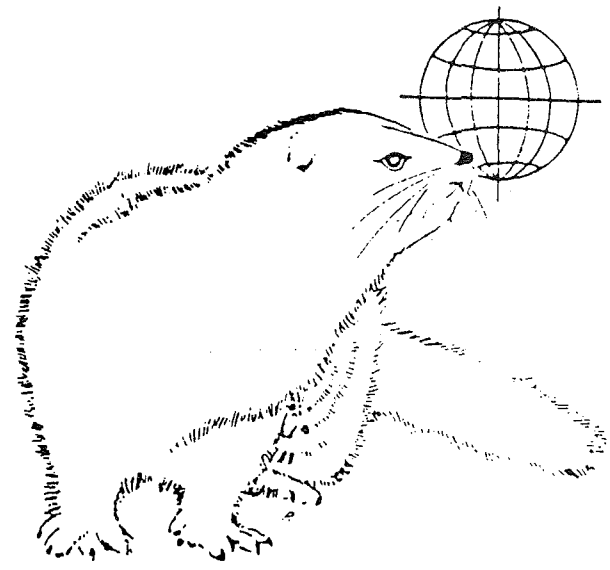

SCIENTIFUR
ISSN 0105-2403
Vol. 18, No. 1
~~November~~, 1994
Februar

Published by **IFASA**

INTERNATIONAL FUR ANIMAL SCIENTIFIC ASSOCIATION

Editor	Gunnar Jørgensen
Address	SCIENTIFUR P.O. Box 145, Økern N-0509 Oslo, Norway
Tel.	+47 22 64 41 50 (private: +47 32 87 53 30)
Fax	+47 22 64 35 91 (private: +47 32 87 53 30)
Subscription 1994	NOK 600,- per volume (year) Air mail delivery + NOK 80,-
Bank	Den Norske Bank, Account No. 7076 66 38986 **Please note:** Payment by cheque in foreign currency must be added fee of exchange, i.e. the equivalent of NOK 60,-.
Giro Account	Postbanken, Acc. No. 0826 060 2064 IFASA/SCIENTIFUR, P.O. Box 145, Økern N-0509 Oslo, Norway

SCIENTIFUR
ISSN 0105-2403
Vol. 18, No. 1
February, 1994

Titles of other publications - not abstracted

About good and poor chinchillas. *Anonymous. Deutsche Pelztierzüchter, V. 66 (5), pp 95-99, 1992. 18 ill. In GERM. Code 2-4-14-O.*

What is the value of mink manure? *Anonymous. Deutsche Pelztierzüchter, v. 66 (6), pp 118, 1992. 1 table. In GERM. Code 10-14-M.*

The best maturity of furs is their natural ripeness. *Anonymous. Deutsche Pelztierzüchter, v. 66 (6), pp 119-121, 1 ill. In GERM. Code 2-14-M-F-O. Code 2-14-M-F-O.*

Skinning of mink, skin preparation and storage. *Anonymous. Dansk Pelsdyravl, v. 55 (10), pp 438-448, 1992. 23 ill. In DANH. Code 12-14-M.*

Skinning of foxes, skin preparation and storage. *Anonymous. Dansk Pelsdyravl, v. 55 (10), pp 449-453, 1992. 8 ill. In DANH. Code 12-14-F.*

Skinning instructions for use of machinery. *Anonymous. Dansk Pelsdyravl, v. 55 (10), pp 454-462, 1992. In DANH. Code 12-14-M-F.*

Period of loosing weight. *A.H. Sanders. Deutsche Pelztierzüchter, v. 66 (1), pp 4-5, 1992. 2 ill. In GERM. Code 6-12-M.*

Chinchilla: Learning by observing. *Anonymous. Deutsche Pelztierzüchter, v. 6 (4), pp 71-74, 1992. In GERM. Code 12-14-O.*

Fur animal production in Eastern Europe. *Anonymous. Deutsche Pelztierzüchter, v. 66 (3), pp 50-52, 1992. In GERM. Code 13-M-F-O.*

4. Genetics

5. Reproduction

Titles of other publications - not abstracted

Size of testes and breeding performance are not connected in mink. *Ulla L. Nielsen, Niels Therkildsen. Dansk Pelsdyravl, v. 55 (12), pp 553, 1992. In DANH. Code 5-2-M.*

6. Nutrition

Titles of other publications - not abstracted

Mink feeds may be fatty! *G. de Jonge. Deutsche Pelztierzüchter, v. 66 (3), pp 46-48, 1992. 2 tables. In GERM. Code 6-M.*

7. Veterinary

Titles of other publications - not abstracted

Poisonings in nutria. *U.D. Wenzel, G. Albert. Deutsche Pelztierzüchter, v. 66 (4), pp 69-70, 1992. In GERM. Code 8-9-O.*

