetic and pharmaceutical industries.

Fat Science Proc. 16th ISF Congress, Budapest, 1983, pp. 577-584.
3 tables, 2 fig.

Sequences from the text/G.J.

Polar fox reserve fat as a raw material of the industry of cosmetics.

B. Baranowska; H. Szczepanska; M. Galazka; K.Brezezinska; D. Mazur.

The investigation of fox fat carried out in the authors' laboratories has shown excellent dermatological properties related to its high oleic acid and significant linoleic acid content, and the presence of fat-soluble vitamins A, D, E and K.

Thus the value of polar fox fat is comparable with that of mink fat which is often utilized in several countries by the pharmaceutical industry and particularly by the industry of cosmetics in manufacturing cosmetic emulsions like body milks, hydrating milks and even shapooings and bath-oils.

The fatty acid composition of fox oil stands near to that of the saponifiable oils used most frequently in cosmetics. The resemblance in the composition of cosmetic fox oil and avocado oil is particularly noteworthy. The polish industry of cosmetics already utilized successfully fox oil instead of avocado oil. The quality of creams, hydrating milks, body milks, in the processing of which fox oil was substituted for avocado oil, was satisfactory.

Fat Science Proc. 16th ISF Congress, Budapest, 1983. pp. 585-591.
7 tables, 1 fig.

Sequences from the text/G.J.

The ferret as a replacement for the dog in toxicity studies.

J.E. Hart

The ferret has been put forward in recent years as a potential replacement for the beagle dog in drug toxicity studies but while it has considerable cost advantages over the dog, there is less background information on its use and it lacks the dog's balance of practical assets for instance ease of phlebotomy. The ferret appears to be less suitable than the dog for use in safety evaluation, but nevertheless represents a useful second non-rodent species where additional toxicological characterisation of a drug or other chemical is required.

Animal Technology:Vol. 37 No.3: pp. 201-205, 1986.
36 references.

Authors summary

Situation and outlooks of the breeding work in rabbit and fur animal production.

Holdas, S.

Eighty years ago nobody had seen fantasy in table rabbit production. Ever since this branch of productions has achieved considerable development and it has became integrated part of the Hungarian animal production. There are similar opportunities in the field of production of Angora and different fur animals.

The author considers important the up-to-date selection, breeding value estimation and hybridization.

Allattenyesztes es Takarmanyozas (Hungary). 1986 35(2) p. 165.171.
In HUNG Su ENGL.

Authors summary

Otter breeding (Lutra lutra, Linnaeus, 1758) in Polish zoological gardens

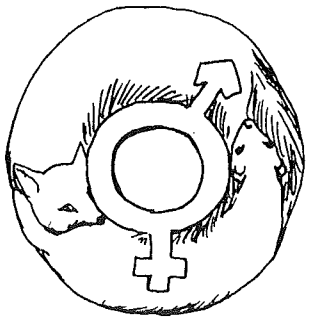
J. Smielowski

Otter has been exhibited in polish zoological gardens for 100 years. Information has been gathered on individuals of this species (N = 35) bred during the last 30 years (1952-1983). In the fifties the otter was bred in numerous quantities in Polish zoological gardens which could account for their great numerosity in this period of natural population due to its local origin. In the seventies new attempts were made to breed the species basing on imports from Hungary (zoo in Poznan) and from Bulgaria (Wroclaw, Lodz, Poznan). Under conditions of the Polish zoological gardens the survival rate of otter is relatively low and equals three years one month and 27 days (N = 26) and it is an absolute exception that a male had been kept alive in Cracow zoological garden for 10 years 7 month and 17 days. The experiments seem to indicate two problems in otter breeding under captivity conditions: the first one-adaptability period of young otters, originating usually from freedom hence their great mortality during the first year (N = 6) and the second one - vehement and quick reaction of the organism of individuals staying in the garden for longer than one year (after the period of initial adaptation) in result of drastic environmental changes (thermal, e.g. in Lods zoo). The survival rate is most possibly influenced also by the type of premises, deprived as a rule of its natural substrate, in which the species is kept and exhibited.

Roczniki Akademii Rolniczej w Poznaniu. Zootechnika(Poland).(1985).(No.163/33) p. 85-91.
1 table, 6 references
In POLH. su. ENGL, RUSS

Authors summary

GENETICS



Genetic polymorphism of IgG in mink. I. Identification of 8 allotypes.

D.K. Belyaev; I.I. Fomicheva; A.V. Taranin; O.K. Baranov.

By means of intraspecific immunization of domestic mink (*Mustela vison* Schr.), 8, in all probability, complex IgG allotypes were detected in their sera. Based on the results of analysis of the preparations of the IgG heavy (H) and light (L) chains, as well as proteolytic IgG fragments, we assigned the allotypes detected to three groups: (1) marker of the L chain, L1; (2) allotypes of the C region of -chains (H2, H3, H4, H6, and H8) and conformational allotype H7; (3) conformational allotype 5 with unknown location on the chains.

Expl Clin. Immunogenet. 3: 10-19 (1986). 7 fig., 34 references.

Authors abstract

Genetic polymorphism of proteins in mink in relation to resistance to Aleutian disease.

Ivanova, L.P.; Evsikova, L.P.

In the population studied, all animals were TfA/TfA. The incidence of Aleutian disease in mink of genotypes AA, AB and BB at the postalbumin locus was 65.6, 61.5 and 50.0% resp.

Moscow, USSR: 135-138, 1985. 3 tables, 5 references. In RUSS

CAB - abstract

Genetic polymorphism of IgG in mink II. A Genetic analysis of allotypes.

D.k. Belyaev; I.I. Fomicheva; A.V. Taranin; O.K. Baranov.

Population distribution and inheritance pattern were analyzed in mink IgG allotypes: L1 (L-chains), H2, H3, H4, H6, H7, and H8 (the constant region of the H-chains, i.e. C gamma-allotypes) and conformational allotype 5 with unknown chain localization. Contrary to expectation, neither allelism, nor close linkage were demonstrated for these allotypes. The major feature of the inheritance of H2, H3, and H4 C gamma-allotypes, as well as allotype 5, was significant excess of negative (without these allotypes) progeny in the F_1 generation from monohybrid
cross. The explanation offered for this departure of the C gamma-allotypes from normal Mendelian genetics suggests widespread latencies of their expression in mink.

Expl clin. Immunogenet. 3: 65-74 (1986). 6 tables, 16 references.

Authors abstract

Genetics and evolution of the mink Lpm system

Baranov, O.K.; Kutyavina T.V.; Yermolaev V.I.; Savina M.A.; Belyaev D.K.

Data on immuno- and biochemical identification, genetic control and phylogenesis of new allotype Lpm13 of the Lpm system in domestic mink are presented. This allotype is encontered in mink populations with the frequency 0.9

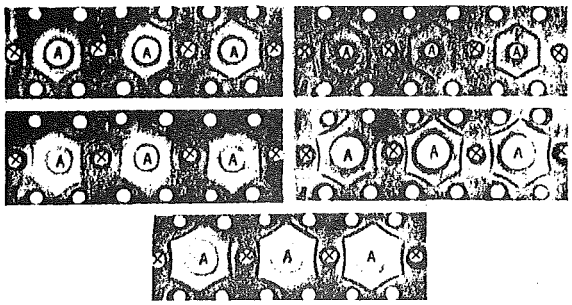


Рис. 1. Панельные испытания норочьих сывороток. В лунках А: анти-Lpm4 (*а*), анти-Lpm8 (*б*), анти-Lpm10 (*в*), анти-Lpm11 (*г*), анти-Lpm13 (*д*). В лунках верхнего и нижнего рядов каждой пластинки двойной иммунодиффузии внесены 12 норочьих сывороток; крестиком помечены лунки контрольных норочьих сывороток, реагирующих положительно

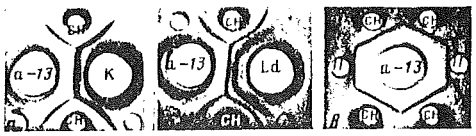


Рис. 2. Иммунохимические тесты на принадлежность Lpm13 к Lpm-изотипу. Обозначения: сн – сыворотка норки, а-13 – анти-Lpm13, К – кроличья анти-Lpm, Ld – кроличья анти-липопротеин низкой плотности норок, п – препарат Lpm-протеина. *а* – *е* – см. объяснения в тексте

and higher. The availability of Lpm13 genetic narker permitted another haplotype to be revealed, in addition to the eight known Lpm haplotypes by means of genetic analysis. It was established that, alongside with the earlier described haplotype $Lpm^{3,4,6,8,9,10,11}$ (abbreviation H3), there exist a similar haplotype, $Lpm^{3,4,6,8,9.10,11,13}$ (abbreviation H3.13), containing the Lpm^{13} gene. Of the rest seven haplotypes, five have the Lpm^{13} gene and two do not. Taking into account this gene and corresponding antigenic marker, the differentiation of 28, instead of 25, phenotypes and 45, instead of 36, genotypes for the Lpm system became possible. Lpm13 antigenic specificity was found with no exception in all individual serum samples taken from ten species and interspecific hybrids of Mustelidae which are closely related to domestic mink. The data obtained give grounds to refer the newly identified Lpm^{13} gene to the first evolutionary conservative category of genes of the multigenic Lpm system which is also represented by the Lpm^{6}, Lpm^{9}, Lpm^{10} and Lpm^{11} genes. The hypotheses of instantaneous formation of polymorphism of the Lpm system in domestic mink are briefly regarded.

Genetika, USSR: 23(1): 143-156, 1987.
5 tables, 3 fig., 24 references.
In RUSS Su ENGL.

Authors summary

Heterochromatin heteromorphism (C-band) in the karyotype of the blue fox (Alopex lagopus)

Marek Switonski

In the karyotype of the blue fox ten chromosome pairs with one heterochromatic (C-band) arm exist. Among 204 animals (originated from 19 families) ten foxes showed heterochromatin heteromorphism; one chromosome had not the heterochromatic arm. These animals belonged to two families. G-band patterns showed that observed heteromorphism concerned the chromosome pair No. 13.

Rocz. Nauk. Zoot. T. 12, z. 1 (1985) 29-35
1 tabel, 5 fig., 17 references
In ENGL Su POLH, GERM, RUSS.

Authors summary

Fox colors in relation to colors in mice and sheep

Stefán Adalsteinsson, Páll Hersteinsson, Eggert Gunnarsson

Color Inheritance in foxes is explained in terms of homology between color loci in foxes, mice, and sheep. The hypothesis presented suggests that the loci *A* (agouti), *B* (black/chocolate brown pigment) and *E* (extension of eumelanin vs. phaeomelanin) all occur in foxes, both the red fox, *Vulpes vulpes*, and the arctic fox, *Alopex lagopus*. Two alleles are postulated at each locus in each species. At the *A* locus, the (top) dominant allele in the red fox, A^{r}, produces red color and the corresponding allele in the arctic fox, A^{w}, produces the winter-white color. The bottom recessive allele in both species is *a*, which results in the black

color of the silver fox and a rare black color in the Icelandic arctic for when homozygous. The *B* alleles are assumed to be similar in both species: *B*, dominant, producing black eumelanin, and *b*, recessive, producing chocolate brown eumelanin when homozygous. The recessive *E* allele at the *E* locus in homozygous form has no effect on the phenotype determined by alleles at the *A* locus, while E^d, the dominant allele is epistatic to the *A* alleles and results in Alaska black in the red fox and dark phase in the arctic fox. Genetic formulae of various color forms of red arctic fox and their hybrids are presented.

The Journal of Heredity 78:235-237.1987
2 tabels, 12 references

Authors abstract

Cross breeding heterosis in mink production

Bente Lyngs

Different breeding methods are described, the main stress laid on cross-breeding systems. In some of these systems, heterosis can be used to obtain a surplus production.

Heterosis is defined and explained by means of theories from literature. The most important ones are heterozygotism, dominance, over-dominance and epistasis. Description of causal theories is divided into two groups:
1. Genetic/statistic models.
2. Genetic/physiological models.
The two groups make up two methods to explain the same phenomenon.

Individual, maternal and paternal heterosis is defined and described. Examples of heterosis estimates of the reproduction and litter characters are stated. The estimates are taken from research in pigs, cattle, sheep, rabbit and mice. The utilization of heterosis is related to cross-breeding systems.

A cross-breeding program with single crossings and back crossings is initiated on four mink farms. The animal material is Scanblack and Wildmink with two lines within each type. Registrations have been made partly on live animals, partly on fur. The characteristics registrated include the reproduktion data of the females, live-animal evaluation of the pelt quality of males and females and pelt quality, colour, purity and size of groups of male pelts. The results are analyzed for heterosis.

Ph. D. - thesis, 70 pp.
28 tables, 10 fig., 71 references.
In DANH.

Authors summary translated by Charlotte Schomacker

Genetics of colour in nutria.

Siler, R.

Standard types (De Nuri and Brunellis), mutants with a dominant colour type (black, golden and white), and mutants with a recessive colour type (black, white, albinotic, pastel, smoke, beige, sapphire, platinum and lemon) are discussed, and their genotypes are suggested.

Chovatel: 24(12): 282-283, 1985.

CAB - abstract

Karyotype of the striped skunk, Mephitis mephitis

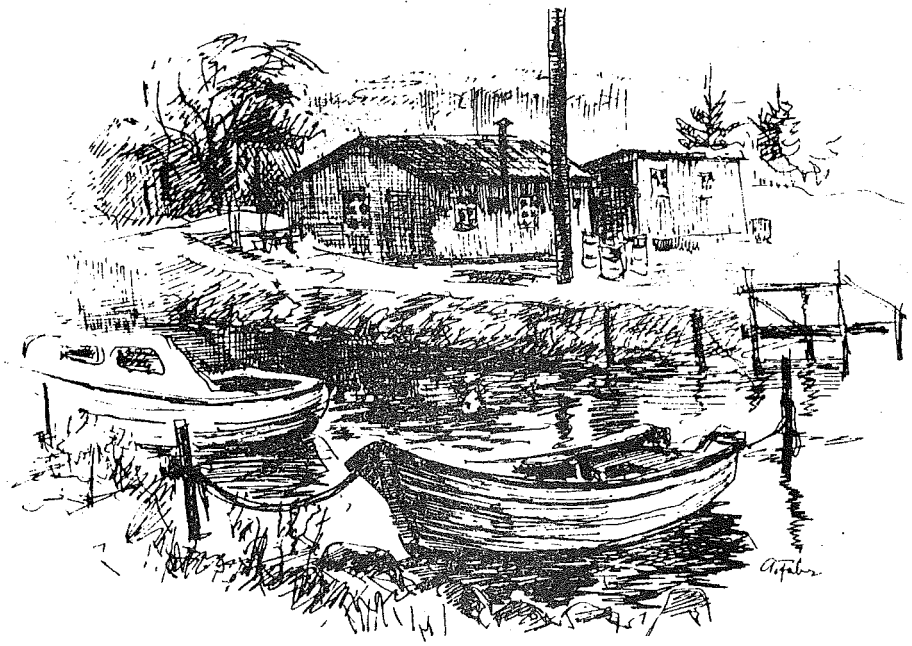
Fernande B. Genest; P. Morisset; R.P. Patenaude.

The karyotype of the striped skunk (*Mephitis mephitis* (Schreber)) was studied in fibroblast and blood cultures from 4 males and 6 females. Observations of standard, C-banded, and G-banded karyotypes show a diploid number of $2n = 50$, with 22 pairs of meta- submetacentrics and 2 pairs of acrocentrics. The X chromosomes is a large submetacentric, which can be precisely identified only with C or G bands. The Y, an acrocentric, is the smallest chromosome in the complement. One case of polymorphism was observed: one individual had a larger Y than in other males. On the whole, the striped skunk's karyotype is quite charac-

teristic by its C-banding (centromeric heterochromatin rare, some arms wholly heterochromatic) and G-banding (many arms without bands) patterns.

Génét. Sél. Evol., 1986, 18 (2), 11-122.
2 tables, 2 fig., 17 references.
In FREN Su ENGL.

Authors summary



Original report

Ethological observations concerning the reproductive instinct at mink

Romulus Gruia Dept. Agric. of State I. A. S. Prejmer, judetul Brasov, Romania

Summary
Through a systemic approach, the paper analyses the reproductive instinct at mink with the help of the ethological principles. The elements of psysiological ethology referring to this instinct, shown in farms during mating, suggest rich information linked to its characteristics and structure, as well as to the interference of external elements which determine the respective behaviours. At the same time, the paper underlines the applicable character of the ethological descriptive method of the behaviours linked to the reproductive instinct, the performed observations tending to ellucidate and direct some practical aspects referring to mink mating.

The zooproductive ecosystem specific to fur animal breeding through its characteristics, can easily enough disturb the psychophysiological mechanism chain at animals, in our case at minks, eliminating or modifying one or several of the internal or external causal elements.

Through their impact upon minks, modern technologies determine a series of behaviour modifications at animals, as through behaviour is exteriorized the integrate reactivity of the body as a system tending to maintain its dynamic equilibrium in comparison with the medium (5,6).

For the mink reproduction too, the anthropic factor constitutes the element of cybernetic regulation, as even during the first stages the farm mink reproduction isn't any more the result of heterosexual relations, obtained through selfregulation and interaction inside the groups of animals, being in fact the artificial result of man intervention (7,8).

The chain of reactions of the reproductive act, ethologically considered, depends on the internal motivational factors (ex. the sexual hormones), as well as on the external stimulative situations. These two causal cathegories, beside the ecological factors, are in interconditioning and lead, through selfregulation, to the final stage, i.e. procration.

The reproductive instinct, ethologically materialized through animal mating, starts and maintains in fact all the reproduction stages (the couple constitution through the direction pairing, mating, period of gestation, parturition, lactation and weaning).

As it is known, the instinctual behaviour of the pairs is formed by a series of sexual reflexes ordered as follows: erection, embracing, joining and ejaculation (1,4). From an ethological point of view one can find the three components of the diagram of instinctive action: the appetitive behaviour, the starting inborn mechanism and the consuming act (tabel 1).

Table 1: Ethophysiological structuration of the reproductive instinct components during pairing.

Diagram of instinctive action		Ethophysiogival elements
I.	Appetitive behaviour	- courting (stimuli-signals)
II.	Innate release mechanism	- hypophyso-gonadical cycle (endogeneous sources of the behaviour)
III.	The consuming act	- erection reflex - embracing reflex - joining reflex - ejaculation reflex

In the case of mink too, the spontaneous character of matings is given by the nervous potential of action accumulated in the nervous system. This state or tendency is started by the signal-stimuli (key-stimuly), which are known for all the organs of sence. Stimulating-signals for minks prepared to pairing may by represented, as it is known, by the presence of the opposite sex, characteristic smell, specific sounds during the reproductive season etc.

As for the "affinity" between partners during mink mating, were observed several cases when a female introduced turn by turn at several males accepts but one of these; and vice versa, it is pointed out the existence of a certain number of males who mate only a single female all the season (monogams). But this type of behaviour at males is undesired in industrial exploitation, where one is interested, as it is known, by the selection of polygam males because of economic considerations. The observations we have done in this sense, during 5 years, show in figure 1 the structure of male effective and the average on this period.

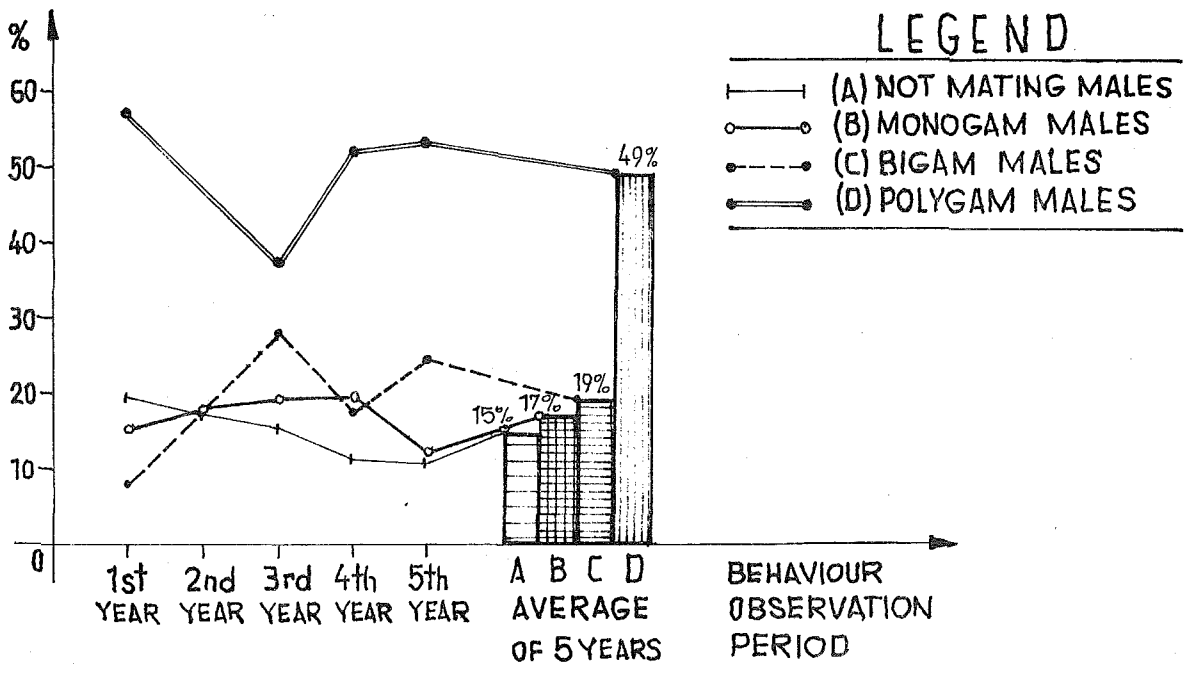


Fig. 1: Mating behaviour at mink males, as a manifestation of the reproductive instinct.