Diseases in nutrias caused by parasites. 1: Coccidiosis. *U.D. Wenzel, G. Albert. Deutsche Pelztierzüchter, v. 66 (3), pp 49-50, 1992. In GERM. Code 9-O.*

Notes
SCIENTIFUR
Vol. 18, No. 1, 1994

The fur animal industry is entering the new year full of genuine optimism based on extremely positive auction reports from all over the world. This is a good beginning, and hopefully it is also the beginning of a new, long lasting, positive, and stable era in the fur animal industry where all parties concerned will cooperate and do their best to eliminate the risk of another economic crisis like the one which is now finished - but still not overcome.

The Board Meeting of IFASA was held in Kastoria, Greece, on the last day of October and the first day of November of 1993. The great hospitality we met, the meeting with key persons in the fur industry, the visit to the enormous, newly built Fur Centre and to some of the leading fur manufacturers as well as the information we received about ancient Kastoria including the development of the town and of the unique fur industry in the area - all of this was a very inspiring background for the Board Meeting in the town of Kastoria, also called THE FUR METROPOLIS IN WORLD TRADE.

Before I report from the Board Meeting, I would - on behalf of the entire Board - like to express our sincere thanks to those responsible for the arrangement, i.e. to Michael Petliskas, President of The Chamber of Commerce, and to our friend and scientific colleague Paschalis Ikonomidis. Already at the Council meeting in Oslo in 1992, IFASA accepted an invitation from Greece regarding the arrangement of the IFASA Congress in the year 2000 in Kastoria. We are convinced that this is the right place for such a congress. We can, however, recommend all our colleagues not to wait for year 2000 to come before they visit this charming Fur Metropolis.

NEWS FROM IFASA

Participants in the Board Meeting were: Einar J. Einarsson (president), Gunnar Jørgensen (vice president), Stanislaw J. Jarosz, and Wim Verhagen. Bruce D. Murphy was unable to attend.

The president welcomed Wim Verhagen as the new member of the Board replacing Niels Glem-Hansen who is no longer in the fur industry and at the same time expressed his sincere thanks to Niels Glem-Hansen for the work he has done within IFASA.

The Board decided to ask Jens Groot (DK) to be the personal alternate for Wim Verhagen until the ordinary election at the Council Meeting in connection with the IFASA congress in Poland in 1996.

The accounts for IFASA, SCIENTIFUR, and the Oslo Congress as well as the budget for 1994 were discussed and approved.

The activities of the working groups were discussed. Due to the poor economy of IFASA, it has not, so far, been possible to transfer money to the working groups in order to initiate activities. As a guideline, the Board would like each working group to meet at least once between the international congresses. Such meetings should be arranged as IFASA symposiums within the working groups or in a cooperation between these groups or with other scientific groups.

The Board decided to arrange the next Board Meeting in The Netherlands in the autumn of 1994 (October), and to invite representatives of all the working groups to discuss the possibilities making them more active.

Stanislaw Jarosz informed about the next IFASA congress in Poland in 1996. The congress is planned to take place in the first half of September 1996 at the Conference Centre of Warsaw Treaty, Warsaw.

Prof.Dr. Grazyna Jezewska is appointed chairman of the congress. All correspondence regarding the congress should be addressed to Prof.Dr. Jezewska, Agricultural University of Lublin, Dept. of Animal Breeding, ul. Akademicka 13, PL-20 934 Lublin, Poland.

SCIENTIFUR INDEX UPDATED

The electronic version of the SCIENTIFUR INDEX has now been updated and includes all volumes from 1 to 17, incl. The price of the updated index is as follows:

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Due to differences in exchange ratio between Norwegian and Danish Kroner, the rates of membership and subscription have been adjusted slightly:

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IMPORTANT: The membership fee has to be paid each year to obtain the right for discount on subscription to SCIENTIFUR and on participation in symposia and congresses arranged by IFASA. The fees not paid from year to year will be accumulated, and the right to a discount will only be effective once the full membership fee has been paid.

Invoices are delayed this year due to our moving the activities from Denmark to Norway, but they will be sent out at the beginning of February. We hope you will pay your bills as soon as possible. Any reminder regarding payment for subscription will be added the amount of NOK 100.-

Please note the changes in addresses, telephone and fax numbers as well as bank and giro accounts. All changes are stated on the first page.

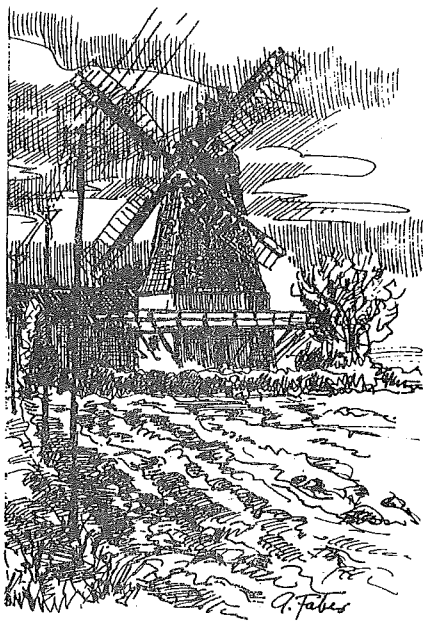
My sincere thanks to colleagues and friends all over the world for all the Christmas and/or New Year Greetings I have received at my addresses. You and all readers of these notes are hereby asked to accept my very best wishes for the new year.

PLEASE HELP US MAKE THE IFASA/SCIENTIFUR FAMILY LARGER HERE IN YEAR ONE AFTER THE CRISIS.

Best regards,

Your editor

Gunnar Jørgensen



Original Report

Influence of curing time on rheological properties, colour and display colour stability of nutria ham

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Summary

The influence of curing time of the hindquarter nutria muscles on rheological properties, colour and display colour stability of prepared ham was studied. The nutria ham rheological properties, evaluated instrumentally and organoleptically were most preferable after 72 h curing time. The colour and display colour stability of nutria ham after 48, 72 and 96 h curing time were comparable. After 24 h display time, the dominating wavelength and colour purity of ham samples decreased by 1.7% and 15.3%, respectively, at simultaneous lack of changes in lightness. Taking into consideration rheological properties, colour and display color stability of nutria ham, the optimum curing time for nutria muscles is 72 h.

Introduction

From a nutritional and dietetic point of view nutria meat can be an important raw material in meat processing. Its functional properties are comparable with beef (ref. 2) and it is used for the production of sausages. Lesiów et al. (ref. 3) found that hindquarter nutria muscles can also be used for preparation of nutria ham.

In a previous paper Lesiów et al. (ref. 4) examined the influence of the curing time on the over-reaction degree of nutria muscle pigments and some of its technological properties. They found 3 days as the optimum curing time for nutria hindquarter muscles.

The objective of this research was to determine the influence of curing time on rheological properties, colour and display colour stability of nutria ham.

Materials and methods

Investigations were made on hindquarter muscles isolated from nutria slaughtered at 7-12 months of age. The nutria meat pieces of 2x2x5 cm were removed 24 h after slaughter, without fat and connective tissue and were cured by a dry method. The curing mixture consisted of 99.4% NaCl and 0.6% sodium nitrate, which was added in an amount of 2.3 kg/100 kg meat (ref. 8). The curing was carried out at 2-4°C till 96 h.

The following rheological properties of nutria ham were determined according to the method of Tyszkiewicz (ref. 7): elasticity (D_{um}), fluidity (F_{um}), plasticity (τ_{um}), limit point (τ'_0) and the stress at which follows 70% penetration of the plunger into the depth of the sample (τ_{70}). The measurements of the strain of samples in the shape of a ring (diameter 30 mm and the thickness of 10 mm) were made on a modified Hoeppler consistometer equipped with an inductive and comparative transformator of mechani-

cal magnitudes and a recorder of measurements. A plunger with a diameter of 14 mm was used. Stepwise changed stresses were the multiple of 31.88 kN/m^2. The time of sample loading, just as the time while there was no force acting upon the sample between the successive loading, was 60s.

Colour of the minced nutria meat was evaluated by the Tyszkiewicz method (ref. 6). Colour of nutria ham samples in the shape of rings was determined in the same way as for raw meat. After curing times of 48, 72 and 96 h, the measurements of samples, displayed continously for 2, 5, 8 and 24 h at 20°C under 250Lx lightning were carried on. Percentage reflectance at selected wavelegths (%R540 and %R640) were measured with the spectrofotometer "Specol" equipped with R45/0 attachement.

The nutria ham was prepared in a way described by Lesiów et al. (ref. 3). Three-five parallel determinations were made within each of the two series of study. Data were analysed statistically using methods of correlation and regression. The t-Student test was used to estimate the significant differences between average values (P=0.05) (ref. 5).

Results and discussion

The results of the influence of curing time on the rheological parameters of nutria ham are presented in table 1.

There were not found significant differences in rheological parameters of nutria ham prepared from meat cured 48 h and 72 h. Similarly, some of the rheological parameters of nutria ham prepared from meat cured 72 h and 96 h were not significantly different. In spite of the fact that ham prepared from meat cured 96 h was characterized by the highest elasticity, plasticity, τ_{70} and the lowest fluidity, it was less preferable in comparison with the two others. The ratings of organoleptical evaluation of consistency of nutria ham were 4.25, 4.43 and 4.17 respectively (ref. 3), the highest after 72 h of curing time, and are in accordance with the presented in table 1 rheological parameters.