As a result of man action, modifications appear in animal behaviour, or, in other words, the industrial system of breeding modifies a behaviour resulting as a consequence of the phylogenetic evolution of minks in nature (where monogam matings are probably spread enough), into really polygam populations.

The reprodutive instinct ethologically considered, in a causal-explicative manner, may be ellucidated, the considerations in this sense starting from hormones and proprioceptive sensations as internal factors, which are, at the same time, an endogeneous source of the behaviuor.

The mink behaviour during mating season indicates to a great extent the hormonal rythmicity, behaviour evident at this species through repeated matings, through the acceptance of another partner at mating, through later return to the first partner designed (when technology allows it) etc. All these show in fact the "finding out" of females in full ovulation, the action being in accordance with the endocrine rythm and not different from it, the efficiency of matings becoming maximal. This manner of behaviour at mink leads to avoidance, as much as possible, of sexual behaviour incompatibility.

If in the relations between the female and the male appear the agressive intolerance, characterized at mink by merciless fight, as it is currently practiced, one interferes immediately, bacause this fact indicates that the female isn't in the ovulation period, or that she presents certain pathological aspects (infantilism, hermaphroditism etc) or that it is in fact a smaller male having the aspect of a female. Therefore, courting presents a variable duration and a different aspect of the behaviour.

Observations can go deeply by taking into consideration the behaviour of mink, during mating season, as a synthesis between reaction. Unitary instinctive actions are often composed of a series of other actions containing a determined sequence of partial actions. Thus, the two partners during mating change between them answers which are signal-stimulus for the other partner and for the next action. In the case of act, which greatly depends upon the courting and, next, mating duration (table 2).

Courting consists of a series of attitudes and movements, usually ritualized, which, in their quality of social releasers, have as function to induce at the respective partner the physiological and behavioural activation under the form of sexual disponibility, making possible mating followed by ovule fecundation (2,9). As a result of this behaviour is released the erectin reflex and then the whole series of instinctive actions.

The normal bahaviour during courting consists of specific movements and sounds of the mink male, corresponding to the behaviour type and respectively to the inborn release scheme described by

Table 2: Orientative duration of the partial actions of the reproductive instinct at minks manifested during mating (in minutes)

Specification	Appetitive behaviour -courting-	Consuming act		Medium
		Erection and embracing reflex	Mating and ejaculation reflex (intermitently)	Duration of mating
Short mating	1 - 2	1 - 2	1 - 3	2 - 5
Medium mating (normal, of a majority)	3 - 10	3 - 10	4 - 15	10 - 25
Long mating	over 10	over 10	over 15	40 - 180

Lorenz. The female is in estro phase, and the behaviour is situated between reaction and action.

The release of courting behaviour may be inhibited too due to the intense intensification of another instinct. At males, the overintensificated instinct which blocks courting is either the territorial agression instinct, or the ravage instinct (2).

When, for one reason or another, the mink male lacks the external situations necessary to normal manifestation of territorial behaviour (ex. cage subdimension; unknown cage, etc), he disposes of a specific energetic overcharge, due to which the perceptive sensorial thresholds diminish, making possible the release of an intense agressive answer to an inadequate stimulus-signal represented by the female, proper to the species. The same thing can be said for the ravage instinct, mink being a carnivorous animal as it is known, by a transfer of signification of the behaviour type may appear an impulsional accumulation. Thus, when the male catches the female with its mouth from the dorsal region of her neck it results a stimulatory situation, similar in a way, up to a point, to that one preceeding booty strangle, which probably supports the commutation of the accumulated impulse release.

The result of courting behaviour of this type is the fact that they lead to accidents and thus to mortalities among the mink females, particularly during the first and the third week of the mating season (figure 2).

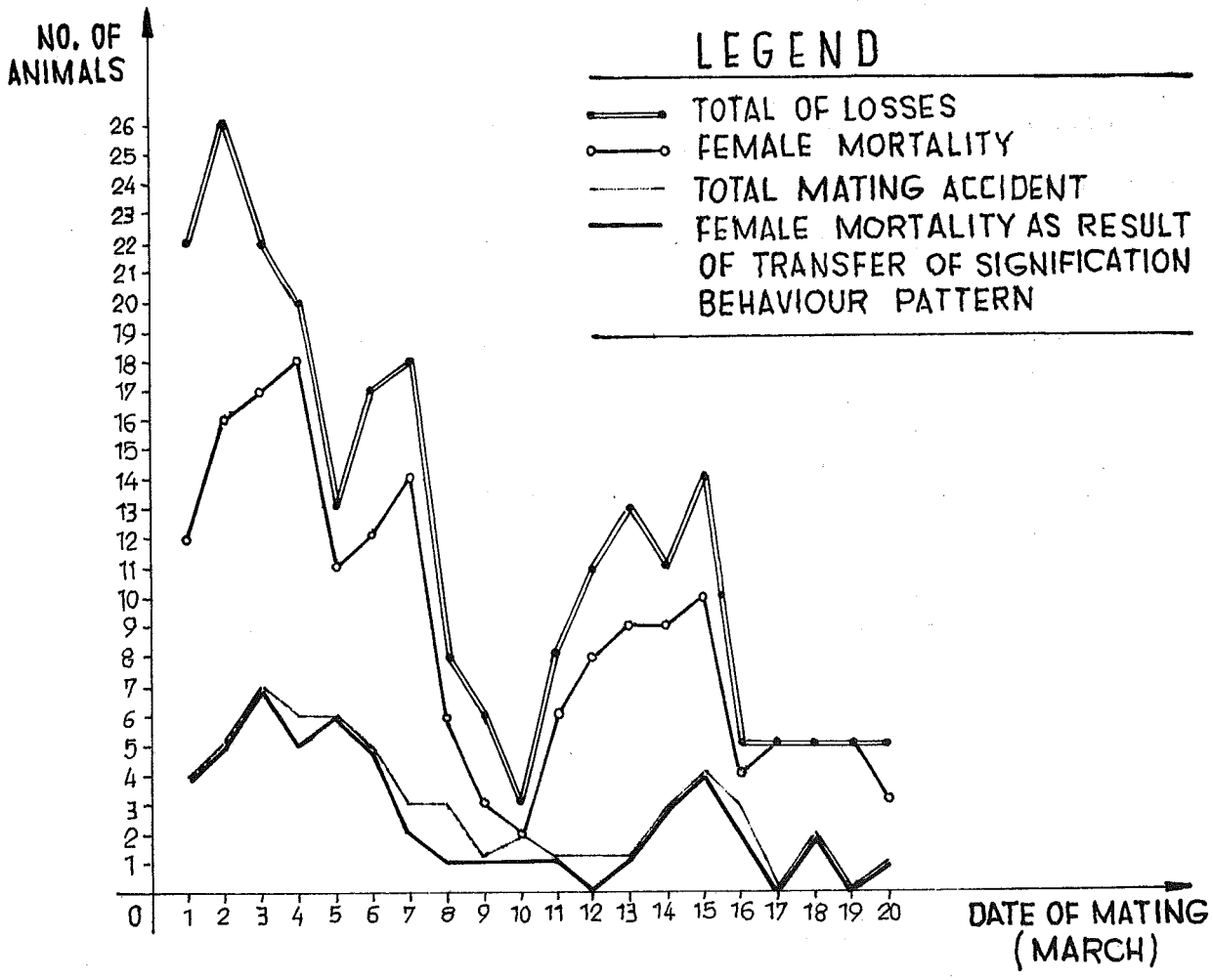


Fig. 2: Evolution of mink losses during the mating season as a result of the appetitive behaviour blocked by an overactivated instinct.

Age and type of colour are characteristic elements of the population of exploited animals, which influence the mink behaviour during the mating season. It was observed that minks of over 2 years generally mate sooner than first-time mated ones, and Standard mink begin and finish mating almost 4-5 days earlier than the coloured type of minks.

Referring to the age of the animals, as for the reproduktive instinct, one must take into consideration also the onthogenesis of the endocrine rythms in order to explain the behaviour modifications. The endocrine rythms perform evolutions during onthogenesis in accordance with the genetic programme of the species and of the individual. Onthogenesis participate, beside other parameters, at the definition of an endocrine rythm (10). Within the framework of mink breeding technology, this phenomenon interests for the first 3-4 years of life, regularly corresponding to the productive activity of the animals, although biological life is larger.

No doubt the individual variability has an influence on mink behaviour during mating season. The exagerated sexual dimorphism of the too fat males leads to the impossible mating, the action generally stopping at the phase of embracing reflex. The genocontent of the animal, the state of health and mink preparing for reproduction by an adequate technology of nourishment and maintenance influence also the behaviour and release of the reproductive instinct.

Another causal cathegory upon the characteristics of the instinctual behaviour of mink during the reproductive season is represented by ecologic aspects, especially by the elements of physical medium (climate and social elements) (7,8).

Mating technique generally influences the mink behaviour during the respective season. It is to be observed that males mate better in their own cage than in that one of the female, to give only an example, the explanation consisting in the manifestation of the instinctive behaviour of territory defence.

The territorial intolerance seems to be subordinated to the reproductive activity, fact that confirms *N. Tinbergen*'s observation (1951) in accordance with which agressivity is not an autonomous instinct, but a secondary one, being incorporated to other major instincts. The territorial behaviour proves to be especially the males' attribute, and its release takes place during courting and pairing period, being conditioned by the presence of the female. The agressive conflicts become the more intense and frequent, the intraspecific intolerance is the bigger so as the space at the minks' disposal is of reduced quality, as in the case of zooproductive ecosystems. in comparison with natural ones.

The mating act, that follows courting, is going on under the form of certain behaviour types characteristic to mink, during which the distance between individuals is annulled, partners establishing a full contact, of a variable duration (see tab. 2). Mating is part of the consuming act, thus representing an innate and rigid act.

To avoid stresses of any kind is indicated during the reproductive period at mink, as under the frame of the zooproductive ecosystem they may become disturbing elements or risky ones. The information received under the form of heat, smells, sounds, light, antigenic stimuli etc., not sufficiently controlled, through informational agression, lead to mink organism oversolicitation, especially among large animal agglomerations and shows itself by stress, behaviour troubles etc (3). That's why silence, sure manipulation of minks, animal reflex formation under the frame of mating technique are recommended in order to avoid behaviour modifications linked to the manifestation of reproductive instinct.

Another aspect of the ethology linked to the reproductive instinct is that one referring to the very active behaviour during pairing. The males used excessively, due to the type of behaviour are finally exhausted and the number of infecund matings grow. The performed observations indicate the utilisation of the whole lot of males at pairing, no matter the manner of behaviour.

It must be mentioned that, biologically, during the last decade of the month of march appear males' exhaustion, they presenting a specific behaviour during this period. Matings become rarer, the second female introduced to the male is very rarely mated (in 1-5% from the cases), regularly being manefested only the embracing instinct. The range of partial actions is interrupted and, therefore stimuli-signals not existing any longer for the other partner and for the next action, the unitary instinctive action isn't any longer achieved. The number in diminution at the end of the season, as an expression of the described behaviour,

Table 3: The manifestation of the reproductive instinct at mink at the beginning and at the end of the mating season.

Specification	U.M.	Day of Mating					
		1st. day	2nd. day	3rd. day	antepen. day	pen. day	last day
Couples of minks introduced for mating	No.	2410	2410	2410	312	248	215
Couples of minks With matings performed	No.	1100	1039	1141	48	8	3
	%	46,64	43,11	47,34	15,38	3,22	1,40
Average of mated females at the beginning and at the end of the season	%		45,37			7,61	

is put into evidence in table 3.

The duration of matings greatly increases at the end of the month of march, courting being longer, with resting breaks for the mink male. Instead of 15 minutes, pairing may have a duration of 30-40 minutes, but with large differences from a case to another.

Besides "disappearance" of sexual activity at the end of season, as well as at its beginning, appear a series of actions of the minks totally different from those characteristic to the reproductive behaviour. Ethologically, they constitute the so-called substitution activities or improper activities and they appear when two equally intense instincts are concomitently activated and can not be consumed on a natural way due to the strong irritation state (9). The actions have no connection to the real situation and have no direction component. For example sometimes during courting minks interrupt themselves from action and eat different feed remnants, drink, or play with the water from the watering place, sleep, or walk, jump in cage etc.

As it can be observed, the ethological descriptive method of behaviours linked to the reproductive instinct of mink has a pronounced appliable character. The profound study of the respective techniques makes possibilility of rentability growth, through the number of kits and respectively of furs obtained.

Conclusions

From the performed observations and the given examples, which define the instinctive behaviour of mink during the mating season, are put into evidence its characteristics as being spontaneous, typical, innate, that it consists of an appetitive behaviour, the release mechanism and the consuming act.

The reproductive instinct of mink is based on internal elements ready to overflow and external elements given by the excitation-signals resulting from the complexity of information (biological, technological, ecological, biocybernetical etc.) of the zooproductive ecosystem specific to the industrial exploitation of this species.

The applicable character of the descriptive ethological method of behaviours linked to the reproductive instinct of mink succeeds, through a characteristic outlook, to contribute to ellucidate some deep aspects referring to mink mating.

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The litter size in chromosomally polymorphic blue foxes

Auli Mäkinen; Outi Lohi

About 50% of the Finnish farm bred blue foxes have a Robersonian translocation in a heterozygous form, whereas the distributions of the homozygous form 2n=48 and the 2n=50karyotype with two acrocentric autosome pairs seem to be nearly equal. The effect on fertility exerted by the heterozygous Robertsonian translocation was studied on the material from a blue fox farm in Finland during four years. It is concluded that there is a tendency to litter size reduction in mating groups 2n=49 compared to the 2n=48 and 2n=50 mating groups.

In this investigation, the 2n=48 chromosome constitution in parental blue fox groups has every year had a slight tendency to increase the litter size. In addition, the segregation of the karyotypes within the litters of the parental 2n=49 mating groups is in favour of the 2n=48 karyotype. Hence, an evolutional tendency towards lower chromosome number without any acrocentric autosomes seems to be indicated.

Hereditas 107: 115-119 (1987).
7 tables, 10 references

Authors abstract

Reproduction of blue foxes (Alopex lagopus) with different number of chromosomes

I. Christiansen; Outi Lohi, Tove Cleeman-Mitchell; Tove Nørgaard Clausen; Niels Therkildsen

The karyotype 2n=48, 49 and 50 were in the breeding stock of Alopex species on a Danish fur farm represented in proportions 14-45-41%. Reproduction data is presented for 450 females of which 296 were mated with alopex males and 154 used in interspecific crossing with vulpes males. In Alopex x Alopex matings the age of the female had a significant effect on litter size. First year females averaged 1.3 pups less per litter than proven females. No effect of karyotype could be seen among young females. Among old females the karyotype 2n=50. In crossing with Vulpes males no consequent effect of age or karyotype was observed.

Acta Agric. Scand. 37:335-339, 1987
4 tables, 12 references

Authors summary

Effects of melatonin implantation on spermatogenesis, the moulting cycle and plasma concentrations of melatonin, LH, prolactin and testosterone in the male blue fox (Alopex lagopus)

A.J. Smith; M. Mondain-Monval; K. Andersen Berg; P. Simon; M. Forsberg; O.P.F. Clausen; T. Hansen; O.M. Møller; R. Scholler

Melatonin administration to male blue foxes from August for 1 year resulted in profound changes in the testicular an furring cycles. The control animals underwent 5-fold seasonal changes in testicular volume, with maximal values in March and lowest volumes in August. In contrast, melatonin treatment allowed normal redevelopment of the testes and growth of the winter coat during the autumn but prevented testicular regression and the moult to a summer coat the following spring. At castration in August, 88% of the tubular sactions in the testes of the controls contained spermatogenia as the only germinal cell type, whereas in the treated animals 56-79% of sections contained spermatids or even spermatozoa. Semen collection from a treated male in early August produced spermatozoa with normal density and motility.

Measurements of plasma prolactin concentrations revealed that the spring rise in plasma prolactin values (from basal levels of 1.6-5.4 ng/ml to peak values of 4.1-18.3 ng/ml) was prevented; Values in the treated animals ranged during the year from 1.8 to 6.3 ng/ml. Individual variations in plasma LH concentrations masked any seasonal variations in LH release in response to LHRH stimulation, but the testosterone response to LH release after LHRH stimulation was significantly higher after the mating season in the treated animals,

Effects of melatonin implants in the male blue fox

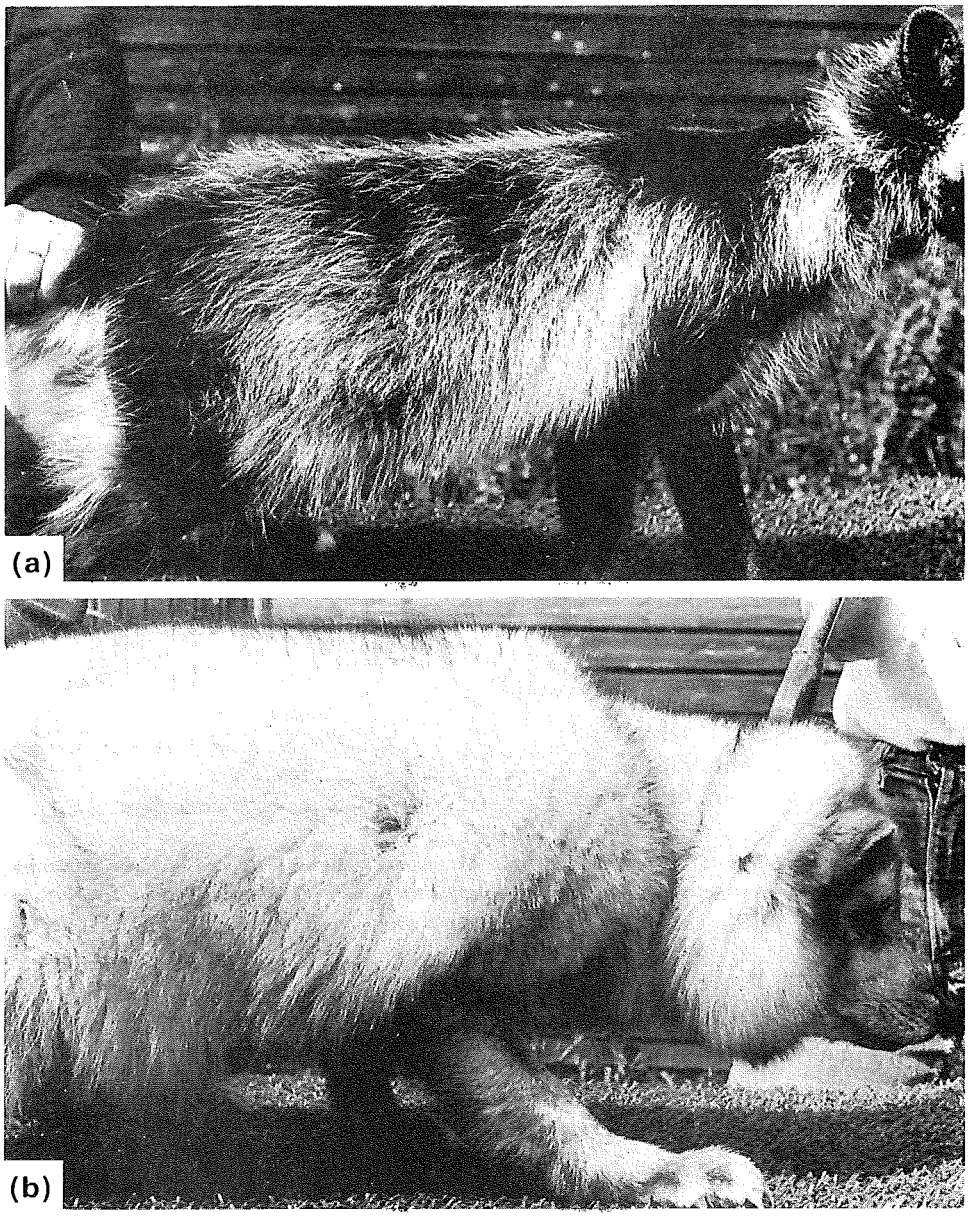


Fig. 7. Typical appearance of a control (a) and a treated (b) fox in July 1985.

indicating that testicular testosteone production was maintained longer than in the controls.

The treated animals retained a winter coat, of varied quality and maturity, until the end of the study in August.

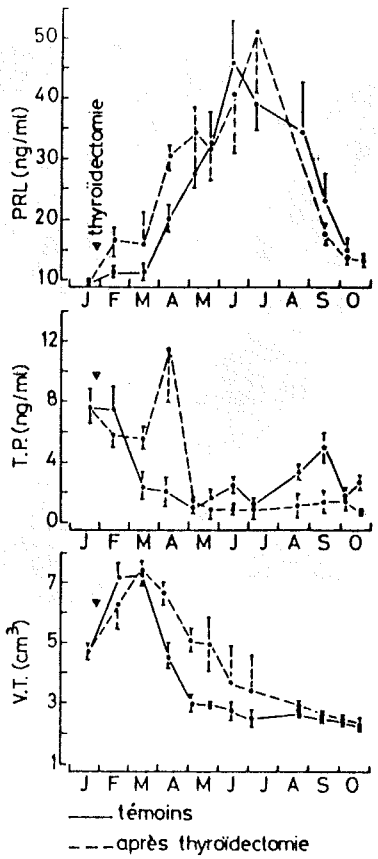
J. Reprod. Fert. (1987) 79, 379-390
7 fig., 35 refernces

Authors summary

Endocrinology. - Effects of thyroidectomy on spring and summer variations of testis activity and plasma prolactin in the mink

Jeanne-Marie Jacquet; Christian Coutant; Daniel Maurel; Line Boissin.Agasse; Jean Boissin

The possible role of thyroid hormones in the setting of sexual quiescence was investigated in the mink, since levels of thyroid hormones were earlier shown to rise while testicular activity decreased. When performed at the beginning of the sexual period, thyroidectomy transiently stimulated testosterone production, and significantly prolonged the duration of maximal testicular development. These results indicate that mink conforms to a pattern of inhibitory thyroid-testis interactions similar to that peviously descibed in several species of birds and mammals. Thyroidectomy was unable, however, to prevent ultimately the installation of sexual quiescence which also appears independent of the photoperiod. On the other hand, thyroidectomy did not modify, from February to October, the general pattern of prolactin secretion, even though the vernal stimulation of prolactin secretion, induced by increasing daylength, was significantly enhanced in the absence of thyroid hormones.



Effects of thyroidectomy, performed in winter, at the time of maximal testis activity and of minimal plasma thyroxine and prolactin levels, on seasonal variations of testis volume (V.T. cm^3), plasma testosterone (T.P. ng/ml) and prolactin (PRL ng/ml) in the mink under natural photoperiodic conditions.

C.R. Acad. Sc. Paris, t. 303, Série III, No. 9, 1986.
1 fig., 11 references.
In FREN Su ENGL

Authors summary

Differentiation in male ferrets of a sexually dimorphic nucleus of the preoptic/anterior hypothalamic area requires prenatal estrogen

Stuart A. Tobet; David J. Zahniser; Michael J. Baum.

Experiments were conducted to determine when during perinatal development testicular steroids act in ferrets to promote the organization of a bilateral nucleus in a medical position at the border of the preoptic area (POA) and anterior hypothalamus (AH), henceforth referred to as the male nucleus of the POA/AH (MN-POA/AH). The formation of the MN-POA/AH was promoted in female offspring by treating their mothers with testosterone over the last 11 days of the 42-day gestation period, wheras MN-POA/AH formation was not disrupted in males castrated within 1,2 or 5 days of birth. Additional experiments were conducted to determine whether the active hormone which induces differentia-

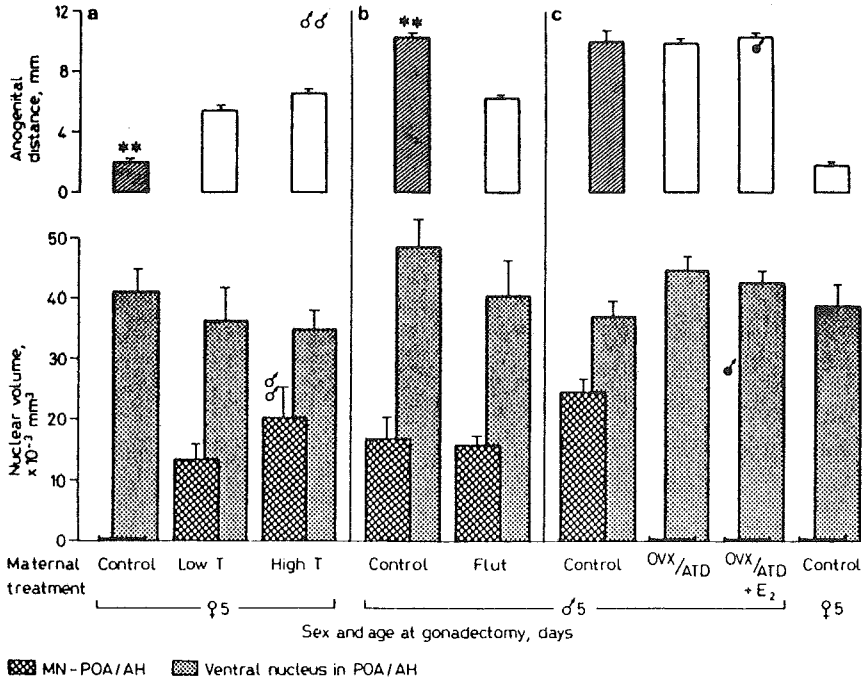


Fig. 3. Bottom panel: Effect of prenatal hormone treatments on unilateral volume of the MN-POA/AH and ventral nucleus in the POA/AH. In panal a, female offspring are from mothers treated with vehicle (control), low or high dosages of T over the last 11 days of gestation. MN-POA/AH volumes of 2 males from mothers treated with the high dose of T are also displayed (♂). In panel b, male offspring are from mothers treated with vehicle (control) or 15 mg/day of the antiandrogen, flutamide (Flut), over the last 11 days of gestation. In panel c, male and female offspring are from mothers which were ovariectomized on day 30 of gestation (OVX) and implanted with the aromatase inhibitor, ATD, with or without additional E_2 for the last 12 days of gestation. The female control group includes two females from sham-operated mothers, and one female each from ovariectomized mothers treated with ATD or ATD plus a low dose of E_2. The bar above OVX ATD + E_2 represents only the ventral nucleus volume of males exposed to a low dose of E_2 in which the MN-POA/AH was not discernible. The volume of the MN-POA/AH from one male exposed to a high dose of E_2 prenatally is also depicted (♂). Four animals were analyzed in each group. Top panel: Anogenital distances at birth of the animals displayed in the bottom panel. Data are expressed as mean ± SEM. **Significant treatment effect ($p < 0.01$).

tion of the MN-POA/AH in the male ferret is an androgen or an estrogen. MN-POA/AH formation was inhibited in males deprived prenatally of estrogenic stimulation via maternal ovariectomy and subcutaneous implantation of the aromatase inhibitor 1,4,6-androstatriene-3,17-dione (ATD) on gestational day 30. By contrast, MN-POA/AH formation was not disrupted in males exposed prenatally to the antiandrogen flutamide. These results imply that estrogen, derived from the neural aromatization of circulating testosterone, acts prenatally to promote the organization of the MN-POA/AH in male ferrets. The development of sex-dependent features of forebrain morphology may depend on the neural action of estrogen in males of diverse mammalian species.

Neuroendocrinology 44: 299-308 (1986). 7 fig., 48 references.

Authors abstract

Cyclic formation and decay of the blood-testis barrier in the mink (Mustela vison), a seasonal breeder

R. -Marc Pelletier

The correlations between the germ cell population and the blood-testis barrier were studied during puberty and throughout the reproductive cycle in a seasonal breeder, the mink. A classification of 12 stages, corresponding to the cellular associations appearing during the cycle of the seminiferous epithelium, was proposed and used to identify the stages of the cycle in pubertal mink. In adult mink, the reproductive cycle was divided into two spermatogenic phases - an active phase lasting 9 months, and an inactive phase lasting 3 months. The active spermatoge-

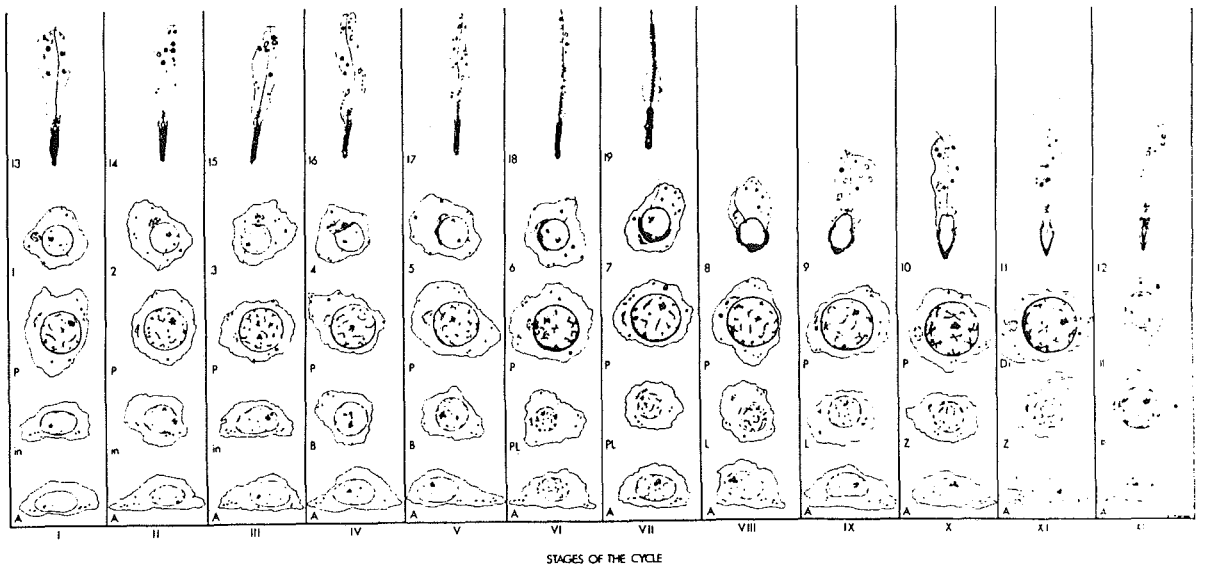


Fig. 1. The characteristic cellular composition of the 12 stages (Roman numerals) of the cycle of the seminiferous epithelium in the mink. These stages of the cycle are found in cross sections of seminiferous tubules and are composed of several different cellular generations. The steps of development of the spermatid (Arabic numerals) refer to the nuclear and acrosomal modifications observed during spermiogenesis. The first 12 of these steps of spermiogenesis were used to define the 12 stages of the cycle in the mink.

nic phase was broken down into three distinct periods: the first spermatogenic wawe.Degenerating germ cells were found in comparable and relatively low proportions during puberty and during the first and last spermatogenic wawes of the adult reproductive cycle. The permeability of the blood-testis barrier to intravascularly infused electron-opaque tracers (i.e., horseradish peroxidase and lanthanum) was tested at the time of the first spermatogenic wawe at puberty and throughout the reproductive cycle of the adult. The relationship between epithelial permeability and germ cell populations prevailing during puberty and during the first and last spermatogenic wawes of the adult active phase was the same. During puberty, the establishment of the blood-testis barrier did not coincide with the development of a tubular lumen. In adult mink, the barrier cyclically decayed during the last wawe of the active spermatogenic phase and reformed during the first wawe of the next active phase. The decay and the reformation of the barrier were not coincident with the appearance or disappearance of a particular generation of the germ cell population from the seminiferous epithelium but were correlated with cyclic cytological changes in Sertoli cells and the rythmic development and occlusion of the lumen. During the peak months of the active spermatogenic phase, however, a blood-testis barrier secluded spermatogonia and young spermatocytes from older generations of germ cells. It is concluded that 1) during puberty and also during the first and last spermatogenic wawe of the adult mink reproductive cycle, the development of germ cells is possible in the absence of acompetent, impermeable blood-testis barrier, and 2) the transient presence of a permable epithelial barrier does not initiate an autoimmune response of sufficient magnitude to cause destruction of the seminiferous epithelium.

The American Journal of Anatomy 175:91-117 (1986).
2 tables, 20 fig., 58 references.

Authors abstract

Investigations on heat diagnosis in silver foxes (Vulpes fulva argentata) and blue foxes (Alopex lagopus).

Michael Olivier

The present investigations deal with oestrus controls in silver and blue foxes.

In silver fox and 42 blue fox vixens the receptivity towards the male, the external genitalia and the internal vagina, the elctrical resistance of the vaginal secretion and vaginal smears were examined daily, starting at the time of distinguished vulval swelling.

The first day of metoestrus, characterized by a shift of the cells in the vaginal smear, was used as reference point.

The following results were obtained:
In both genera the duration of sexual receptivity (oestrus) shows distinct individual variations. In the silver fox it is one to six, in the blue fox one to five days.
The main mating activity is observed during the three days preceding the onset of metoestrus.

The swelling of the vulva and the vaginal mucosa, being more pronounced in the blue fox, reaches its maximum at the end of pro-oestrus.
In both genera vulva edema declines during the main mating period.
During the oestrus the pale and dry vaginal mucosa shows a cough-lozenge like pattern.

The electrical resistance of the vaginal secretion increases rapidly at the end of pro-oestrus.
Peak resistance values are measured during oestrus i.e. on average three days (silver fox) resp. four days (blue fox) before the onset of metoestrus.
The resistance values decrease abrubtly during advanced oestrus, reaching basic levels in early metoestrus.

Vaginal smears are characterized by a predominance of mainly caryopycnotic supreficial calls during the three days of maximum mating activity.

A marked shift towards cells from deeper epithelial layers (basal, parabasal and intermediate cells) indicates the end of oestrus.

The transitions from pro-oestrus to oestrus and from oestrus to metoestrus are accompanied by increasing amounts of leucocytes.

Based on the obtained results and the related literature experimental inseminations were performed with fresh or frozen silver fox semen, each in four blue fox vixens. The succesful insemination trial proves the detection of the optium mating resp. insemination time.

Thesis: Tieraerztliche Hochschule Hannover. 65 pp.
7 tables, 14 fig., 52 references.
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Authors summary

Pulsatile release of luteinizing hormone and testosterone in male ferrets

Cheryl L. Sisk; Claude Desjardins

The temporal organization of LH and testosterone secretion was examined in male European ferrets. Hormone levels were measured in frequent blood samples taken via an indwelling cannula from sexually mature and castrated ferrets.

Intact ferrets discharge LH and testosterone in discrete pulses, but the frequency and amplitude of these pulses vary within and between individual males. The average frequency of LH pulses was 1.14 ± 0.25 pulses/h, and 16.96 ± 2.5 ng/ml, respectively. The frequency, amplitude, and duration of hormone pulses were similar during the light and dark phases of the light-dark cycle. LH and testosterone peaks were temporally coupled with LH pulses preceding testosterone pulses by 10-20 min. However, not all LH pulses evoked a rise in testosterone. Frequently, trains of 2 or more LH pulses gave rise to a single testosterone pulse.

Castration provoked a rapid increase in the frequency of LH pulses, and the interpulse interval bacame strikingly uniform within hours after orchidectomy. The amplitude of LH pulses, in contrast, increased gradually over the first 6 postcastration days and then plateaued at about 4.5 ng/ml.

These findings demonstrate that LH pulses constitute functionally important

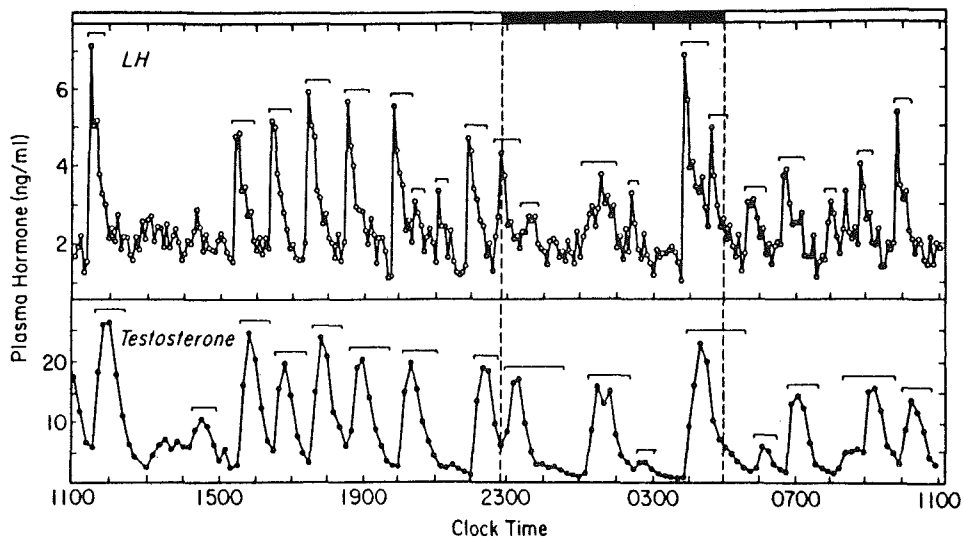


FIG. 2. Plasma LH (O–O) and testosterone (●–●) concentrations in blood samples collected from an adult male ferret throughout a 24-h period. Sample collection was begun 4 h after lights on (0500 h CDST). *Brackets* designate statistically significant hormone peaks, as identified by PULSAR.

signals to the testis, as evidenced by temporally related increments in testosterone secretion. Moreover, distinct differences in the development of the postcastration rise in the frequency and amplitude of LH pulses suggest that testosterone operates via multiple mechanisms to regulate LH release in adult male. Finally, this study emphasizes the utility of the ferret as an animal model to study neural determinants of LH release in the male.

Endrocrinology 119: 1195-1203, 1986.
3 tables, 4 fig., 39 references.

Authors abstract

Evidence of dopaminergic regulation of prolactin and a luteotropic complex in the ferret

G.O. Agu; K. Rajkumar; B.D. Murphy

The role of dopaminergic agents in prolactin (Prl) release and the luteotrophic role of Prl and luteinizing hormone (LH) were investigated in pseudopregnant female ferrets. A single injection of the dopamine antagonist pimozide (0.63 mg/kg) resulted in a tenfold elevation of plasma Prl in anestrous females. Subcutaneous injection of pimozide on alternate days from Day 2 through Day 16 of pseudopregnancy elevated both Prl and progesterone levels. Daily treatment with the dopamine agonist 2 alpha - bromoergocryptine (bromoercriptine, 4 mg/kg), from Day 2 through Day 16 of pseudopregnancy lowered levels of both plasma Prl and progesterone. Neither pimozide nor bromocriptine had a direct effect on preogesterone secretion by luteal cells in vitro. Daily intraperitoneal administration of a monoclonal antibody against gonadotropin-releasing hormone from Day 2 through Day 10 of pseudopregnancy

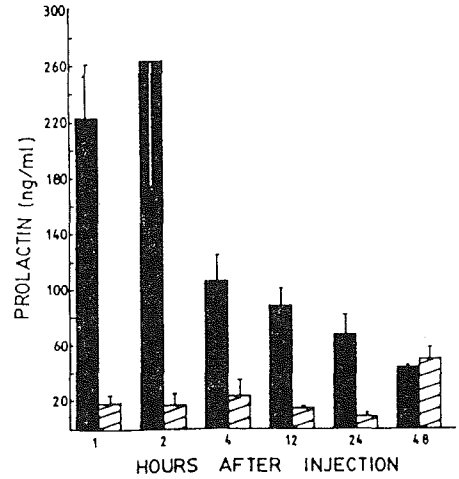


FIG. 1. Plasma prolactin levels (mean + SEM) in anestrous ferrets treated with 0.63 mg/kg of pimozide (*solid bar*) or vehicle (*striped bar*). Blood samples were collected at times indicated (n=5).

lowered both plasma LH and progesterone, but had no effect on plasma Prl concentrations. Daily administration of equine antisera against bovine LH or 100 IU of human chorionic gonadotrophin to pseudopregnant ferrets lowered progesterone levels. It is concluded that Prl release is influenced by dopaminergic compounds, and both Prl and LH are required for luteal maintenance in the ferret.

Biology of reproduction 35, 508-515, 1986. 7 fig., 32 references.