Influence of curing time on colour parameters of minced nutria meat is shown in table 2.

In all examined samples the dominating wavelength reached its highest value after 48 h of curing. The dominating wavelengths of meat cured 48 h and 72 h were not significantly different. The data are consistent with previous results of Lesiów et al. (ref. 4). The authors found lack of significance between the highest overreaction degree of nutria muscle pigments after 75.5 h (about 53.3%) and after 48 h of curing (about 50.7%).

A significant correlation between dominating wavelength (λ_d) and colour purity (Pe) was found and a regression line ($pe=0.00979\lambda_d - 5.4875$, R=0.997) fitted very well to the experimental data.

Table 1. Influence of curing time on the rheological parameters of nutria ham

Curing time	Rheological parameters				
(h)	$D_{um}(n.10^{-3})$ (m^2/kN)	$F_{um}(n.10^{-6})$ (m^2/kN.s)	τ_{um} (kN/m^2)	τ'_o (kN/m^2)	τ_{70} (kN/m^2)
48	0.2817^a	1.2327^a	27.8659^a	478.194^a	286.625^a
72	0.3542^{ac}	1.2306^a	37.0536^{ac}	454.284^a	307.070^a
96	0.3977^c	1.0110^c	45.5994^c	472.881^a	341.696^c

Data in the column with the same superscript are not significantly different (P=0.05).

Table 2. Influence of curing time on colour parameters of minced nutria meat

Curing time	Colour parameters		
(h)	Dominating wavelength λ_d(nm)	Colour purity Pe	Lightness Y (%)
0	625.241[a]	0.6372[a]	19.0475[a]
24	611.612[b]	0.5047[b]	21.4809[b]
48	619.493[c]	0.5766[c]	18.7163[a]
72	617.293[cd]	0.5508[d]	18.7334[a]
96	615.824[d]	0.5413[d]	18.8192[a]

Data in column with the same superscript are not significantly different (P=0.05).

Table 3. Influence of curing time on colour and display colour stability of nutria ham

Curing time	Display time	Colour parameters		
(h)	(h)	Dominating wavelength λ_d(nm)	Colour purity Pe	Lightness Y (%)[x]
48	0	614.749	0.5315	27.722
	2	611.470	0.5032	27.552
	5	608.409	0.4786	27.726
	8	607.185	0.4693	27.725
	24	604.427	0.4491	28.162
72	0	615.094	0.5340	27.966
	2	610.955	0.4989	27.677
	5	608.450[x]	0.4790	27.914
	8	607.179[x]	0.4678	27.840
	24	604.523	0.4504	27.869
96	0	614.414	0.5275	27.861
	2	610.423	0.4947	28.057
	5	607.855	0.4744[x]	28.313
	8	606.801	0.4666[x]	28.116
	24	604.523	0.4493	28.350
48	λ_d=-0.3617t + 612.0695 r=-0.8677		Pe=-0.00284t + 0.5085 r=-0.8504	
72	λ_d=-0.3548t + 612.0173 r=-0.8479		Pe=-0.00277t + 0.5076 r=-0.824	
96	λ_d=-0.3296t + 611.3742 r=-0.8315		Pe=-0.00258t + 0.5026 r=-0.8209	

x - data not significantly different, t - time (h), r_k=0.8054 (for n-2=3 and P=0.01).

Lightness of nutria meat was highest after 24 h of curing and then there were not found significant changes in this parameter. Influence of curing time on colour and display stability of nutria ham is presented in table 3.

The following changes of colour parameters of nutria displayed on light, in comparison with control samples, were observed: decrease of dominating wavelength by 1.7%, 1.7%, 1.6% and colour purity by 15.5%, 15.7%, 14.8% respectiely, after each time of curing and non-significant changes in lightness.

In order to learn, whether the changes occuring in colour stability of nutria ham after examined curing times are similar, the parameters of an equation derived by Klossowska (ref. 1) were calculated:

$\lambda_d = \lambda_{doo} - (\lambda_{do} - \lambda_{doo}) * (1_{.1}^{-kt})$

where

λ_d and λ_{doo} - dominating wavelength of samples displayed on light for t (2 h) or infinitive time (24 h),

k - parameter, the rate of dominating wavelength decrease.

The counted parameters on the basis of data presented in table 3 are shown in table 4.

The rate of dominating wavelength decrease for nutria ham prepared from meat cured 48 h was lower than for 72 h and 96 h cured samples. However, there were not found significant differences between λ_{doo} parameters in all curing times.