Authors abstract

Acute effects og GnRF-induced gonadotrophin secretion upon ovarian steroid secretion in the ferret

Christine Matson; B.T. Donovan

The effects of an increase in endogenous gonadotrophin secretion on the production of oestradiol, progesterone, androstenedione and testosterone by the ovaries of anaesthetized anoestrous and oestrous ferrets were followed. Gonadotrophin secretion was enhanced by the injection of gonadotrophin releasing factor (GnRF), and serial blood samples were collected over 9h for hormone assay. Thyrotrophic hormone releasing factor (TRF) or acetic acid were injected for control purposes. The plasma content of oesradiol in oestrous females was significantly higher than during anoestrus, but secretion of this streoid was not increased by any means. The plasma concentration of progesterone in anoestrous females was

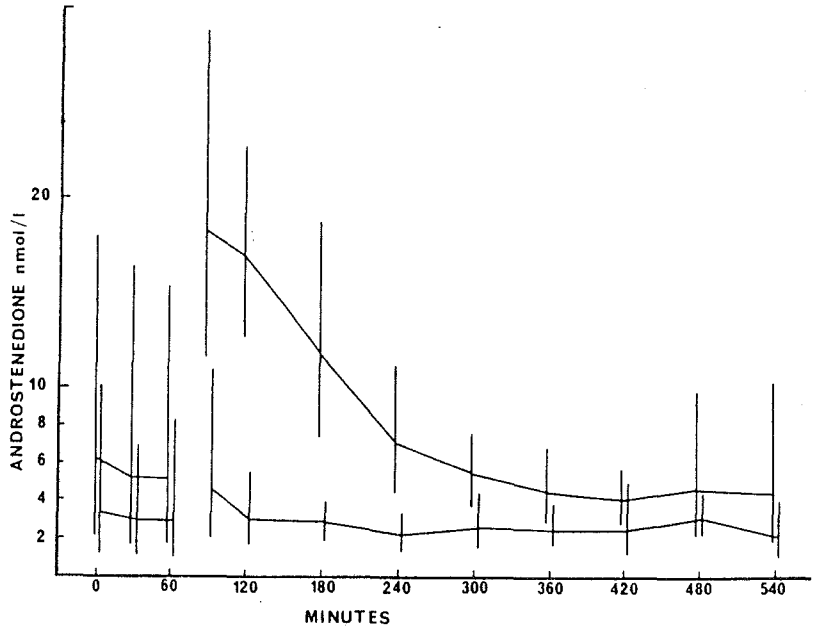


Fig. 1.
The changes in plasma androstenedione concentration in anoestrous (upper curve) and oestrous (lower curve) ferrets following the iv injection of 300 μg GnRF immediately after collection of the blood sample at 60 min. Geometric means and 95% confidence limits are plotted.

significantly higher than during oestrus. It was increased by GnRF in anoestrous ferrets and less markedly in oestrous females. The plasma concentration of androstenedione was raised by GnRF to a greater extent during anoestrus than during oestrus. Testosterone was present in higher concentration in the plasma during anoestrus than during oestrus, and the level was increased by GnRF admini-

stration. These findings indicate that the ovaries of the anoestrous ferret secrete significant quantities of steroid hormones, and that they respond readily to gonadotrophic hormone.

Acta Endocrinologica 1986, 111: 373-377.
1 fig. 9 references.

Authors abstract

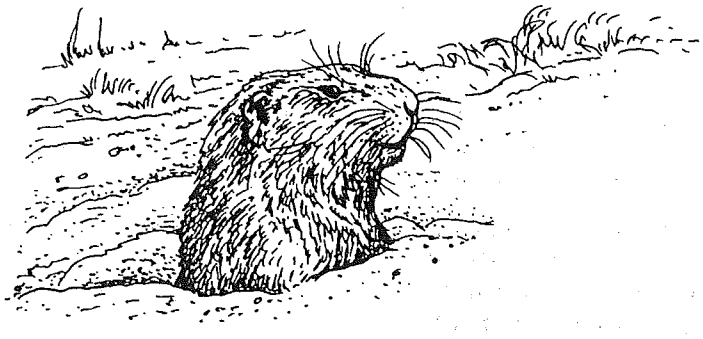
Selective abortion of entire litters in the coypu: Adaptive control of offspring production in relation to quality and sex

L. M. Gosling

There are strong theoretical reasons for expecting the evolution of an adaptive control of offspring production in relation to their quality and sex, but little empirical evidence that it exist *(Williams 1979; Clutton-Brock and Albon 1982)*. Data from a 12-yr study of coypu reproductive biology suggest that adaptive control may exist in this species and that one mechanism is the selective abortion of entire litters. Young females, in better than average physical condition and expected to litter in the summer, abort small litters of predominantly female embryos at around wk 13-14 of the 19-wk gestation period. Large litters and small, predominantly male litters are retained, and parturition follows normally. Females conceive soon after selective abortion, and the new litter is significantly larger than that aborted: about 5.82 (± 2.07 SD) as opposed to about 4.17 (± 1.74). Neonate size is positively correlated with female condition (and body size) and inversely related to litter size. The differences in body size at birth are carried through to differences in adult size. These data are consistent with the hypothesis that when females are in above-average condition, it would pay them to invest preferentially in offspring of the sex whose chances of future RS will benefit most *(Trivers and Willard 1973)*. Males would be expected to benefit most in the coypu and other species that have polygynous mating systems. Females that abort small, predominantly female litters (with large embryos) abandon offspring that would continue to be costly during the last 6 wk of pregnancy and during the 8-wk lactation period but that would pay off, in fitness terms, little better than small females; instead, they invest their large fat reserves in the production of a larger litter.

Am. Nat. 1986, Vol. 127, pp. 772-795.
9 tables, 1 fig., 61 references.
+ appendix: Binomial analysis of combinations of male and female embryos at particular litter sizes.
16 tables.

Authors summary



The effect of iron supplementation on mink kits

Asbjørn Brandt and Heddie Mejborn: National Institute of Animal Science, Dept. of Furbearing Animals, 48 H Roskildevej, DK-3400 Hilleroed, Denmark.

Summary

The effect of equivalent amounts (about 50 ppm) of dietary ferroEDTA, amino-acidchelated iron, iron sulphate and ferri-glutamate on normally fed pastel mink kits is reported.

The blood was analyzed for the number of erythrocytes, leucocytes and thrombocytes, haematocrit, haemoglobin, mean cell volume, mean cell haemoglobin content, plasma iron, iron binding capacity, ceruloplasmin, the activity of creatine kinase, aspartate aminotransferase and alanine aminotransferase.
We found a development of microcytic anaemia and suppressed growth in all experimental groups as sequel of the relative low iron supplementation level.
The group receiving amino-acid-chelated iron had the highest liver iron content.
The liver zinc concentration of the control group and the one receiving iron sulphate were lower than the rest. Groups with low liver zinc had simultaneously the highest copper contents indicating a degree of metabolic interaction.
At 5 1/2 month of age 4 kits from each group were submitted to a digestibility trial for the determination of the excretion (balance) of iron, zinc and copper.
The iron source did not significantly influence the iron-, zinc- and copper balances, and most of the ingested minerals were excreted in the feces. Concerning the mineral excretion in the urine iron--EDTA supplemented animals excreted significantly ($P < 0.001$) more zinc than other groups.

Introduction.

Iron deficiency anaemia in mink is currently a problem, and has therefore been subject to a number of investigations (Helgebostad, 1968; Skrede, 1970a, 1970b, 1971). These have led to a pronounced fall in the occurrence of anaemia as the result of a better prevention by for example adding different iron- and other mineral compounds, and vitamins. In spite of this, anaemia is still observed among mink during the growth period.

Anaemia can of course develop as a result of other suboptimum conditions in the feed or in the animal than iron deficiency. On the other hand it can not be excluded, in particular considering the very complex chemical conditions, which are found in wet minkfeed, that iron supplements could be involved in chemical reactions or interactions with compounds in the feed or the digestible tract with the

result of a compromising utilisation and subsequent development of anemia in the mink.

With this as a background it was the purpose of this study to examine, if complex-bound iron in the form of iron-EDTA, amino-acidchelated iron or iron glutamate, added to conventional danish mink-feed, would be utilized better than iron sulphate with the subsequent optimization of the haematological values in mink during the growth period. Furthermore whether the mentioned compounds would influence the iron-, zinc- and copper balance.

Materials and Methods.

At weaning 5 groups of 10 pastel maleand female mink kits were randomly selected among clinically healthy animals.

Table 1. Composition of farm feed (%).

Compound	
Fish offal (fresh/frozen)	47.5
Tobis, sprat (fresh/frozen)	10.0
Blood cells (fresh/frozen)	2.0
Poultry silage	5.0
Poultry waste (frozen)	5.0
Barley (heat treated)	4.5
Oats (heat treated)	0.5
Wheat bran	2.0
Soya bean oil/chicken fat	0.6
Protein mixture:	3.0
50 % Fish meal, low ash, max. 10 % fat	
40 % Blood meal 10 % Soya beans, toasted	
Vitamin mixture:	2.0
60 % Wheat germ	
30 % Wheat bran	
10 % Vitamin mixure	
Slaughter offal	4.0
Glucose	0.5
Skimmed milk powder	1.0
Lard	1.5
Acetic acid	0.1
Water	10.8
Percentage of calculated metabolizable energy from :	
Protein	50.3
Fat	35.8
Carbohydrate	13.9

The animals were fed conventional farm feed (table 1), not supplemented with iron exept the natural occurring content. The feed was supplemented with equivalent amount of iron (about 50 ppm) as ironEDTA (ferro-EDTA) (group 2), amino-acid-chelated iron (group 3), iron sulphate (group 4) and iron glutamate (ferri-glutamate) (group 5). The control group (group 1) got the mentioned feed without extra iron supplement. The total iron-, zinc- and copper content of the feed were measured with atomic absorption spectophotometry. A general iron supplementation of about 50 % of the normal level in danish mink-feed was aimed.

On day 90 and 120 (T=2 and T=3) after birth, blood samples were taken by toe nail clipping. At pelting time (T=4) a bigger sample was taken by cardial puncture under anaesthetia. The blood samples were analyzed for total amount af erythrocytes, leucocytes og thrombocytes, haematocrit, haemoglobin, mean cell volume (MCV), mean cell haemoglobin (MCH), and plasma iron, latent and total iron binding capacity (L,T-IBC) and ceruloplasmin in plasma. Beside that leucocyte differential count and the activity of the enzymes creatine kinase (CK), aspartate aminotransferase (ASAT) and alanine aminotransferase (ALAT) in plasma were measured.

At the age of approximately 5 1/2 month, 4 animals per group entered a 4 day balance period for determination of excretion of iron, zinc and copper in feces and in urine, and the corresponding balances. The tecnique was decribed by Mejborn (1986).

At pelting time the animals were euthanized by thiobarbital-Na, weighed and pelted without preseding drumming. Liver, kidneys, heart and spleen were weighed, and the right liver lobe was analysed for the content of iron, zinc and copper by atomic absorption spectophotometry.

The results were subjected to an analysis of variance, and the differences between groups were tested by Duncan Multible Range Test.

Results and Discussion.

Supplementation of conventional danish minkfeed with iron varies a lot : 75-250 ppm with an avarage of 180 ppm in wet feed.
As the requirement of iron to mink under the given feeding circumstances was unknown, we aimed at an iron supplement of about half the supplement in practical mink feeding, in order to reach a level where possible differences in absorption-/utilization of the iron sources could be seen.
We found a variation in the content of the 5 feed mixtures : for group 1 (control) the iron content was 106 ppm in wet feed (340 ppm in dry matter), which was the level, when no iron was supplemented. For group 2 and 5 the iron content was about 120 ppm in wet feed (350 ppm in dry matter), which is a little lower than aimed, while it for group 3 and 4 was about 155 ppm in wet feed (440 ppm in dry matter).
For all groups the zinc content was approximately 30 ppm in wet feed (85 ppm in dry matter) and the copper content about 4.5 ppm in wet feed (13 ppm in dry matter).

As mentioned, this iron supplementation in the trial was about 50 % of the average in danish feed kitchen diets. This is clearly seen in the haematological data, which is shown in table 2 and 3. Anaemic microcytic values with a depressed number of erythocytes, thrombocytes, and leucocytes were prevailing in all groups at all ages. These values also indicate a general suboptimum growth and general performance.

Table 2. Erythrocytes, thrombocytes, haematocrit, haemoglobin, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) at three different ages (T). Mean values for male mink in each group.

Group		1	2	3	4	5	Ref.[1)]
Iron source		-	EDTA	am.acid	sulph.	glutamate	int.
Erythrocytes (10^{12}/l)	T=2	5.9^{a}	5.9^{a}	6.1^{a}	6.0^{a}	5.8^{a}	5.8-7.5
	T=3	8.2^{a}	7.9^{ab}	7.8^{ab}	7.9^{ab}	7.6^{b}	6.8-8.8
	T=4	7.3^{ab}	7.7^{a}	7.4^{b}	7.1^{b}	7.1^{b}	8.0-9.0
Thrombocytes (10^{9}/l)	T=2	420^{b}	479^{ab}	525^{ab}	528^{ab}	723^{a}	470-660
	T=4	439^{b}	429^{b}	522^{a}	456^{b}	520^{a}	450-660
Haematocrit (%)	T=2	33.4^{a}	35.4^{a}	34.1^{a}	35.7^{a}	33.8^{a}	38.0-48.0
	T=3	48.5^{a}	45.2^{ab}	42.3^{b}	44.4^{ab}	42.4^{b}	39.0-49.8
	T=4	39.3^{ab}	40.8^{a}	35.6^{b}	38.5^{ab}	35.9^{ab}	45.4-51.4
Haemoglobin (mmol/l)	T=2	8.8^{a}	8.6^{a}	8.2^{a}	8.3^{a}	8.3^{a}	9.3-11.7
	T=3	11.8^{a}	11.2^{ab}	10.8^{ab}	11.1^{ab}	10.5^{b}	10.2-12.7
	T=4	9.9^{a}	10.1^{a}	9.2^{a}	9.4^{a}	9.1^{a}	11.7-13.7
MCV (fl)	T=2	56.7^{b}	56.5^{b}	58.0^{ab}	59.3^{a}	57.5^{b}	57.0-63.2
	T=3	57.9^{a}	55.9^{ab}	55.2^{b}	55.3^{b}	54.3^{b}	54.8-60.8
	T=4	55.0^{a}	54.8^{a}	51.7^{a}	55.0^{a}	53.4^{a}	54.8-60.0
MCH (fmol)	T=2	1.60^{a}	1.60^{a}	1.44^{b}	1.44^{b}	1.53^{a}	1.6-1.8
	T=3	1.52^{b}	1.53^{ab}	1.58^{a}	1.55^{ab}	1.53^{ab}	1.4-1.6
	T=4	1.56^{a}	1.54^{ab}	1.50^{b}	1.52^{b}	1.60^{a}	1.4-1.6

1) Reference interval = (5-95 percentile) Source: A.Brandt. a,b: Means within a row not sharing a common superscript letter are significantly different ($P < 0.05$).

Table 3. Total number of leucocytes and differential counts of leucocytes at different ages (T). Mean values for male mink in each group.

Group		1	2	3	4	5	Ref.[1]
Iron source		-	EDTA	am.acid	sulph.	glutamate	int.
Leucocytes (10^9/l)	T=2	6.5^{a}	5.7^{a}	6.2^{a}	6.2^{a}	7.7^{a}	6.7-12.4
	T=4	2.9^{a}	3.5^{a}	2.3^{a}	2.5^{a}	3.2^{a}	4.0-13.0
Leucocyte classes - % of total leucocytes:							
Rod shaped	T=2	3.0^{a}	2.0^{ab}	0.5^{b}	0.7^{b}	1.5^{ab}	2.0
	T=4	2.3^{a}	1.4^{a}	2.5^{a}	1.4^{a}	2.2^{a}	2.0
Segmented	T=2	54.0^{a}	55.5^{a}	46.0^{b}	52.7^{a}	43.5^{b}	45.3
	T=4	57.0^{ab}	50.7^{a}	50.8^{ab}	51.9	51.1^{b}	52.6
Eosinophiles	T=2	1.0^{a}	1.0^{a}	1.0^{a}	0.7^{a}	1.5^{a}	2.7
	T=4	0.0^{a}	2.5^{a}	2.5^{a}	1.4^{a}	2.6^{a}	1.8
Basophiles	T=2	1.4^{a}	0.0^{b}	0.0^{b}	0.0^{b}	0.5^{ab}	0.0
	T=4	0.0^{b}	0.0^{b}	0.0^{b}	0.2^{a}	0.2^{a}	0.2
Lymphocytes	T=2	36.0^{b}	39.0^{ab}	49.0^{a}	44.0^{a}	52.5^{a}	53.2
	T=4	35.8^{b}	41.4^{a}	40.7^{a}	42.1^{a}	40.4^{a}	44.7
Monocytes	T=2	1.3^{a}	3.0^{a}	3.5^{a}	2.1^{a}	1.0^{a}	0.3
	T=4	3.0^{a}	3.2^{a}	3.5^{a}	2.9^{a}	3.5^{a}	0.3

1) Reference interval = (5-95 percentile. For differential counts mean) Source: A.Brandt. a,b: Means within a row not sharing a common superscript letter are significantly different ($P < 0.05$).

Table 4. Iron content, total and latent iron binding capacity (T,L-IBC) and ceruloplasmin, activity of the enzymes creatine kinase (CK), aspartate aminotransferase (ASAT) and alanine aminotransferase (ALAT) in plasma from male mink. T=2 animals about 90 days old, T=4 animals about 6 month old. Means of 10 animals per group.

Group		1	2	3	4	5	Ref.[1]
Iron source		-	EDTA	am.acid	sulph.	glutamate	int.
Plasma iron (mymol/l)	T=2	32.8^{a}	24.5^{b}	33.7^{a}	27.9^{ab}	22.7^{b}	25-36
	T=4	28.8^{ab}	23.5^{b}	32.8^{a}	31.3^{a}	23.7^{b}	20-35
Total-IBC (mymol/l)	T=4	46.1^{c}	48.3^{b}	49.3^{a}	47.0^{bc}	45.0^{c}	44-69
Latent-IBC (mymol/l)	T=4	15.9^{b}	22.3^{a}	17.3^{b}	15.7^{b}	16.0^{b}	24-35
Ceruloplasmin (rel)	T=4	0.76^{b}	0.86^{b}	0.81^{b}	0.83^{b}	1.02^{a}	1.0
CK (mykat/l)	T=4	4.41^{b}	4.68^{b}	3.74^{b}	3.99^{b}	6.63^{a}	0.8-3.3
ASAT (mykat/l)	T=4	1.50^{ab}	1.37^{b}	1.39^{b}	1.25^{b}	1.78^{a}	0.8-2.3
ALAT (mykat/l)	T=4	2.67^{ab}	2.19^{b}	1.94^{b}	1.92^{b}	3.02^{a}	1.6-3.6

1) Reference interval = (5-95 percentile) Source: A.Brandt. a,b,c: Means within a row not sharing a common superscript letter are significantly different ($P < 0.05$).

Table 4 shows the content of iron, total and latent iron binding capacity (T,L-IBC) and ceruloplasmin plus the activity of the enzymes creatine kinase (CK), aspartate aminotransferase (ASAT) and alanine aminotransferase (ALAT) in mink kit plasma. Table 5 showes the mean body weight and weight of organs at pelting time. There were no significant differences between groups, but there was a tendency, that the animals from group 4 were a little bigger than the others. The increased body weight was reflected in increased weight of organs - especially liver weight, but neither of these differences were significant.

Table 5. Mean body- and organ weight and mineral concentration in liver at pelting time (T=4) of male mink, whose feed was supplemented with different iron sources. 10 animals per group.

Group	1	2	3	4	5
Iron source	-	EDTA	am.acid	sulph.	glutamate
Weight (gram)	1836	1874	1721	2051	1674
Liver weight (gram)	54.5	55.2	57.2	62.7	54.0
Kidney weight (gram)	9.1	9.1	9.3	10.0	8.7
Heart weight (gram)	9.9	9.5	9.8	10.1	9.4
Spleen weight (gram)	4.4	3.7	4.9	4.3	3.7
Liver iron (mg/kg)	266^{b}	208^{b}	343^{a}	259^{b}	276^{ab}
Liver zinc (mg/kg)	278^{b}	359^{a}	356^{a}	274^{b}	334^{a}
Liver copper (mg/kg)	492^{a}	370^{ab}	214^{b}	506^{a}	356^{ab}

a,b,c: Means within a row not sharing a common superscript letter are significantly different ($P < 0.05$).

The content of iron, zinc and copper in liver from the males is also stated in table 5. Group 3, which got amino-acid--chelated iron, had a higher iron content in the liver, all though not significantly different from the group, which got iron glutamate (group 5). There were no difference between the other groups, but there was a tendency, that group 2 (iron--EDTA) was a little lower according to iron content.
The results are in accordance with previous investigations in mink by Skrede (1986). He found, that feeding mink with different iron sources did not result in different liver iron content exept when ferro-fumarate was given together with cysteine; resulting in a pronounced rise in iron content in the liver.

The zinc concentration in liver from animals in the control group (group 1) and group 4 (iron sulphate) was significantly lower than the others. The groups with low zinc concentration were at the same time the ones, which had the highest copper concentration. These conditions indicate, that there are certain interactions between the zinc- and the copper metabolism.
Group 3 had a very low copper concentration and furthermore the highest iron concentration in the liver, which also could be a result of interactions between these two minerals.

In the balance period the average feed intake was a little lower in group 1 and group 4 (because of 1 animal in each group) than for the other groups. The difference though was only significant between group 1 and group 5 ($P < 0.05$).
The iron balances in the 5 groups are shown in table 6. As the iron level in the feed for group 1 was lower than for the others, these animals had of course a lower iron intake. Likewise because of the feed iron content, the iron intake in group 3 and 4 was a little higher.
The control group with the low intake excreted significantly ($P < 0.05$) less iron in the feces than the other groups.