Table 4. The parameters of the Klossowska equation counted for 48, 72 and 96 h curing times and 0, 2 and 24 h display times

Curing time	Parameter	
(h)	k (h^{-1})	λ_{doo}(nm)
48	0.1717	601.922
72	0.256	602.858
96	0.2684	602.987

Conclusions

1. The nutria ham rheological properties, evaluated instrumentally and organoleptically, were most preferable after 72 h of curing time.
2. The dominating wavelength and colour purity of nutria minced meat samples were highest after 48 h and 72 h of curing time.
3. The display colour stability of nutria ham after 48, 72 and 96 h of curing time were comparable. After 24 h display time, the dominating wavelength and colour purity of ham samples decreased by 1.7% and by 15.3%, respectively, at simultaneous lack of changes in lightness.
4. Taking into consideration rheological properties, colour and display colour stability of nutria ham, the optimum curing time for nutria muscles is 72 h.

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Original Report

Development of dominance relationships in group-reared blue foxes

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Abstract

Hierarchy and dominance rank of 8 farmed blue foxes (*Alopex lagopus*) were examined in relation to sex, body weight, tameness, locomotor activity and urine markings at different times of the year. The foxes were held in a seminatural enclosure where about 150 hours of behavioural recordings were obtained by video or by visual recordings from August 1991 until the end of the breeding season in April 1992. The results show that group-reared blue foxes are social animals whose hierarchical features already began to emerge during the growing period (Aug-Sep). Males are typically dominant over females. Body weight and tameness of the animals are not necessarily dependent on dominance value. Social rank order is often pronounced during feeding times. The number of feeding contacts correlates with dominance value, especially during the breeding season. The social structure seems to be more unstable during the breeding season where aggressions between individuals are increasing. At this time, locomotor activity correlates quite postitively with dominance value. The social rank order of females may be influenced by the timing of heat cycle and maturation. It can be concluded that group-housed blue foxes easily form a fixed social organization. During the breeding season, however, the dispersal of the group becomes more probable because of increased social tension.

Introduction

The arctic fox (*Alopex lagopus L.*) has been previously regarded as solitary (*Fox, 1969; Banfield, 1977*). In recent years, however, the evidence for its sociability and communal living in the wild has been presented (*Hersteinsson and MacDonald, 1982; Eberhardt et al., 1983; Garrott et al., 1984; Frafjord, 1991*). Studies in captivity have additionally supported the conclusion that the arctic fox develops social dominance hierarchies when raised in captive groups (*Wakely and Mallory, 1988; Angerbjörn et al., 1991; Korhonen and Alasuutari, 1991; 1992a, b, c; Kullberg & Angerbjörn, 1992*).

Although previous studies have provided considerable information regarding social behaviour and group living in the arctic fox, more data are needed especially concerning the development and changes in juvenile and adult hierarchies. This paper examines dominance hierarchies of captive blue foxes, and possible factors, eg. sex, body weight, tameness, locomotor activity and

urine marking behaviour affecting the hierarchy at different time of the year.

Materials and methods

Animals and management
The experiments were carried out at the Mud-dusjärvi Experimental Farm in Finnish Lapland (69.04°N, 27.07°E). The subjects were farmbred blue foxes (4 males, 4 females) that originated from the same litter, except for one female (F-4). The litter was born on May 19, 1991 (female F-4 on may 18, 1991). Before the experiments all the animals were kept together under conventional shadehouse conditions. On August 14th (at the age of 3 months), all of the animals were transferred into a large L-shaped ground floor enclosure (17 m x 19 m x 8 m; 2 m high). The experimental enclosure contained five wooden nest boxes mearsuring 70 cm long x 40 cm wide x 40 cm high. Two large stones were additionally located in the enclosure.

A fresh farm feed was provided ad libitum to the animals once daily. The feed, mainly composed of slaughterhouse offal, fish and cereals, was manufactured by the farm's kitchen. The foxes were weighed monthly. At the same time, character (tameness score) was subjectively estimated. The estimation was performed in a blind manner by four different persons (after which the mean of these four was selected to represent the actual character value). The reactions of each animal towards the estimator were scored on the following scale: 1=very tame, 2=tame, 3=normal, 4=defensive, 5=very defensive (*Korhonen et al., 1986*).