Table 6. Total iron balances in 4 days in 5 1/2 month old male mink, whose feed was supplemented with different iron sources. 4 animals per group.

Group	1		2		3		4		5	
Iron source	-		EDTA		am.acid		sulphate		glutamate	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Intake (FFe), mg	76.7^{c}	4.0	93.2^{b}	4.2	114^{a}	4.2	111^{a}	14.1	95.9^{b}	1.0
Excreted in feces (GFe), mg	65.2^{b}	6.7	92.3^{a}	6.6	111^{a}	8.2	107^{a}	21.8	92.1^{a}	2.9
Excreted in urine (UFe), mg	0.7	0.2	1.6	0.6	2.0	1.7	1.1	0.4	1.0	0.3
Balance (BFe), mg	10.8	5.7	-0.7	3.1	1.0	5.9	2.9	16.4	2.8	2.2
GFe/FFe, %	85.0		99.0		97.4		96.4		96.0	
UFe/FFe, %	0.9		1.7		1.8		1.0		1.0	
BFe/FFe, %	14.1		-0.8		0.9		2.6		2.9	

a,b,c: means within a row not sharing a common superscript letter are significantly different ($P < 0.05$).

The excretion was about 85 % of the intake in the control group, and 96-99 % in the other groups. Candela et al. (1984) found in accordance with this in a trial with pigs, that approximately 95 % of iron given as iron-EDTA was excreted in the feces.

We found no difference between groups in the amount of iron excreted in urine, and the excretion represented 1-2 % of the intake. Candela et el. (1984) also showed, that in both humans and pigs less than 1 % of an iron intake (iron-EDTA) was excreted via the kidneys, while Tandon et al. (1984) after injection of EDTA found, that the iron excretion in urine increased after repeated injections.

The iron balances was not significantly different, but there was a tendency that group 1 (control) had a higher iron balance, and group 2 (iron-EDTA) had a lower iron balance. We persumed that the iron source had no particular influence on the iron balance, though we have not demonstrated whether the different iron levels in the different groups could have had an effect on the results.

The results of the zinc balances are stated in table 7. There was no clear difference between groups in the zinc intake, as the level in the food was the same for all groups, and the slightly lower zinc intake in group 1 is a result of the lower feed intake.

The groups, which had the highest zinc intake, also had the highest excretion in feces, and for all groups the ecxretion exceeded the intake (100-107 %) - still group 1 excreted "only" 97 %.

The zinc excretion in urine was the same for all groups exept group 2, which excreted about 2 1/2 times the amount of the others. This is accordance with a rat experiment of Tandon et al.'s (1984) demonstrating an enhanced urinary excretion of zinc followingon intraperitoneal injection of iron-EDTA.

All exept the control group seemed in a negative zinc balance, but there were no significant differences between groups.

Table 7. Total zinc balances in 4 days in 5 1/2 month old male mink, whose feed was supplemented with different iron sources. 4 animals per group.

Group	1		2		3		4		5	
Iron source	-		EDTA		am.acid		sulphate		glutamate	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Intake (FZn), mg	18.7^{c}	1.0	20.5^{bc}	0.9	22.0^{ab}	0.8	20.7^{abc}	2.6	23.0^{a}	0.3
Excreted in feces (GZn), mg	18.1^{b}	1.9	22.0^{ab}	1.5	23.0^{a}	1.7	20.7^{ab}	4.1	24.4^{a}	1.6
Excreted in urine (UZn), mg	0.6^{b}	0.1	1.6^{a}	0.1	0.6^{b}	0.2	0.6^{b}	0.1	0.6^{b}	0.1
Balance (BZn), mg	0	0.9	-3.1	0.6	-1.6	1.2	-0.6	3.4	-2.0	1.3
GZn/FZn, %	96.8		107.3		104.5		100.0		106.1	
UZn/FZn, %	3.2		7.8		2.7		2.9		2.6	
BZn/FZn, %	0		-15.1		-7.3		-2.9		-8.7	

a,b,c: means within a row not sharing a common superscript letter are significantly different ($P < 0.05$).

Table 8. Total copper balances in 4 days in 5 1/2 month old male mink, whose feed was supplemented with different iron sources. 4 animals per group.

Group	1		2		3		4		5	
Iron source	-		EDTA		am.acid		sulphate		glutamate	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Intake (FCu), mg	2.7^{c}	0.1	3.5^{a}	0.2	3.7^{a}	0.1	3.1^{b}	0.4	3.6^{a}	0.0
Excreted in feces (GCu), mg	2.1^{c}	0.2	2.7^{b}	0.2	3.0^{ab}	0.4	2.6^{b}	0.5	3.3^{a}	0.2
Excreted in urine (UCu), mg	0.08	0.01	0.14	0.04	0.17	0.14	0.11	0.06	0.12	0.03
Balance (BCu), mg	0.5	0.1	0.7	0.1	0.5	0.5	0.4	0.3	0.2	0.2
GCu/FCu, %	77.8		77.1		81.1		83.9		91.7	
UCu/FCu, %	3.0		4.0		4.6		3.5		3.3	
BCu/FCu, %	19.2		18.9		14.3		12.6		5.0	

a,b,c: means within a row not sharing a common superscript letter are significantly different ($P < 0.05$).

As the copper level in the feed was the same for all groups, the found differences in copper intake (table 8) can be assigned to the difference in feed intake. The copper excretion in feces reflected partly the intake, and comprised 77-84 % of the intake except in group 5, where it was 92 %. We found no difference between groups in the amount of copper excreted in urine. This is in aggrement with the reults of Tandon et al. (1984), who found no change in copper excretion in urine after injection of iron-EDTA, even if the injections were repeated.
The copper balance was not influenced by the iron source.

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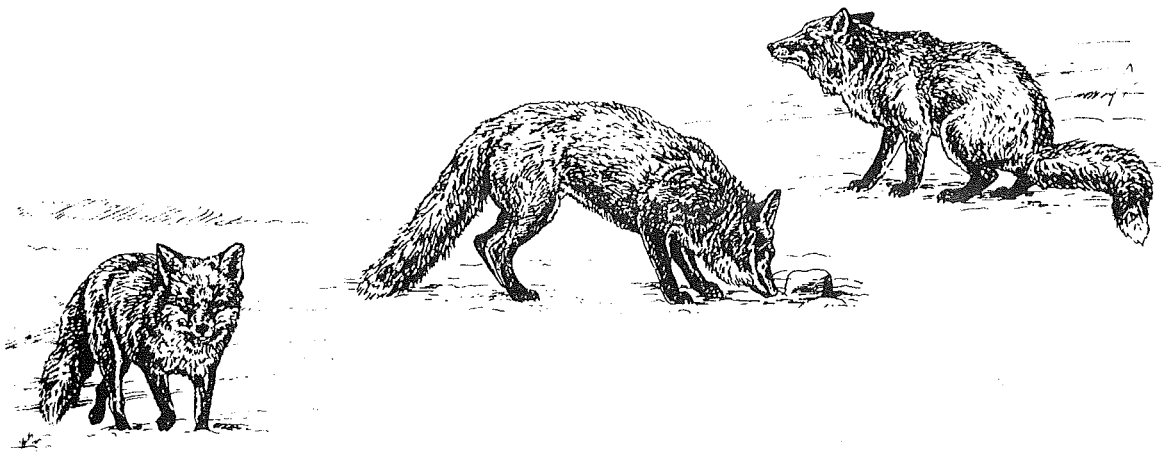

Original report

Determination of Minerals in Mink Feed by Atomic Absorption Spectrophotometry and Inductively Coupled Plasma Emission Spectrometry

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The mineral content in mink feed has generally been analysed using the atomic absorption spectrophotometry (AAS) technique. Introduction of an alternative technique, the inductively coupled plasma emissionspectrometry (ICP) has made a comparison of the two methods desirable.

Analysis of identical feed samples were carried out at Dept. of Fur Animal Production, Royal Veterinary and Agricultural University (AAS-technique) and at Biotechnical Institute, Kolding (ICP--technique).

Materials and Methods

Twenty mink feed samples of one kg each were collected from five different feed kitchens in the period from 17. september to 7. december. The samples were collected daily by the Dept. of Fur Animals, Natl. Institute of Animal Science. The daily samples from each week was mixed and 1 kg of this blend was freeze-dried.

The freeze-dried samples were ground in a laboratory mill, divided into two portions and sent to the two laboratories in air-tight packs.

Dry matter was determined by drying until constant weight at 100 degrees C.
At Dept. of Fur Animal Production, the samples were ground in a laboratory mill with 1 mm holes. Dry matter was determined both before and after the grinding, as water may evaporate during the grinding process.
The procedure of the AAS-technique used has been described in details elsewhere (Enggaard Hansen, 1973 & 1974) and only a short outline of the proceedings is given here.

Samples for determination of Na and K were digested with nitric acid in order to avoid loss of sodium. The other minerals were determined after ashing at 525 degrees C. and boiling on a water bath with diluted hydrochloric acid.

To avoid interference with P, lanthanum chloride was added to the solutions used for determinating Ca and Mg.

To prevent interaction between K and Na, a surplus of K was added to the solution before determination of Na while a surplus of Na was added before determination of K.

Silica crucibles, redistilled water and reagents with guaranteed low content of minerals (Merck, Suprapur) were used to avoid contamination.

The procedures used for determinating minerals by the ICP-technique has been described (Paaske Jensen, 1985). After grinding and passage through a 1 mm sieve the samples were ashed at 550 degrees C. The ash was then boiled for some minutes in diluted hydrochloric acid.

Before the determination, an internal standard solution was added to the digest solution. In order to eliminate the effect of potential interference, the emission of light was measured at two different wave-lengths for each mineral.

Results and Discussion

The results of the determination of minerals related to the two analytical methods used are shown in table 1. The results of a Students t-test performed on the difference between the corresponding results from the two laboratories is shown in table 2. One pair of zinc results has been excluded from the statistical analysis because of an error bigger than the difference expected due to differences in analytical methods.

TABLE 1. CONTENT OF MINERALS IN MINK FEED, DETERMINED BY ICP AND AAS

		g/kg dry matter										mg/kg dry matter							
FEED		Ca		P		Mg		Na		K		Fe		Zn		Cu		Mn	
KITCHEN	WEEK	ICP	AAS	ICP	AAS	ICP	AAS	ICP	AAS	ICP	AAS	ICP	AAS	ICP	AAS	ICP	AAS	ICP	AAS
I	34	17.1	17.2	12.5	12.8	1.35	1.33	2.8	3.1	7.0	7.9	461	503	77	79	21	21	60	65
do.	39	17.7	17.8	12.7	13.1	1.38	1.38	3.3	3.8	7.4	7.9	492	521	82	80	15	16	60	60
do.	45	15.2	15.7	11.6	12.2	1.32	1.39	2.8	3.0	6.7	7.4	389	485	68	75	16	18	58	66
do.	49	24.3	23.5	15.4	17.0	1.39	1.45	2.3	3.6	7.3	7.7	488	480	76	81	18	19	72	71
II	34	19.7	18.6	13.7	13.5	1.51	1.43	3.6	3.8	7.1	7.9	579	594	235	109	27	27	114	112
do.	39	20.3	18.7	12.6	12.5	1.49	1.38	3.4	4.1	7.0	7.3	546	565	133	114	19	20	119	107
do.	45	18.9	17.8	11.9	12.7	1.35	1.43	2.5	3.4	7.4	7.6	477	502	102	107	10	12	101	106
do.	49	18.5	17.0	12.5	13.1	1.56	1.59	3.4	3.4	8.2	8.3	601	496	97	115	27	32	114	117
III	34	17.4	17.1	11.5	12.1	1.44	1.44	3.7	3.8	7.6	8.2	608	683	89	95	28	31	83	87
do.	39	14.8	14.2	10.3	11.0	1.38	1.37	3.5	4.3	7.0	8.1	561	670	93	99	27	29	82	92
do.	45	20.2	20.8	13.0	14.3	1.51	1.45	3.7	3.9	6.8	7.1	695	615	95	100	28	28	100	100
do.	49	21.0	21.0	13.4	14.6	1.44	1.39	4.0	4.2	7.5	7.5	685	775	87	98	21	24	91	101
IV	34	24.8	24.8	14.7	15.7	1.71	1.64	4.6	5.0	7.6	8.9	744	784	106	114	44	48	109	122
do.	39	23.6	24.2	14.4	15.1	1.66	1.57	4.0	4.9	8.0	9.0	614	703	111	123	30	34	119	125
do.	45	25.9	25.6	14.9	16.4	1.50	1.63	3.8	4.0	6.9	7.6	532	642	101	115	12	14	116	122
do.	49	33.2	31.5	19.0	20.2	1.62	1.67	4.0	4.3	7.4	7.8	508	579	103	105	24	25	104	113
V	34	17.2	16.4	13.0	13.1	1.48	1.41	2.8	3.5	7.6	8.6	305	345	184	178	27	27	62	64
do.	39	14.7	15.3	11.4	11.9	1.47	1.39	2.4	3.1	7.6	8.3	264	306	102	102	12	11	66	61
do.	45	10.2	10.0	9.3	9.8	1.43	1.48	2.1	2.0	7.8	8.2	227	263	197	206	16	20	61	66
do.	49	15.4	14.4	11.6	12.2	1.48	1.49	3.5	2.6	6.9	8.5	290	341	68	73	22	23	70	73

As shown in table 2 the P, Na, K, Fe and Cu determinations from the two laboratories were significantly different, while the difference was less significant for Ca, Zn and Mg.

A possible explanation for the difference between the two laboratories, might be

Table 2. A Students t-test on the difference between the content of minerals determined by ICP and AAS

MINERAL	MEAN	SD	SD/ICP in %	T	P
Ca	0.43	0.75	3.80	2.53	*
P	-0.70	0.49	3.80	-6.32	***
Mg	0.01	0.07	4.76	0.53	NS
Na	-0.38	0.47	14.20	-3.64	**
K	-0.65	0.41	5.56	-7.03	***
Fe	-39.30	55.80	11.09	-3.15	**
Zn*	-4.63	8.00	7.71	-2.52	*
Cu	-1.75	1.65	7.43	-4.74	***
Mn	-3.45	5.78	6.56	-2.67	*

* The results from week 34 from feed kitchen II have been excluded.

that dry matter was not determined after grinding at The Biotechnical Institute.

It is known that water may evaporate during grinding due to a rise in temperature.

The systematically higher results obtained by Dept. of Fur Animal of Production, cannot be explained by the possible error in measuring the water content, as it would require the highest values to be determined at Biotechnical Institute.

The higher values for Na and K found at the Dept. of Fur Animal Production can be explained by the different ashing procedures. As mentioned above, wet oxidation is more lenient, as the risk of loosing especially Na during the ashing procedure is reduced.

Despite of the deviations found, it must be concluded that the difference accounts for only 4 % to 14 % of the absolute amounts of the investigated minerals.

Thus, the ICP-technique must be characterized as applicable for routine mineral analysis of fur animal feed.

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Supplementary feeding of young mink with ammonium salts.

Isupov B. A.; Gamulinskaya I. N.

Various salts of ammonia were tested as possible additives in diets for mink. Of all the salts tested, ammonium sulphate was the most effective in improving pelt quality, and had no adverse effect on feed intake, growth or physiological state of the mink.

Perm', USSR :68-73, 1984.
3 tables, 6 references
In RUSS.

CAB - abstract

Effect of supplementary ammonium sulphate on internal organs and pelt quality of mink

Gamulinskaya, I. N.; Isupov B. A.

Histological experiments showed that replacing some of the protein in diets for mink with ammonium sulphate induced no structural changes in exocrine and endocrine organs, but increased the functional activity of the thyroid gland. The diet with ammonium sulphate could bring about a saving of 25% in the cost of animal feedstuffs and produce pelts of better quality.

Perm', USSR ; 14-18, 1984
3 tables, 6 references
In RUSS.

Cab - abstract

Nutritive value of hydrogenomonas biomass for mink

Perel'dik, D. N.

Each 100 g of "hydrogenomonas biomass" (HB) contained protein 55.4, fat 4.2, carbohydrates 2.7 g and energy 300 kcal; each 100 g digestible protein of HB comprised arginine 6.28, valine 5.28, histidine 1.71, isoleucine 3.28, leucine 9.56, lysine 4.70, methionine 3.80 g. Those nutrients in HB were digestible by mink.

Nauchnye Trudy Nauchno-issledovatel'skogo Instituta Pushnogo Zverovodstva i Krolikovodstva: 29: 165-170, 1983
4 tables, 1 reference
In RUSS.

Cab - abstract

Nutritive value of feather meal for polar foxes and silver-black foxes

Kletskin P. T.; Glazov E. M.; Kolchanova N. V.; Kulikov N. E.

During their reproductive period and the period of growth of their offspring, polar foxes and silver-black foxes could be fed on diets containing feather meal to provide at least 40% of the animal protein. Feather meal is a complete source of nutrients but it is low in calcium and, particularly, phosphorus. It is suggested that when 40% of the animal protein in the diet is replaced by feather meal there should be at least 15 g of mash from *(bull)* heads or edible bones per 100 kcal metabolizable energy.

Nauchnye Trudy Nauchno-issledovatel'skogo Instituta Pushnogo Zverovodstva i Krolikovodstva : 29:170-178, 1983.
7 tables
In RUSS.

Cab - abstract

Digestibility of nutrients in dried protein feeds with young sables

Gladilov Yu. I.; Mironova I. M.

Digestibility of crude protein in feather meal, estimated with young sables, was 84.2%; that of crude fat 86.2 and nitrogen-free extract 78.5. Digestibility of

crude protein from a protein-and-vitamin supplement was 90.0%, and that of nitrogen-free extract 11.5. Metabolism trials with the young sables showed that feather meal contained 51.4 g digestible protein, 7.3 g digestible fat, 10.5 g digestible N-free extract and 342 kcal matabolizable energy/100 g, and that the protein-and-vitamin supplement contained 56.7 g digestible protein, 2.3 g digestible N-free extract and 265 kcal metabolizable energy/100 g.

Nauchnye Trudy Nauchno-issledovatel'skogo Instituta Pushnogo Zverovodstva i Krolikovodstva : 29:197-203, 1983.
3 tables, 7 references.
In RUSS.

Cab - abstract

Secondary poisoning hazards to stone martens (Martens foina) fed bromadiolone-poisoned mice

Mogens Lund; Anders Maltha Rasmussen

Four stone martens were fed bromadiolone-treated mice for one or four days. No symptoms of poisoning were observed in spite of up to 31 mice, or a maximum a.i. of 13.9 mg/kg, being consumed by a single individual.

Nord. Vet.-Med. 1986, 38, 241-243.
1 tables, 4 references
In ENGL. Su DANH.

Authors abstract

Mercury, cadmium, and lead in British otters.

Mason C. F.; Last N. I.; Macdonald S. M.

Samples of hair, liver, kidney and musle collected from 36 otters *(12 from Wales, 17 from Scotland and the Orkneys, and 4 from East Anglia)* between July 1982 and September 1985 were examined by atomic absorption spectroscopy. Hair contained the highest levels *(mg/kg)* of all three metals *(Hg, 18.75 plus or minus 3.63; Cd, 1.12 plus or minus 0.64; Pb, 13.05 plus or minus 4.16)*. The results indicate that heavy metal contamination is not causing direct mortality in otters in the UK, but some individual otters had levels of mercury and lead known to cause sublethal effects in other mammals.
Bulletin of Environmentel Contamination and Toxicology: 37(6): 844-849, 1986.
1 table, 1 fig., 17 references

Cab - abstract

Some nutritional characteristics of the muskrat.

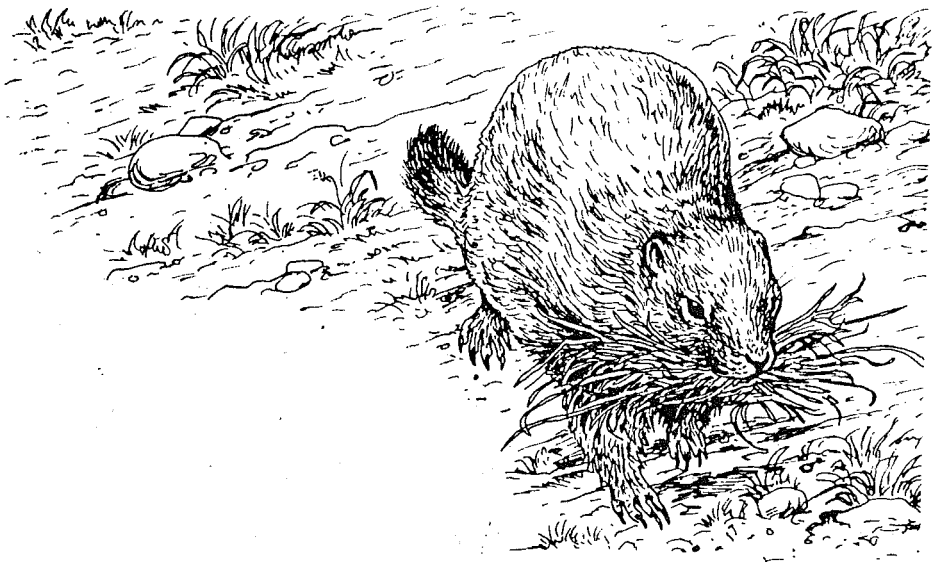
Zaripov R. Z.; Krochkova S. A.; Gil'manova L. F.