Monitoring of social relationships
The animals were monitored by a video camera (Panasonic NV-G1) which taped their behaviour principally from 10:00 to 11:00 A.M., and from 1:00 to 2:00 P.M. Personal visual observations lasting for 24 hours each were made monthly. The most common behavioural patterns, including the number of social contacts (i.e. visual status signals when two foxes met), aggressions (biting and chasing) and dominance relationships (the other fox shows dominant or submissive behaviour towards the other one) were used for the estimation of hierarchical order and social status of the individuals (*Wakely and Mallorry, 1988*). The animals were additionally monitored (by video camera and visually) several days weekly for 15 minutes before feeding, at feeding time, and for 15 minutes after feeding in order to estimate their feeding hierarchies. Each animal subject received its feed on a wooden tray (measuring 30 cm long x 25 cm wide x 2 cm thick). Each tray was placed about 0.5 m away from the others. The order in which the individuals ate, as well as the number and outcome of challenges over feed items made by the other foxes, were recorded. Feeding order was determined on the basis of aggressive encounters and visual status signals over feed items (*Korhonen and Alasuutari, 1992a*). All agonistic behaviours were pooled for the determination of dominance ranks. The dominance values were calculated as the arcsine of the proportion of wins (*Beilharz and Zeeb, 1982*).

Detection of heat cycle and sexual behaviour
The development of the oestrus cycle was individually monitored by evaluation of vulvae swelling and the change in electrical resistance in the vaginal tract (*Möller, 1980*). Mating activities were followed daily by a video camera and by visual circadian observations during the breeding season. Each mating effort observed was recorded as well as aggressive interactions and visual signals involved with reproductive behaviour.

Statistics
Statistical analyses were carried out according to the GLM-procedure in SAS using analyses of variance and Spearman's rank correlation.

Results

Some fragmens of data concerning periods I-III have been presented in the Vth. Sci. Congr. in Fur Animal Production, in Oslo (*Korhonen & Alasuutari, 1992d*). The present data were divided into the following five time periods: I. Aug 15-Sep 30 (the growth period, from age of 3 to 4.5 months), II. Oct 1-Nov 30 (the autumn period, from age of 4.5 to 6.5 months), III. Dec 1-Feb 29 (the winter period, from age of 6.5 to 8.5 months), IV. Mar 1-Mar 31 (early breeding period, from age of 8.5 to 9.5 months), and V. Apr 1-Apr 30 (late breeding period, from age of 9.5 to 10.5 months). The basal data for the above periods are summarized in tables 1-3.

During the first period of the study (table 1), the foxes were still growing and their hierarchical order was unstable and playful in character.

Table 1. Values of dominance and factors examined in relation to dominance during the periods I, II and III. M-2 is the most dominant male of the group

Variable	M-1	M-2	M-3	M-4	F-1	F-2	F-3	F-4
PERIOD I								
Dominance value	57.2	90.0	19.3	52.7	54.6	48.9	2.8	1.8
Body weight, kg	4.7	4.5	3.8	4.6	4.7	3.8	4.5	3.9
Feeding contacts, %	9.4	39.1	3.5	10.9	9.1	12.0	8.7	7.2
Loc.activity, %/24 h	36.1	35.3	38.1	38.6	34.2	36.7	38.9	32.5
Tameness value	4.0	3.0	3.0	3.3	2.3	2.3	2.0	1.3
Urinations/day	6	2	5	4	2	85	3	7
PERIOD II								
Dominance value	61.1	90.0	43.4	65.9	41.8	32.1	19.9	9.0
Body weight, kg	7.5	7.7	6.3	6.1	6.8	5.5	6.7	6.5
Feeding contacts, %	13.1	36.3	7.6	13.7	6.1	8.3	9.8	5.4
Loc.activity, %/24 h	22.6	27.2	30.6	31.7	26.3	32.6	31.1	23.8
Other contacts, %	11.7	21.8	10.9	14.5	16.2	9.8	10.7	4.3
Contacts with M-2, %	15.4	-	16.7	12.8	23.1	17.9	9.0	5.1
Tameness value	2.0	3.5	4.0	4.0	3.0	3.5	4.0	3.5
Urinations/day	4	3	3	1	2	3	2	7
PERIOD III								
Dominance value	64.3	90.0	54.0	42.4	43.7	41.8	20.6	3.9
Body weight, kg	8.0	7.7	6.7	6.5	6.7	5.4	6.9	6.9
Feeding contacts, %	14.5	25.4	9.1	13.4	10.6	12.0	9.5	5.5
Loc.activtiy, %/24 h	22.0	21.0	18.9	21.5	20.1	17.9	15.4	15.4
Other contacts, %	17.0	19.9	9.1	10.8	16.6	11.0	11.9	8.1
Contacts with M-2, %	34.5	-	13.1	14.8	12.5	17.9	12.2	10.5
Tameness value	2.3	2.7	2.0	3.0	2.0	1.7	2.0	1.7
Urinations/day	4	2	2	3	3	3	3	3

Therefore, table 1 excludes the values for other contacts (physical contacts outside feeding time) and contacts with the most dominant male. Nevertheless, male M-2 was already now ranked as the most dominant individual whereas females F-3 and F-4 were found to be clearly the least dominant ones. The relationships between the other foxes were still fairly variable. No significant relationship was found between sex and dominance. Body weight, activity, the use of nest boxes, lying on roofs and stones or the circadian number of urinations did not significantly correlate with dominance (table 2). However, the number of feeding contacts (physical contacts with other foxes at feeding time) and the tameness value showed a significant dependence ($p<0.05$) on dominance.