In the muskrat the length of the intestines exceeds body length 7-fold and the volume of the stomach in relation to that of the small and large intestines is 23:18:54. The protein in caecal contents is made up of 13% bacterial and 25% infusorial proteins. The soft faeces are formed in the caecum and they contain crude protein 39, crude fat 6.6, crude fibre 14.0 and ash 13%. The ash contains calcium 0.6, phosphorus 1.3, potassium 1.6, sodium 0.9% and manganese 99, copper 1.7, zinc 53 and iron 9.5 mg/100g DM. Coprophagy contributes daily 40% DM to the diet, which is equivalent to about 37% of gross energy and up to 52% protein. There are 3 distinct periods in the nutrition of the muskrat: reproductive period *(April to September)*; prewintering period *(October and November)*; and the wintering period *(December to March)*. In winter, heat production is 94.2 kcal/kg body weight, applicable to all sexes and ages. During the reproductive period the energy cost of activities increases 1.2-fold in the male and 1.6 to 1.8-fold in the female. Digestibility of DM is 54.5% in winter, 77.3 in spring and 66.4 in summer when the muskrat is on natural diet. When given a diet of rye bread wastes and carrot DM digestibility increases to 94.7%. During the reproductive period, protein requirement is 20 g/100 g dietary DM; in winter it is 8 to 12 g/100 g DM; that of crude fat is up to 3.7% dietary DM; and that of crude fibre in the spring-summer period is up to 20 to 30% *(best value 15.5%)*. Ca:P ratio in

the diet is 1:1, i.e., Ca and P at 0.40 and 0.46 g/100 g DM. The diet should also contain Mn 42, Cu 1.1, Zn 31.1 and Fe 4.6 mg/100 g DM. When reared in cages muskrats should be allowed daily 5 to 10 g animal feeds. In summer they should be given daily 40 g raw potatoes and up to 45 g green oats or grass and aspen bark at up to 16 g/kg body weight.

Krolikovodstvo i Zverovodstvo : (No. 5): 9, 1986
2 tables
In RUSS.

Cab - abstract



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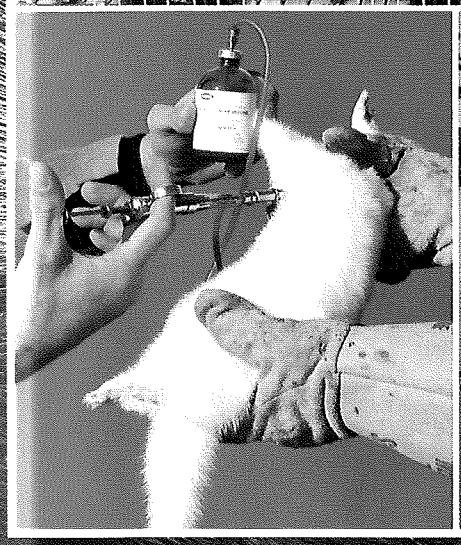

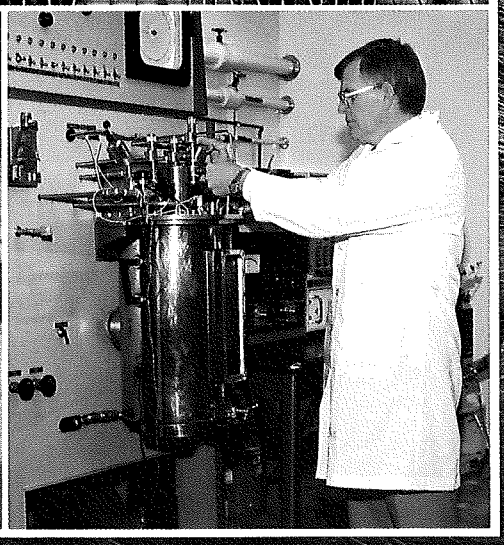

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Avian influenza a virus causing an outbreak of contagious interstitial pneumonia in mink

L. Englund, B. Klingeborn, T. Mejerland

An outbreak of contagious respiratory disease in mink occured in October 1984 on the south-east coast of Sweden. High morbidity with coughing, sneezing and dullness was reported. Post mortem examination showed interstitial pneumonia in most examined mink. An avian influenza A virus was isolated and shown to belong to serotype H1ON4. Serological studies established that this virus was the most probable cause of the outbreak and also that this new viral infection seemed to be limited to the south-east coast of Sweden.

Acta vet. scand. 1986, 27, 497-504.
1 tabel, 3 fig., 14 references
In ENGL. Su. ENGL. NORG.

Authors abstract

A serological survey of enteric parvovirus infections in finnish fur-bearing animals

Pirjo Veijalainen

Parvovirus infections in Finnish fur animals, i.e. ferrets, raccon dogs, blue foxes and mink, were studied. The ferret was found to be the only insusceptible animal. Parvo enteritis of raccoon dogs, reported since 1980, has spread from East Finland to other parts of the country. A new candidate for the Parvovirus family was found to infect blue foxes. According to serologic investigations, the virus resembled feline panleukopenia virus more than canine parvovirus. Clinical signs during the infection have been mild. Annual vaccination has not eradicated mink enteritis virus on farms, but the disease has taken a subclinical form.

Acta vet. scand. 1986, 27, 159-171.
3 tables, 24 references.
Su: SWED.

Authors abstract

Mink parvoviruses and interferons: In vitro studies

Danny L. Wiedbrauk; Marshall E. Bloom; Donald L. Lodmell

Although interferons can inhibit the replication of a number of viruses, little is known about their ability to inhibit parvovirus replication. Therefore, in vitro experiments were done to determine if Aleutian disease virus and mink enteritis virus, two autonomously replicating mink parvoviruses, (i) induced interferon, (ii) were sensitive to the effects of interferon, or (iii) inhibited the production of interferon. The results indicated that these parvoviruses neither induced nor were sensitive to the effects of interferon. Furthermore, preexisting parvovirus infections did not inhibit poly (I).poly(C)-induced interferon production. This independence from the interferon system may, therefore, be a general property of the autonomously replicating parvoviruses.

Journal of Virology, Dec. 1986, p. 1179-1182.
4 tables, 1 fig., 24 references.

Authors summary

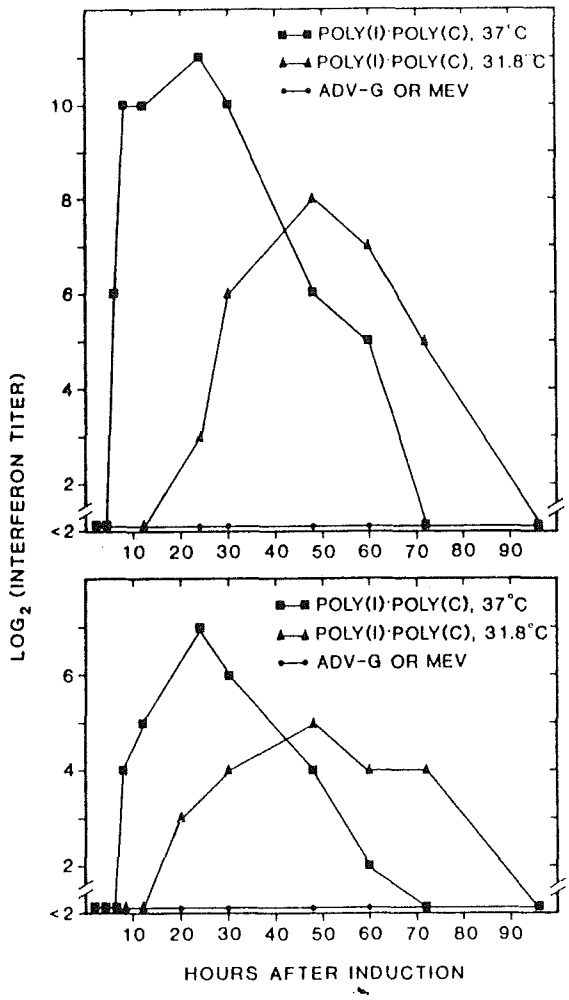


FIG. 1. Kinetics of interferon production in CCL-64 cells (top) and CRFK cells (bottom) after induction with poly(I) · poly(C)-DEAE dextran, ADV-G, or MEV. Cell monolayers were incubated with the poly(I) · poly(C)-DEAE dextran inducer, ADV-G, or MEV (virus multiplicities of infection were 10, 1.0, or 0.1) for 2 h at the indicated temperatures. The interferon inducer was removed with two phosphate-buffered saline washes, Eagle minimum essential medium supplemented with fetal bovine serum was added, and the cells were incubated as before for the indicated times. The cell-free supernatant fluids were assayed for antiviral activity on homologous cells. Because ADV-G and MEV did not induce interferon in these cells under any of the conditions imposed, the data for each cell type are shown as a single line. The variability of the interferon assay was 1 twofold dilution.

Experimental infection of red fox with canine parvovirus

S. Buonavoglia; P. DE Nardo; A. Fioretti

Four red seronegative to canine parvovirus were inoculated intravenously with canine parvovirus. During the two-week observation period the animals did not present any clinical signs of disease but there was leukopenia, viral presence in faeces (positive haemagglutination test and viral isolation in tissue culture) and also the presence of a haemagglutination antibody in the sera of the foxes.

J. Vet. Med. B, 33, 597-600 (1986).
1 tables, 1 fig., 14 references.
In ENGL SuGERM, ENGL

Authors summary

Vascular changes and liver tumours induced in mink by high levels of nitrite in feed

N. Koppang; A. Helgebostad

Two groups of female mink were fed a diet supplemented with 30-50 mg/kg bw sodium nitrite for up to six years. The first group also received dimethylamine hydrochloride. Seven male offspring from litters born in the first year were fed the same diet for nine months but showed no pathomorphological change. After three yars on trial, female mink developed occlusive changes in some branches of the efferent hepatic veins, and 21% of the mink in group 1 and 31% in group 2 developed liver haemangioendotheliomas or precancerous liver changes. The pathhomorphological changes were identical to those seen in animals exposed to *N*-nitrosodimethylamine (NDMA). This result indicates in-vivo formation of NDMA as a result of the high nitrite in the diet. However, NDMA was not measured in the blood of the nitrite-exposed mink.

Proceedings of the IXth International Symposium on N-Nitroso Compounds, held in Baden, Austria, 1-5 September 1986, pp. 256-260

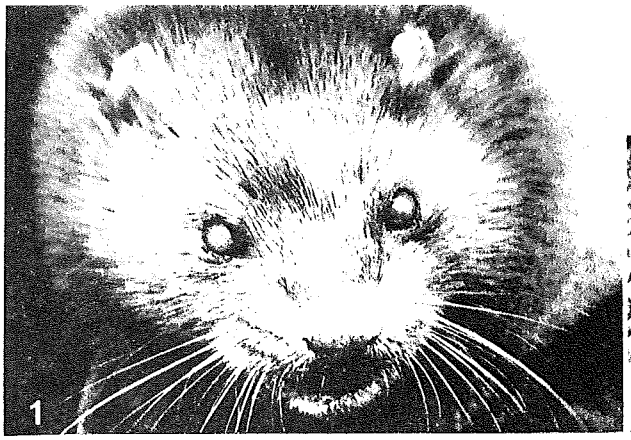
1 tables, 2 fig.

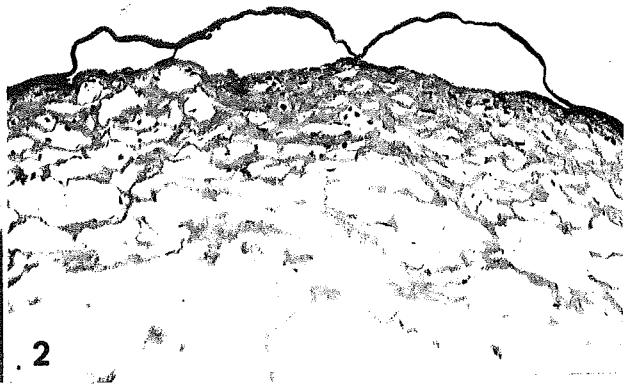
Authors summary

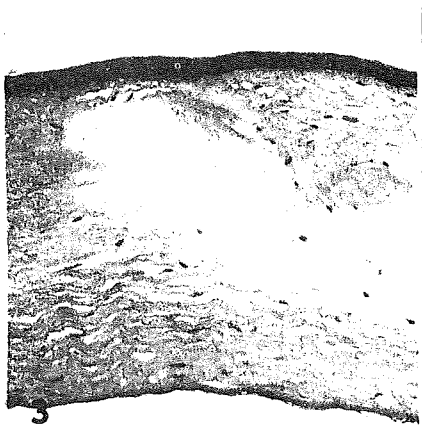
Chronic corneal edema in aged ranch mink

W.J. Hadlow

Chronic corneal edema occured in 53% of 116 ranch mink *(Mustela vison)* 8 to 11 years old. Most were royal pastel females, the main group at risk. Bilateral







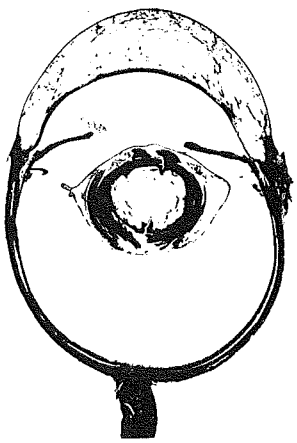


Fig. 1. Severely edematous, opaque corneas; 10-year-old mink.
Fig. 2. Epithelial bullae protrude centrally from severely edematous cornea; 11-year-old mink. HE.
Fig. 3. Early corneal edema; 9-year-old mink. HE.
Fig. 4. Moderate corneal edema centrally; 8-year-old mink. Keratocyte nuclei enlarged. HE.
Fig. 5. Typical appearance of severely edematous cornea; 9-year-old mink. HE.

in 46 of 66 affecetd mink studied, the edema evolved over a month or so until the cornea became opaque, diffusely pale blue-gray or white, and greately thickened. The swollen cornea did not become ulcerated, pigmented, or vascularized, even after it had been severely edematous for a year or two. The edema supervened as a consequence of spontaneous deterioration of the corneal endothelium. Attenuation and loss of the endothelial monolayer were the most common light microscopic changes. Other changes included discrete excrescences (guttata) along the posterior surface of the thickened Descemet's membrane and a subendithelial fibrillar or fibrocellular layer (posterior collagenous layer) often apposed to the excrescences. Likened to the primary endothelial dystrophies of man and the dog, this endothelial disorder of mink is regarded as an abiotrophic degeneration with its own distinguishing features in this species.

Vet. Pathol. 24:323-329 (1987).

1 tables, 17 fig., 24 references.

Authors abstract

Studies on the lung fluke, paragonimus westermani-diploid type, in the nothern part of Hyogo prefecture, Japan VII, experimental oral infection of a red fox with the metacercariae

Toshiyuki Shibahara; Hiroshi Nishida

As a part of a series of ecological studies of *P. westermani*-diploid type in the nothern part of Hyogo Prefecture, Japan, an experimental infection of a red fox *Vulpes vulpes japonica)* with the metacercariae was performed. As a result, it was demonstrated that the metacercariae easily infected the fox and reached sexual maturity in it. Hence, it became clear that the fox, as well as raccoon dogs and wild boars, also may serve as a natural definitive host of the diploid type of *P. westermani.*

Jpn. J. Parasitol., Vol. 35, No. 5, 427-431, October, 1986.
1 tables, 4 fig. *Authors summary*

Campylobacter colitis in ranch mink in Ontario

D. B. Hunter, J. F. Prescott, D. M. Hoover, G. Hlywka, J. A. Kerr

Outbreaks of colitis, where *Campylobacter jejuni* and *Campylobacter coli* were only pathogens isolated occurred in weaning mink *(Mustella vison)* on two commercial mink ranches in Ontario. Lesions were restricted to the proximal colon and were characterized by multiple 1 mm focal or 1 mm linear erosions/ulcers in the region 2 cm distal to the ilealcolonic junction. Histological changes included thickening of the colonic mucosa, inflammatory cell infiltrate in the lamina propria and submucosa, cellular debris and inflammatory exudate within cryptal lumens and multiple areas of mucosal erosion/ulceration. Four *C. jejuni* negative mink were challenged with 5.1×10^9 colony forming units of *C. jejuni* by oral inoculation. Three of four experimentally infected mink developed diarrhea by day 4 postinfection with lesions grossly and microscopically similar to mink in the naturally occuring outbreak. Examination of lesions by transmission electron microscope failed to show evidence of *C. jejuni* invasion of intestinal epithelium. Feeding uncooked slaughterhouse chicken offal was the likely source of *C. jejuni* in the naturally occurring outbreaks.

Can J Vet Res 1986; 50; 47-53
7 figs., 26 references
In ENGL. Su ENGL, FREN.

Authors abstract

Examination of the appearance of trichinellosis in nutria (Myocastor coypus mol).

Jörg Geller

In the submitted work the occurence of trichinellosis is tested by meat samples, that were taken of nutria raised in farms. There were 18 farms from throughout the Federal Republic of Germany involved, in which during the fur bearing season of 1982/83 these animals were

with a carnivor is wrong since the nutria is a genuine herbivor.

It is proposed to withdraw the law about testing nutria meat samples for trichinellosis.

Hannover no publisher 1984 57p.:
4 tables, 4 fig., 42 references.
In GERM Su ENGL *Authors summary*

The role of the red fox (Vulpes vulpes) as a wild final host for echinicoccus granulosus (camel strain) in Egypt

B.A. Ahmed; S.A. Fayek

Five red foxes "V. vulpes" and five puppies (as a control) were infected with fertile hydatid cystic fluid of camel origin. Three foxes died one week post infection.

The other two foxes died on 20th day post infection. The latter two foxes together with the five control dogs were sacrificed and necropsied.

Echinococcus granulosus worms collected from both hosts did not reach sexual maturity and exhibited variations in morphological characters, size and number of segments. These variations indicated that there is a retardation and abnomalities in the development of E. granulosus in foxes. The authors wish to point out that the fox is not normally regarded as suitable final host of E. granulosus of camel strain.

Vet. Med. J. Vol. 33, No. 3, 81-88, 1985
1 tables, 5 fig., 9 references. *Authors summary*

Antibody and cellular immune responses to microfilarial antigens in ferrets experimentally infected with Brugia malayi

James P. Thompson, Richard B. Crandall, Thomas J. Doyle, Stephen A. Hines, Catherine A. Crandall

Eleven of 15 ferrets experimentally infected with *Brugia malayi* became amicrofilaremic after a brief patency; only four ferrets remained patent after 6 months of infection and two of these ferrets developed a high, persistent microfilaremia. Blastogenic responses of peripheral blood lymphocytes to antigens of microfilariae (mf), assayed in vitro, demonstrated an antigen sensitivity at prepatent, patent and postpatent periods of infection. Lymphocytes from ferrets with high microfilaremia had elevated background responses in culture which were directly correlated with the number of circulating mf. This background response was attributed to antigenic stimulation by mf present in the lymphocyte cultures; addition of mf to cultures of lymphocytes from postpatent ferrets induced responses equivalent to those observed in microfilaremic ferrets. Lymphocyte responses to the mitogen, concanavalin A, did not differ significantly among microfilaremic and uninfected ferrets. Antibody in IgG to antigens of mf measured by ELISA and by immunoblots from SDS-PAGE showed similar patterns of response in ferrets which became amicrofilaremic in the few ferrets which remained microfilaremic. Prausnitz-Kustner tests demonstrated no consistent differences in titers to microfilarial antigens between patent and amicrofilaremic ferrets. The results suggest a high level of immune responsiveness to antigens of mf in infected ferrets with no evidence of immunosuppression associated with prolonged microfilaremia or of major changes in immune responses with development of amicrofilaremic infections.

Zeitschrift fur Parasitenkunde : 72(4): 525-535, 1986.
1 tabel, 4 figs., 24 references *Authors abstract*

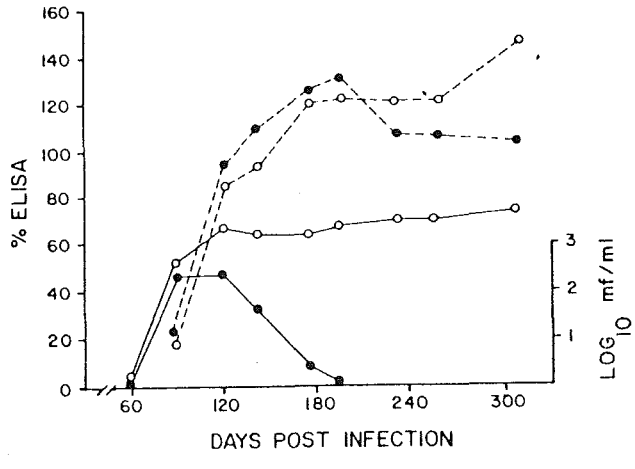


Fig. 3. Microfilaremia (*solid lines*) and IgG antibody (*dashed lines*) responses in ferrets that cleared mf (*closed circles*) and ferrets exhibiting persistent microfilaremia (*open circles*)

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ABSTRACTS FROM MEETING IN SCANDINAVIAN ASSOCIATION OF AGRICULTURAL SCIENTISTS DIV. OF FUR ANIMALS

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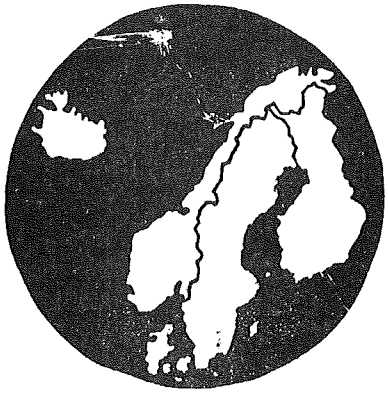

ABSTRACTS FROM
MEETING IN SCANDINAVIAN ASSOCIATION OF AGRICULTUREL SCIENTISTS
DIV. OF FUR ANIMALS
Tromsø, Norway, September 1987.

Regarding FUR ANIMAL PRODUCTION - NJF SEMINARIUM NO. 128

Selection experiment with mink

Gabrielle Lagerkvist

A selection experiment with standard mink was started in 1984 at the research centre at Funbo-Lövsta, Swedish University of Agricultural Sciences, Department of Animal Breeding and Genetics. Selection commenced among males in 1984 and among females in 1985. Selection will continue until 1989. In the report results from 1986 and from 1987 are presented.

The experiment consist of four selected lines plus a control line:

1. Increased body size (weight in September) (BS)
2. Pelt quality (density of underfur) (PQ)
3. Fertility (litter size at 3 weeks of age) (F)
4. Combined selection for fertillity and body size (F+BS)
5. Unselected control (C)

The BS, PC, F and C lines each consist of 80 females and 20 males, while the F+BS line includes double these numbers. One objective of the experiment is to compare the results of separate selection for two traits (BS and F lines), followed by crossing, to those achieved in the F+BS line, with combined selection for the same traits. Only 1 year old animals are used in the selected lines. The selection is carried out by use of selection indices. For pelt quality and body size, the sources of information are full and halfsibs. For fertility, a pedigree index is applied.

The reproductive result in the F line was in 1986 5.2 kits, per mated female at 3 weeks of age - about 1 kit more than the average of the other selection lines. In 1987 the corresponding result was 5.1 kits, - 0.5 kits more than the other lines. In 1986, the BS line had the poorest fertillity (3.8) and in 1987, the PQ line (4.2).

In 1986, at 6 weeks of age, the kits in the BS line weighed 331 g (corrected for sex). Kits in this line were significantly heavier than those in the other lines, (BS, PQ and C line $p<0.01$, and F + BS line $p<0.05$). In 1987, kits were on average 40 g heavier, probably due to favourable weather in the early summer. Kits in the BS line weighed 358 g and did not differ significantly from the other lines. Weight in September for males in this line was 2127 g and 2281 g in 1986 and 1987 respectively, an average of 150 g more than for males in the other lines. The males in the F line had the lowest weight, 1977 g and 2097 g respectively. Skin length was 74.4 cm for males in the BS line and 72.7 cm for males in the F and C lines (1986). The

difference in skin length was significant ($p<0.01$).

The PQ line had the highest scores for density of underfur, quality of guard hairs and general impression when graded in November and as pelts. In november, this line differed significantly from the other lines. The BS line had the poorest density of underfur and the highest frequency of metallic sheen.

The highest sales price was achieved for pelt from the BS line (285 SEK for males, low grades excluded). The lowest sales prices were obtained for pelts from the F and C lines, 276 and 277 SEK respectively. After correction to the same skin length, the BS line and the PQ line had the same price, 281 SEK.

In SWED., 8pp.
8 tables, 9 references

The use of littersize index in commercial mink breeding

Ejner Børsting, Jesper Clausen

The paper describes the theoretic value of a littersize index based on a kit's mother and her relatives or the mother and her relatives plus the father and his related breeding females.

The inclusion of the relatives of the kits' mother improved the estimated genetic gain by 37 percent and the inclusion of information from the father's relatives as well as the mother's increased the estimated genetic gain by 67 percent compared to just the mother's own littersize.

Data from 4 farms and 14 populations comprising 4.150 females first litter were correlated to mothers' littersize or to the females' pedegree littersize index.

Negative correlations were found for mothers' littersize and females' first litter in 6 of the14 populations but the correlations between pedegree littersize index were only negative in 3 of the 14 populations.

In. DANH., 11 pp.
4 tables, 5 figs., 3 references

Woolliness in blue fox

Leena Blomstedt, Ulla Joutsenlahti

Woolliness is a common fur defect in the blue fox (Alopex lagopus). The guard hairs seem to bee missing almost completely from an area of various size of the back. This breaks the dark back figure, so characteristic for the blue fox. The prize of a woolly skin is, depending on the severity, from 5 to 15% lower than a corresponding skin withouth the defect. Woolliness is a problem principally in the best skin quality classes, according to auction statistics.

A skin sample was taken in mid November, the normal pelting time, from the middle of the back from three normal, and five woolly blue foxes. The pelt quality matched except for the defect. In fur animals the hair grow in bundles. A bundle may consist of underfur hairs and guard hair, or down only. Mature and growing hairs, in hair bundles with or without a guard hair (twelve of each type from every skin sample), were counted from histological preparations.

The number of hairs was bigger in the woolly than in the normal blue foxes, in each bundle type; 42 (mean) in bundles with a guard hair and 56 in bundles with only underfur, for normal animals 36 and 51 respectively. The distances between the guard hairs are thus bigger in woolly animals, which in part explains the poorer covering. Further more, most of the guard hairs in the woolly animals were abnormally short, and to a greater extent mature, meaning that they could not grow anymore. 43 % of the hairs of underfur was mature in normal animals, whereas 64 % was mature in woolly animals. The percentage of mature and

	Hair Bundle type			
	with a guard hair		with down only	
Animal	Growing %	Mature	Growing %	Mature
Normal	57	43	58	42
Wooly	34	66*	37*	63*

* $p<0.05$ Student's T-test

growing down in each bundle type from normal and woolly blue foxes, are shown in the following table. Finally it must be pointed out that none of the skins were physiologically mature when the pelting was done.

In SWED., 4 pp.
3 tables, 1 referece

Price analyses as information in breeding work.

Outi Lohi, Ejner Børsting,
Ulla Joutsenlahti, Einar J. Einarsson &
Kaj-Rune Johannesen.

When making long term breeding plans it is important to know:

1. Which characteristics the buyers evaluate when judging the pelts.
2. What is the priority order of these characteristics.
3. Is their effect as price factor similar in the production from different countries and between auction houses.
4. Is their relative importance stable from year to year and if not, is it possible to predict the future development.

In the *Scandinavian Association of Agricultural Scientists* has the *Breeding Committee of Fur Animal Division* decided to carry out a statistical analyses of prices on the most important pelt types after each auction season. In each type the analyses are based on the production from two countries and the material comprises the total pelt production excluding low-grades pelts.

Results for scanblack and pastel are also compared with similar analyses made on the Finnish production in 72/73-75/76.

The statistical calculations are done by LSMeans analyses model of SAS Institute. Each auction lot is included as one observation.
The model variables are size, quality, colour, shade (clarity) of colour and auction. Auction within the marketing season is included as a variable in order to be able to eliminate the effect of differences in price level and uneven distribution of pelts in different auctions.

Results.

The average relative prices per trait and class are presented in table 2. In any of the analysed pelt types there is very little difference between countries and auction places.
Quality and size have the strongest influence on the price in all pelt types. Clarity or shade of colour is in both mink types of very little economical value and is therefore excluded in calculations after 1982. In all fox types, however, it is important the total effect being in blue foxes about 20 % and in silverfox and bluefrost fox altogether 30 %. The colour itself (darkness of the colour) is more important in scanblack mink than in pastel. In scanblack it seems to affect the price even more in female pelts. In bluefox the effect of colour has decreased. In silver fox the medium and pale groups are favoured at the moment and the price declines to-

Tabel 1. Pelt types and auction seasons included in the calculations.

	Country and season:		
	Finland	Denmark	Norway
Mink:scanblack og pastel	80/81-85/86	83/84-85/86	
Fox: blue- og shadowfox	80/81-85/86		83/84-85/86
silverfox	83/84-85/86		83/84-85/86
bluefrost fox	84/85-85/86		83/84-85/86
shadow bluefrost	84/85-85/86		

Table 2. Relative prices of different classes per trait.

		MINK								FOX				
		Scanblack				Pastel				Blue	Shadow	Silver	Blue-	Shadow
		Males		Females		Males		Females		fox	bluefox	fox	frost	bl.frost
Auction seasons included:		1972-74	83-85	72-74	83-85	72-74	83-85	72-74	83-85	83-85	83-85	83-85	83-85	84-85
Quality:	SS	100	100	100	100	100	100	100	100	100	100	100	100	100
	Saga	88	94	93	91	93	96	95	95	91	91	83	84	84
	I	81	87	86	82	86	89	87	86	80	82	62	66	62
	II	75	79	82	70	81	82	81	77	70	68	40	44	49
Size:	00		106				104			100	100	100	100	100
	0	100	100			100	100			89	92	87	89	92
	1	94	92			94	95			73	77	70	68	80
	2	89	80		100	89	84		100	60	60	61	46	69
	3	78	71	100	96	78	71	100	97					
	4			87	80			89	86					
	5			77	57			79	68					
Colour:	Black	100	100	100	100					100				
	XX-D	91	96	89	93		100		100	99				
	X-D	89	94	86	90	100	96	100	94	97	77	90	93	57
	Dark	89	92	83	87	97	95	99	90	97	80	100	117	74
	Med.	87	90	80	85	96	95	97	89	99	83	117	125	89
	Pale	85	88	78	81	94	92	96	87	104	90	122	117	104
	X-Pale									103	96	112	106	105
	XX-Pale									100	100	100	100	100
Shade of colour:	R+/R	100		100		100		100		100	100	100	100	100
	R-	98		96		98		95		92	93	90	89	92
	OC	96		94		97		95		87	87	80	79	80
	OC-	96		95		96		93		83	80	73	71	69

wards both ends of the colour scale.

2 tables
In DANH

Authors abstract

Grading of live blue foxes

Hilkka Kenttämies

Grading of fur animals is used together with fertility index in selection of animals for breeding. Comparison of scores evaluated in live animals and pelts shows quality level of the farm and also uniformity of measurement performed in farm conditions. The aim was to study variation for scored pelt and skin traits in the blue fox, factors effecting the traits, and correlations between the traits and prize of skin.

Material consisted of data from an experimental farm in 1983 and from a commercial farm in 1983 and 1986. Data were available totally on 963 live animals and on 534 skins. The live animals were evaluated by the personel of each farm. General appearance and darkness of

colour were scored in the former year, and in addition body size, cleanness of colour, underfur density, guard hair density and possible pelt defects were scored in the latter year. The skins were evaluated according to the Scandinavian standards at the Finnish sale company, the Turkistuottajat Oy.

Coefficient of variation was from 21 to 32 % for most of the traits. The most common defects were woolly and silver pelts. Woollines impaired particularly guard hair density, while silvery hair lessened general appearance. The closest correlations existed between general appearance and density of underfur and of guard hairs (r = 0.52 and 0.50). The large animals tended to be good in underfur density (r = 0.22) and in general appearance (r = 0.15). When compared with the scores for skin, the best animals for general appearance were found to be larger and higher in quality than moderate or worst ones (P<0.001). The best animals were usually darker than the others (P<0.05). Sale prices were similar to the average prices in the respective auctions. Auction affected more markedly price than the scores for general appearance. However, the prices payed for the best animals were higher than for moderate or worst ones (P<0.001). Size of animal affected the prices more than the other traits (P<0.001).

In SWED., 8 pp.
4 tables, 2 figs., 3 references

A new method for comparing fox skin prices

S. Adalsteinsson

At the skin auction in Helsinki at the end of January, 1987, a large variety of fox skins were on sale and variation in prices was quite substantial.

A new method for comparing skin prices was deviced by the author after the above mentioned auction. This method consist of expressing the average price obtained for any given skin type as a percentage of the skin price of the silver fox on one hand and as a percentage of the blue fox skin price on the other hand.

These percentages, when plotted in a plane with the relative price of blue fox skin on one axis and the relative price of silver fox skins on the other axis will fall on a straight line. The individual skin types will thus rank themselves along this straight line and can be compared to each other at a quick glance.

In NORG., 2 pp.
1 fig.

New fox colours in Iceland

S. Adalsteinsson, P. Hersteinsson, A. Pálsdóttir, E. Gunnarsson

The paper described the new hypothesis on fox colour inheritance presented recently in *J. Hered. 78:235-237.*

One new colour type, not described previously, has been found among arctic foxes in Iceland. This colour is light chocolate brown and occured in the wild among pups in dens where both parents were of the dark phase of the arctic fox and showed near-black pigment. This type is believed to be the homozygote for the recessive allele b at the B-locus, combined with the dominant allele E^d at the E-locus which produces the dark phase.

A case of two nonwhite pups out of both parents winter-white was recorded in East Iceland in summer 1987. The phenomenom is consistent with the presence of a bottom recessive allele a at the A-locus in homozygous state. This alleged new allele is then recessive to the previously postulated allele, A^w, for the winter-white phase in the arctic fox. A DNA fingerprinting test was carried out on material from both the pups and both the alleged parents. The test results were in agreement with the assumed parentage of the pups and thus strenghtened the hypothesis that the pups were of genotype aa at the A-locus. This phenomenom is being investigated further.

In NORG., 2 pp.
2 references

Artificial insemination of foxes in Finland 1987

Liisa Jalkanen

In 1987 artificial insemination was used on more than 50 % of finnish fox farms as a routine breeding method. There are even farms, where it is the only method in use. Approximately 200.000 fox females were inseminated, which represents about 25 % of all breeding females in Finland. A total number of 179.274 females inseminated with the intrauterine AI-method was reported through the Finnish Fur Breeders Association. Training and field work of AI-technicians is also controlled by the Association. In 1987 131 new technicians were trained making a total number of 362 technicians on the field. Most of the females (95.000) were inseminated on 182 fox AI-stations.

The main use on AI is still in producing crossbreed skins by inseminating blue fox females (Alopex lagopus) with silver fox semen (Vulpes vulpes). 85 % of insemination combinations were of this type. The results were good. The conception rate of blue fox females was 80 % in both pure and crossbreeding. The conception rate of silver fox females was 74 %. The number of cubs at two weeks age per inseminated female was 4.42 for blue fox females in crossbreeding, 5.67 for pure blue fox combinations and 2.54 for silver foxes. The combination silver fox female x blue fox male gives a poor result (1.58 cubs per female) and only under 1 % of AI-combinations were of this kind.

Experiments of freezing semen and using frozen semen were made on eight different AI-units, but the number of females was small and the results varied greatly.

In SWED.

Is carbohydrate digestibility dependent on dietary carbohydrate level?

Maria Neil

In digestibility trials with carbohydrates to mink digestibility was found to be dependent on dietary carbohydrate level. This was assumed to be an effect of systematical errors in the chemical analysis where content of carbohydrates was calculated by difference. Digestibility of sugar and starch, the carbohydrate fraction most likely to be digested by mink, showed no dependence on carbohydrate level. Conclusion: Analysis of sugar and starch should always be carried out in digestibility trials with carbohydrates to mink.

In SWED., 9 pp.
1 table, 3 figs., 21 references

Comparison of the nutrition digestibility in mink kits and adult mink males.

Jan Elnif, Niels Enggaard Hansen

The digestibility of crude protein, crude fat and easily hydrolysable carbohydrates (EHC) was examined in a 4 weeks period for mink kits, 7 weeks old at start, and adult mink males. All animals of the type pastel.

The animals where kept in normal farm environment and where fed conventional feed.

The apparent digestibility (AD) of crude protein and EHC for the kits rouse during the experiment. AD-protein and AD-EHC where in the beginning of the experimental period significantly lower for the kits but reached the level of the adult in the last week. No such changes where seen for the digestibility of crude

Apparent digestability.

	Crude protein		Crude fat		EHC	
Week	Kits	Adults	Kits	Adults	Kits	Adults
1	81	84	94	95	90	90
2	81	86	93	96	92	96
3	83	85	94	96	93	95
4	87	86	94	95	96	97

fat, and there was only a minor difference between the two groups.

In DANH., 6 pp.
5 figs., 2 tables

Modified starch as a binding agent in mink feed

Jaakko Mäkelä, Tuomo Kiiskinen, Maija Valtonen, Lea Eriksson

In fur animals feed there are sometimes problems with feed consistency. Alginates, which have a water binding capacity 10 times their own weight, have proven to be good binding agents in wet feed. However, addition of more than 1 % in the feed increases the water content of faeces and may disturb the salt and water balance of the animals. In this work, the effects of a new preparation, a derivative of starch, were studied on animal growth, feed digestibility and water and salt balance. Modified starch has a very high water binding capacity, 500 times its own weight. Addition of 0.4 % of modified starch in the feed (1.2 % of dry matter) had no negative effect on the digestibility of protein, fat or carbohydrates in the feed, nor on animal growth or well-being. Water and salt balance trials were performed with an addition of 0.2 and 0.5 % of modified starch in the feed. The water content of the faeces increased along with the increased addition of modified starch. This caused increased need for drinking water. Modified starch contained sodium 11 % of dry matter which was not digested nor resorbed in the intestine. It was excreted in the faeces. Along with the increased excretion of sodium and water also the excretion of potassium increased in faeces although the potassium content of modified starch itself was very low (0.003 % of dry matter). If modified starch is used in greater amounts than the recommended 0.1-0.2 % in the feed, it may disturb the water and salt balance of the animals during insufficient supply of water or increased need for water and salts, e.g. during the nursing time.

In SWED., 6 pp.
4 tables, 2 figs., 3 references

Flotation offal in mink feed

Georg Hillemann

Flotation offal from outlet water from a poultry slaughter plant was given to standard and pastel mink in one winter- and one summer period.

The nutritional contents of the flotation offal used were: Water 72.7 %, ash 3.3 %, crude protein 14.0 %, and crude fat 6.5 %. The content of metabolizable energi was calculated to 1100 kcal./kg.

In the winter period 120 females in a control group and 120 females in an experimental group were fed a diet containing 12 % of flotation offal. The breeding results and the kit weight at weaning were satisfactory.

In the summer period 280 mink in a control group and 280 in an experimental group were fed a diet also containing 12 % flotation offal. Weight gain and skin size were a little smaller in the experimental group compared to the control. Fur quality was improved in the experimental group.

It was concluded, that 12 % flotation offal was the maximum content in the summer period if a reasonable size were to be obtained.

In DANH., 8 pp.
7 tables

Acid preserved chicken byproducts as feed for blue foxes and mink

Morten E. Ruud

Experiments were carried out with chicken byproducts preserved by formic acid as feed for fur animals. The experiments comprised two different types of byproducts from the slaughtering of broiler chicks. One type conscisted of the digestive tract, lungs, heart, and liver. The other type of raw material contained in addition feet, heads and the outer part of the wings. Efficient preservation was obtained by adding 1.3 - 1.9 % formic acid as quick as possible after slaughter. The pH varied from 3.7 to 4.1 in the silage, and from 4.9 to 5.6 in the feed mixture being used in the feeding

experiments. The silage was stored up to 4 months at room temperature.

Digestibility experiments were carried out with adult male mink. The results showed that the formic acid preserved chicken byproducts had no negative effect on the digestibility of protein, amino acids and fat.

Production experiments were carried out during the weaning - pelting and pelting - weaning periods. From weaning to pelting the feed contained 24 % of chicken byproduct silage. In this period there was no sign of negative effects on growth, fur quality or health, neither in blue foxes nor in mink. The same amount of chicken byproduct silage given in the period from early January to weaning gave reduced growth and anemia in mink kits. Blue foxes given the same feed revealed satisfactory kit growth, and normal levels of hemoglobin and hematokrit. This may indicate that mink are more sensitive to formic acid preserved feed than blue foxes, especially in the preweaning and early postweaning period. Male mink given 24 % formic acid preserved chicken byproducts mated normally, and semen quality was normal.

Preservation with formic acid is a low cost, simple and rapid method, which offers great potential as an alternative to freezing. The present experiments showed that large amounts of formic acid preserved chicken byproducts could be used in the diet of mink and foxes without negative effects. However, the negative effects on early growth in the mink experiments indicate that the formic acid levels in the diet should be kept low during this phase of the life cycle.