The second period already represented a more stable situation. All the males were now dominant over the females (table 1). Male M-2 was still clearly the most dominant individual, ruling the others especially at feeding times. Females F-3 and F-4 were still the least dominant animals in the group. Body weight, the number of contacts with the most dominant animal (M-2), tameness value, activity, daily urination numbers or lying on roofs or stones did not markedly correlate with dominance. The numbers of feeding contacts and other contacts (i.e. contacts outside feeding times) had a highly positive correlation with dominance (table 2). The use of nest boxes was most common ($p<0.05$) in animals of lower dominance rank, i.e. in females. Females also tended to lie more commonly on stones than males.

The third period showed a trend rather similar to period II (table 1). Male M-2 was still the dominant individual, and also the other males were mainly dominant over the females. Animals F-1 and F-2 were clearly the highest-ranking females. Once again female F-4 was in the lowest rank. Here the numbers of feeding contacts again correlated significantly ($p<0.05$) with dominance (table 2).

Table 2. Correlation coefficients (Spearman's) between dominance value and other traits. Significance: *P<0.05, **p<0.01. Units for parameters are the same as in table 1

	Dominance value				
	Period I N=8	Period II N=8	Period III N=8	Period IV N=7	Period V N=6
Body weight	0.70	0.33	0.39	0.21	0.38
Feeding contacts	0.72*	0.79*	0.71*	0.88*	0.94**
Other contacts	-	0.83**	0.67	0.11	0.31
Contacts with M-2	-	0.31	0.12	0.86*	0.43
Tameness value	0.71*	0.05	0.64	0.30	0.34
Loc. activity	0.19	0.03	0.70	0.82*	0.09
Use of nest boxes	-0.35	-0.79*	0.36	-0.15	-0.25
Lying on roofs	0.07	0.24	0.05	-0.64	0.37
Lying on stones	-0.55	-0.66	-0.65	-	-
Urine markings	-0.47	-0.24	0.03	0.11	0.70

No correlation between dominance value and other traits was found. The use of nest boxes as well as lying on stones remained slight throughout the winter. Locomotor activity significantly lessened during period III as compared to period I ($p<0.05$). The number of urinations/24 h was of the same order of magnitude in each of the three periods.

The start of the breeding period (IV) was very dramatic due to quarrelling and great aggression between the two most dominant males, M-2 and M-1. Finally, M-1 was so badly bitten that it died on March 8th. Table 3 thus excluded male M-1. At this time, M-4 and M-3 became the next dominant after M-2. As concerns females, F-4 still had the lowest dominance value. Nevertheless, she was the first to come into heat in mid-March. The other females, however, did not show any signs of vulval swelling as yet. The daily number of contacts with M-2 correlated now positively with dominance value ($p<0.05$). The locomotor activity of all animals significantly ($p<0.01$) increased during the breeding period. There was also a significant ($p<0.05$) relationship between activity and dominance value.

The daily number of urinations also increased significantly ($p<0.001$) compared to the previous period. The use of nest boxes, however, was still minimal. During this time, the stones were covered by a thick layer of snow and were thus no longer available to the foxes.

The data for the latter part of the breeding period (V) is given in table 3. On April 6th the dominant female (F-1), just before onset of oestrus, suddenly escaped from the enclosure and we lost it. Therefore, F-1 has been excluded from table 3. During this period, the locomotor activity of the animals again began to decline ($p<0.05$). No relationship between activity and dominance was detected at this time. The dominance value of F-3 was the least but, however, the dominant male (M-2) had most contacts with it. On April 22nd F-3 showed the first signs of coming heat but, however, finally no actual mating was observed. Vulvae swelling of F-2 was slight even in April and she did not come into heat at all. The circadian number of urinations again was low in F-2 and F-3. In the first part of May F-4 was observed to be pregnant, and finally on May 20th it whelped (8 kits). Three days later, however, it killed the whelps. The other females did not give birth.