In NORG, 9 pp.
9 tables

New aspects on biotechnologically conserved fur animal feed: Semi-dry slaughter offal

Anne Näveri

The paper describes a new application of a feed conserving method that is based on the reducing of the a_w (water activity) -value of the feed. With the help of so called humectants, or water binding substances, bacterial growth in the feed stuff is inhibited to a great extent; yeasts and molds are inhibited chemically by propylenglykol which also acts as an effective humectant. In the conserving process, the slightly acidfied fresh slaughter offal is mixed with raw feed flour and propylanglykol, the mass is heated up to 95-100^{0}C for 10-15 minutes, and an antioxydant is added at the end before pumping the hot feed mass into containers. The feed can be stored at any outside temperature or usual storage temperatures in tightly closed containers (f.ex. thick plastic barrels) inpermable to water and gases. In the beginning of July, in 1987, an experimental sample lot of about 1000 kg's of semi-dry slaughter offal was manufactured for a feeding experiment with blue foxes. All the quality analyses performed on the conserved semi-dry feed show good keeping characteristics; these include microbiological analyses as well as several physical and chemical hygienic quality analyses (peroxides, free fatty acids, total volatile nitrogen, biogenic amines etc.) The experimental feed has been used at the ratio of 25 % of the mixed feed manufactured for the feeding group of 40 blue foxes since the beginning of August. In experimental group, the appetite has been good, the faeces' consistence normal and the puppies have gained weight well accompanying the control group of blue foxes.

- To our experience so far, the semi-dry slaughter offal seems to offer a comparable and economical alternative while choosing from different means of storaging or conserving fur animal feed stuffs.

In SWED., 8 pp.
4 tables

Flushing of mink - further studies

Anne-Helene Tauson

Further investigations regarding the effects of flushing on reproductive performance in mink have been carried out in the period 1985-1987. The scope of the investigations was to evaluate the

best model for flushing and the influence of mating system used.

In 1985, 5 groups of each 40 females of which 13 were yearlings were used. A non-flushed control group was compared with groups flushed from February 20 and March 4, respectively. The flushing period was preceded by a two week period of either moderate or severe restriction. Mating started on March 7. In 1986, two different experimental models were used. With three groups of each 35 yearling females effects of flushing from march 3 preceded by a two or three week period of moderate restriction was evaluated in relation to a non-flushed control group. In four groups of each 2 x 20 adult females, flushing from March 3 preceded by a two week period of moderate restriction and mated according to system 1+8(+1) from March 7 or according to system 1+1 from March 18 was compared with non-flushed animals mated according to the same systems. The latter model was also used in 1987 in an experiment with groups of 50 females of which 25 were yearlings. Matings started on March 9 and March 18, respectively.

The results from 1985 agreed with ealier findings in that flushing started 3-4 days before the onset of the mating season and preceded by a 2-week period of moderate restriction improved litter size. The increase compared with the control group was about 1 kit per litter. Flushing from February 20 was less effective, and flushing from March 4 preceded by severe restriction had no positive effect. Also in the yearling females in the 1986 experiment litter size was improved by 1 kit per litter by flushing from March 3 preceded by 2 weeks of moderate restriction. When evaluating the effects of flushing and mating system, no clear-cut results were achieved. All animals, however, had increased in weight during the mating season and therefore weight changes differed less between flushed and non-flushed animals than planned. Gestation lenght increased when matings commenced late and the system 1+1 was used.

In SWED., 8 pp.
3 tables, 14 references

Different fats in fur animal feeding

Kirsti Rouvinen

Introduction

The influence of different plant- and animal fats on growth, skin quality and fatty acid composition of body and skin of fur-bearing animlas has been studied. Also the effect of fat on storage durability and dressing properties of the raw skins are to be clarified.

Material

Fats in experiment 1 were beef tallow (control; groups 1 and 7), mink fat (2), capelin oil (3, 8), soyabean oil (4), rapeseed oil (5, 9), beef tallow: rapeseed oil-mixture 50:50 (6, 10) and in experiment 2 soyabean oil:animal fat mixture 40:60 (control; group 11) and oxidized (rancid) herring offal (12). Fat level in the diets was 20% of dry matter. Groups 1-6 were standard minks (28 pairs/group), 7-10 bluefoxes (21 pairs/group) and 11-12 standard minks (42 pairs/group). Experimental period was from weaning to pelting.

Results

Growth and skin quality.

There were no differences in growth of the animlas or in length and quality of the skins in mink groups 1-6. In mink group 12 growth was significantly reduced compared to control and mass of the pelts was poor. Also many animals died during the experiment. In bluefox groups females fed with rapeseed oil were smaller than in control group. Skin length was however the same in all groups. Purity of the fur color of capelin oil and mixture fat groups was deteriorated compared to control.

Fatty acid composition.

In experiment 1 feed fat had a great influence on fatty acid composition of the skin, subcutaneous fat, inguinal fat, fat from the internal organs and liver. From skin surface towards deeper fat depots the body fat tended to be more saturated. Mink fat was more unsaturated than fat from bluefoxes. There was also a tendency to store more unsaturated fats into the body towards winter. Bluefoxes stored

more fish fats in their body and specially in their liver than did minks. Capelin oil lowered cholesterol level in plasma in minks.

Durability of raw skins.

In the skins in the storage experiment (+8^{0}C, 70% RH) after 5-6 months there can be seen a tendency towards saturated fatty acids and the amount of double bonds tends to fall. This reflects coarsly the oxidation of fats in the skins. The pelts are to be dressed after one year and their dressing properties are to be clarified.

In SWED, 21 pp.
18 tables, 8 fig., 3 references

Some biochemical aspects of fish-induced anemia in mink

Jouko Työppönen; Erik Smeds; Ilpo Pölönen

Trace elements iron, copper and zinc interact during the absorption from the intestine. These elements are essential both in pigmentation of the fur and in antioxidative defence system. Also manganese has the latter function in the organism. These metabolic functions are mainly mediated through different enzyme activities where a given trace element is an essential component in the active site of the enzyme. Anemia was provoked in minks by feeding the animals with high content of raw fish of the cod-family. Feed and mink tissues were analyzed for some biochemical parameters that theoretically can influence the development of anemia and cotton-fur syndrome. The levels and proportions of iron and other studied trace elements in fish feed were normal and all elements except iron were well absorbed in anemic minks. Also the enzyme activities that depend on Zn, Cu and Mn were similar in normal and anemic minks. There were a great individual variation in absorption of iron in normal minks but blood hemoglobin levels were yet the same. Hemoglobin synthesis was impaired only when the iron stores in liver and spleen were almost totally exhausted. Thus, for the diagnosis of a latent anemia, blood hemoglobin is a poor indicator. For that purpose serum iron determination suited better but was not a satisfactory method either because of great individual variation in subclinical cases.

During fish feeding antioxidative factors play a vital role both in preventing rancing process in the feed and because of the increased amount of polyunsaturated fatty acids (PUFA) in the animals. The high content of PUFA in fish feed leads to increased proportion of these fatty acids in cell membranes of the minks. In the present study feed selenium was well absorbed and metabolized to antioxidative selenoenzymes (glutathione peroxidase) but plasma vitamin E level in anemic minks was only half (5 mg/l) of that observed in the control group. Severe early anemia was almost completely cured by a single injection of iron in the beginning of September. However, even a high content (20%) of boiled slaughter offal in the anemiogenic feed had only a slight anemia preventive effect. The poor effect of the slaughter offal was probably caused by oxidation of cysteine to cystine during boiling. Thereby the previously shown beneficial effect of cysteine to iron absorbation was probably lost. In agreement with previous observations, the key mecanism in fish-induced anemia in minks was the strong and specific inhibition of iron absorption. In the present study, the antioxidative defence system in anemic minks was also impaired (Fe-enzymes and vitamin E) which was an additional stress towards anemia and cotton-fur syndrome.
In SWED, 10 pp.
1 table, 13 fig., 5 references.

Treatment of neonatally aleutian disease infected mink kits with gammaglobulin containing antibodies to ADV reduce the death rate of kits due to penumonitis

Bent Aasted; Mogens Hansen

Aleutian disease virus (ADV) can cause pneumonitis in newborn kits (up to three weeks old). In many cases the pneumonitis is fatal, but it can be prevented by treatment with antibodies to ADV. The present report describes antibody therapy

in both experimentally ADV infected mink kits and in mink kits from a farm, where an epidemic developed during the whelping period in the spring of 1987. In both cases the antibody treatment was found to have a beneficial effect on the survival rate of the mink kits, but while 100 per cent survival rate was found in the experimentally infected and antibody treated mink kits, 12,2 per cent of the naturally ADV infected and antibody treated mink kits died. If not treated the death rate was 14.5 per cant.

In DANH, 9 pp.
3 tables, 14 references

Wet pups of the blue fox

M. Liisa Wallenius

In Western Finland there were 43 fox farms which reported appearance of wet blue fox pups in May and June 1987. These were taken ill at the age of between ten days to three weeks. They became wet and lost their hair partly or totally. The mortality among sick pups varied from 0 to 20 %, and those which survived fell behind in growth. The exterior of wet fox pups had resemblance to that of wet mink kits.

Wet fox pups were more often found on the farms which used feed compounds containing higher percentage of fish products than average. During the whelping season the weather was very humid due to long rain periods.

Staphylococcus aureus grew in all bacteriological samples taken from the skin of wet pups and in 8 of 13 samples taken from the urine of vixens with wet pups. In the liver and intestine of dead wet pups grew coliform bacterias, hemolytic E. coli and/or Staph. aureus. All the virological tests were negative.

The appearance of wet pups was regularly preceded by the loss of appetite in the lactating mother. As a treatment for vixens were used penicillin, trimethoprim sulfa or ampicillin. Antibacterial treatment of vixens had no clear effect on their wet pups.

The most effective ways of treating the problem with wet pups seemed to be the improvement of the ventilation in whelping boxes, the use of straw in the boxes in order to dry up the pups and the replacement of the wet and dirty box with a dry one.

In SWED., 5 pp.
4 references

Ringworm in ranch fox

L. Englund, R. Mattsson, T. Mejerland, L. Treiberg

An outbreak of ringworm in a fox farm is described. Infection with Trichophyton metagrophytes was diagnosed by direct microscopy and culturing on Saboraud medium. Hairless patches on the head and dandrufflike changes in the coat were seen in the cubs. A few of the adult foxes showed mild symptoms but most of them were healthy. Members of the family handling the cubs as well as the dogs on the premises had ringworm. The humans were treated with griseofulvin orally and the dogs were washed with antimycotic solution. All foxes were vaccinated with Mentavac (Medexport, Moscow, USSR). New cases ocurred until two weeks after vaccination then the outbreak stopped. One cub which had severe ringworm at the time of vaccination had not improved after ten weeks but all the other changes were healed or healing.

In SWED., 3 pp.

Environmental conditions in cages and nests of farmed foxes and raccoon dogs

M. Harri, F. Fors, T. Haaranen, H. Korhonen, K. Nydahl

The aim of a scandinavian project is to improve environmental conditions of farmed canids. It has been our duty in Finland to characterize the physical environment of cages and nest boxes and to map their influence on breeding success of foxes and raccoon dogs.

Only one in four raccoon dogs preferred to use a sleeping plate despite of cold weather in winter. Animals which did not prefer to use the plates most eagerly messed them up. A dry sleeping plate effectively prevented heat loss from the raccoon dog model while a wet plate was less effective. Heat transfer was highest when the plate was ice covered. Wind also increased heat loss. Blue foxes used sleeping plates even less than the raccoon dogs. They also very soon messed the plates up. The usage of rest shelves was also rather low. The raccoon dogs did not use them at all. At its highest, about 40 % of blue foxes preferred to use the shelves. If the distance of the shelves from cage roof was 30 cm the foxes defecated on it: the shelves got very dirty within a week. If the distance of the shelves from cage roof was only 18 cm the shelves generally remained clean. However, because the animals could not attain a curled position, typical of them in cold wheather, the thermal protection provided by such shelves remain obscure. The blue foxes also used a shelve made of wire net which does not offer any thermal protection. This indicates that the (few) foxes which preferred to use the shelves did so because they like to lie on a high place, rather than because of thermal protection.

The temperature inside different nest boxes was only 3.2 to 8.7 °C higher than that of ambient air. There were no obvious differences between different nest box types. Also the thermal protection provided by the nest boxes was less than expected. At its highest a nest box with a well insulated bottom reduced the heat loss of a model animal by 30 % at -18°C. Ammonia vapour inside the nest was not a serious problem. Its concentration only rarely and only for short periods of time exeeded a value of 50 ppm which has been reported to cause harmful effects (McNitt, 1985).

The breeding success of altogether 120 female blue foxes was evaluated on Maxmo research farm. Mortality of females and whelps was low and there were no differences between the five nest boxes used. The mean final litter size in terms of whelps per all females in the study was 6,6. Again, there were no differences between the nest box types. The place of nest box on the farm and the time of birth did not influence the litter success. There was a weak but significant ($P<0.02$) positive relationship between the weight of the female and its litter size. The mean litter size of the blue foxes on the farm was greater than that of the species in the wild. Thus it seems probable that this, already good result, might not be improved by modulating the nest box.

In SWED., 16 pp.
11 tables, 1 fig., 8 references

November 6, 1987

August 21 - 28, 1988

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DENMARK

Dear Mr. Jorgensen:

Enclosed is a copy of the "invitation" package recently mailed regarding the upcoming 4th International Scientific Congress in Fur Animal Production.

As we are trying to get as wide a coverage as possible, we would like to have the attached four pages published in the next issue of Scientifur.

It would be appreciated if you would arrange this for us. If there is a charge, please send the invoice to: The Secretary, Canada Mink Breeders Association, 65 Skyway Avenue, Suite B, Rexdale, Ontario, M9W 6C7.

Thank you.

Yours truly,

Gary N. Hazlewood

Gary N. Hazlewood
Coordinator

November 1, 1987

August 21 - 28, 1988

I N V I T A T I O N

You are cordially invited to participate in the Fourth International Scientific Congress in Fur Animal Production to be held in Toronto, Canada and Wisconsin, U.S.A., August 21 to 28, 1988. The tentative program is enclosed with this announcement.

The scientific portion will consist of oral reports and posters and is expected to cover genetics, reproduction, nutrition, pelage, pathology and related topics in fur animal production. Manuscripts will be published in a volume which will be available at the beginning of the Conference.

This invitation includes a Call for Titles. Therefore, prior to February 1, 1988, please submit the title of your proposed research presentation.

Manuscripts are due in Toronto before April 1, 1988. These will be expected to follow the format described in the enclosed "Instruction to Authors". The abstract for each manuscript will be copied for inclusion in the program. Wherever possible, we request that the manuscripts be submitted on computer disk as well as in the usual form. IBM-PC format is favoured as are the programs WordPerfect and WordStar, but any readable format (MS-DOS or CP/M) will be gratefully received.

Information on the hotel accommodations and the Congress tours is also included. Early reservation of hotel rooms is necessary.

Please complete the attached sheet and return it as soon as possible to:

The Secretary
Canada Mink Breeders Association
65 Skyway Avenue, Suite B
Rexdale, Ontario, Canada
M9W 6C7

Gary Hazlewood
Coordinator

4TH INTERNATIONAL SCIENTIFIC CONGRESS
IN FUR ANIMAL PRODUCTION

Toronto, Canada & Wisconsin, U.S.A.

August 21 to August 28, 1988

____ I plan to attend the IV International Scientific Congress in Fur Animal Production and plan to present a paper/ poster. The title of my presentation will be:

_____

____ I plan to attend the IV International Scientific Congress in Fur Animal Production. I do not plan to present a paper or poster.

(Please type or print)

TITLE (Prof./Dr./Mr./Ms.) _____

FAMILY NAME _____

OTHER NAME(S) _____

PRESENT POSITION _____

ADDRESS FOR CORRESPONDENCE _____

_____

_____

_____

COUNTRY _____

I may be accompanied by family members (number): _____

Please return this form prior to February 1, 1988 to:

The Secretary
Canada Mink Breeders Association
65 Skyway Avenue, Suite B
Rexdale, Ontario, Canada
M9W 6C7

4TH INTERNATIONAL SCIENTIFIC CONGRESS IN FUR ANIMAL PRODUCTION

TENTATIVE PROGRAM

SATURDAY and SUNDAY	AUGUST 20 AUGUST 21	ARRIVAL IN TORONTO, CANADA (Pearson International Airport) (Howard Johnson's Airport Hotel)	
SUNDAY	AUGUST 21	REGISTRATION	1200 - 2100
		TOUR OF TORONTO	1400 - 1700
		RECEPTION	2000

**** Please note that this is a tentative program only. Final details will be available upon receipt of registration. ****

MONDAY	AUGUST 22	SCIENTIFIC PROGRAM HELD AT HUDSON'S BAY FUR SALES CANADA INC.	0830 - 1700
		CONGRESS BANQUET	1900 - 2200
TUESDAY	AUGUST 23	SCIENTIFIC PROGRAM	0830 - 1700
		PANEL FOR SCIENTISTS AND MINK FARMERS	1930 - 2100
WEDNESDAY	AUGUST 24	SCIENTIFIC PROGRAM	0830 - 1200
		TOURS: NIAGARA FALLS, MINK AND/OR FOX RANCHES UNIVERSITY OF GUELPH	
THURSDAY	AUGUST 25	LEAVE FOR O'HARE AIRPORT, (CHICAGO), U.S.A.	0900
		BUS FROM CHICAGO, ILLINOIS TO MADISON, WISCONSIN	
		TOURS: UNIVERSITY OF WISCONSIN OR UNITED LABORATORIES	1200
		BUS TO FOX HILLS, ARRIVE	1800
FRIDAY	AUGUST 26	TOUR: MINK AND FOX RESEARCH RANCH	0900 - 1800
		HOSTED DINNER IN EVENING	
SATURDAY	AUGUST 27	TOUR: LARGE MINK FARM	
		RANCHER SEMINAR	
		BARBEQUE HOSTED IN EVENING	
SUNDAY	AUGUST 28	BUS TO NORTHWOOD FUR FARM (lunch included)	0800
		RETURN TO O'HARE AIRPORT (CHICAGO) FOR DEPARTURE	1530

PERSONS OUTSIDE NORTH AMERICA ATTENDING THE FULL CONGRESS SHOULD CONSIDER BOOKING AIR TRANSPORTATION TO O'HARE AIRPORT IN CHICAGO, ILLINOIS, U. S. A. WITH A STOP-OVER IN TORONTO, ONTARIO, CANADA

4TH INTERNATIONAL SCIENTIFIC CONGRESS IN FUR ANIMAL PRODUCTION

CALL FOR TITLES

INSTRUCTIONS TO AUTHORS

GENERAL

The proceedings of the 4th International Congress in Fur Animal Production will be published in book form and will be available for distribution at the Congress, August 21 to 28, 1988. The official language for Congress and proceedings will be English. Two copies of written version of the manuscript along with all illustrative material should be prepared and, if possible, a floppy disk containing the manuscript in MD-DOS (WordPerfect or WordStar preferred) or CP/M format should be included. IT IS IMPERATIVE THAT MANUSCRIPTS BE SUBMITTED PRIOR TO APRIL 1, 1988.

ABSTRACTS

A book of abstracts will also be distributed at the meeting. These will be the same as those which are associated with the manuscripts but are to be presented on special camera-ready forms which will be sent with the pre-registration materials. Abstracts should summarize the data and conclusions. They should not contain vague statements such as "data will be presented on" or "the results will be discussed". An excess of abbreviations should be avoided.

MANUSCRIPTS

1. Manuscripts should be typewritten and single spaced;
2. Text should not exceed eight (8) pages, including references;
3. Footnotes should be avoided where possible;
4. Literature citations should be referenced in the text according to the method used in the journal Biology of Reproduction, i.e. for a single author (Jones 1981), for two authors (Einarsson and Fougner 1985) and for multiple authors (Smith et al 1987);
5. All reports cited in the text should appear at the end of the paper in alphabetical order in the form used in Biology of Reproduction:

   Jones, R.E. and Smith, A 1987. Furring, pathology and reproduction in mink caged with chickens. J. Reprod. Fert. 45:78-98;

   Englemann, R.K. 1986. My life in a mink cage. In Edwards, R.E. (ed.) Strange lifestyles of scientists. Plenum Press, N.Y. pp 84-93.
6. Figures should be original drawings or clear, well-focussed glossy photographs of line drawings. Each figure should be referred to in the text. Only essential labelling should be used. Photographs should be clear and trimmed to show only the essential features. Figure legends should contain sufficient information so the figure can be interpreted without reference to the text;
7. Tables should be numbered with arabic numerals and each must be referred to in the text. Sufficient information needs to be presented in the legend so that the table is self-explanatory;

Manuscripts will be read by one or more members of the editorial board chosen by the editor. Care will be taken to ensure that manuscripts by geneticists will be read by a geneticist, those of pathologists by a pathologist, etc. The editor reserves the right to make minor corrections of an editorial nature. If it is perceived that major changes are required, the authors will be consulted.

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