Table 3. Values of dominance and factors examined in relation to dominance during the periods IV and V

Variable	M/2	M/3	M/4	F/1	F/2	F/3	F/4
PERIOD IV							
Dominance value	90.0	56.3	67.5	30.0	22.5	26.3	18.8
Body weight, kg	7.6	5.9	6.2	6.1	5.1	6.3	6.7
Feeding contacts, %	33.3	14.6	19.6	8.7	9.0	9.2	5.6
Other contacts, %	20.5	13.8	13.5	17.0	1.6	10.5	23.1
Contacts with M-2	-	33.8	13.1	23.8	8.5	11.5	9.3
Loc.activity, %/24 h	39.2	34.8	42.2	38.1	33.8	31.5	33.1
Tameness value	1.4	1.4	3.2	2.2	3.0	2.2	2.2
Urinations/day	43	50	28	16	9	5	51
PERIOD V							
Dominance value	90.0	61.2	55.8	-	36.0	9.0	18.0
Body weight, kg	6.2	5.3	5.4		4.3	5.3	5.6
Feeding contacts, %	26.8	21.5	18.1	-	18.0	8.7	6.9
Other contacts, %	16.6	19.2	19.0	-	7.4	20.1	17.7
Contacts with M-2	-	25.0	22.2	-	15.3	31.9	5.6
Loc.activity, %/24 h	27.5	27.4	36.7	-	21.7	30.1	26.9
Tameness value	2.0	2.0	2.5	-	2.0	2.0	1.5
Urinations/day	28	22	26	-	3	4	•1

Discussion

The present results confirm the earlier observations (*Wakely and Mallory, 1988; Angerbjörn et al., 1991; Korhonen and Alasuutari, 1991, 1992a,b*) that captive arctic blue foxes form a hierarchical organization with pronounced dominance relationships when raised in groups. Since there exist additional observations from the wild (*Hersteinsson and MacDonald, 1982; Garrot et al., 1984*), it is tempting to conclude that arctic blue foxes might be even more social than previously believed.

Development of social organization started already in the early growing period. As previously observed by Wakely & Mallory (1988), the juvenile hierarchy was not significantly associated with either a particular sex or weight class. In late autumn, however, social structure of the group reached a more fixed form, and the males became typically dominant to females. This is in agreement with previous findings that males generally dominate females of the same age (*Wakely and Mallory, 1988; Korhonen and Alasuutari, 1991a*). However, if there are both younger and older animals in the same group, the older males and females are then normally dominant over younger ones (*Angerbjörn et al., 1991*).

According to Angerbjörn et al. (1991), the access to limited resources such as food, is very likely one of the major factors inducing the formation of social differences. For instance, when large carcasses are available, wild foxes can be gathered around, and interact heavily. In such situations, the outcome of the conflict is likely to be related to the individuals' dominance order. In the present study, visual status signals to denote dominances were most pronounced during feeding times. In each period there was also a significant relationship between dominance value and number of feeding contacts. Thus, it is obvious that the number of feeding contacts can be utilized to estimate dominances throughout the year. The relationship between dominance value and number of contacts with the most dominant individual (M-2), however, was significant only during the actual breeding season.

Female F-1 was the predominat female until the end of March. It is interesting to note, however, that during the breeding period F-1 did not come into heat first but the lowest female in the hierarchy, F-4 did. The most probable explanation is that F-4 was originally from a different litter which induced the early development of heat in F-4. Thus, it is possible that the genetic origin of the individuals can influence their social relationships.

Outside the breeding season, the daily number of urinations was low, ranging from 1 to 7. During the breeding season, however, urination numbers significantly increased, showing a trend similar to that described in our previous paper (*Korhonen and Alasuutari, 1992a*). All the males displayed a high urination frequency, but in females only the lowest, F-4, urinated very frequently. Probably the high urination frequency observed in F-4 was due to the pronounced heat progress in relation to the other females. Females F-2 and F-3, with the poorest heat signs, also had the lowest urination frequencies. Thus, it is possible that pronunced marking behaviour is induced by the heat cycle in group-housed blue foxes.

The increased locomotor activity observed during period IV agrees well with the previous findings (*Korhonen, 1988*), and is due to increased sexual activity. Locomotor activity did not have a significant relationship with dominance during winter, although some tendency for this was observed at the onset of the breeding season. A rather similar trend has been previously observed also in another blue fox group (*Korhonen and Alasuutari, 1992c*). During period V, since F-1 had escaped and the heat of F-4 was over, the activity of the animals decreased as would be expected.

The reproductive success of the fox group was similar to that found in our previous experiment (*Korhonen and Alasuutari, 1992a*). Since the foxes in both experiments were mature and in normal breeding condition (*c.f. Möller, 1980; Korhonen and Alasuutari, 1992a,b*), it is obvious that dominance relationships and hierarchical tension between the group members explains the poor reproductive performance. There are similar observations from the wild fox groups that often only one of the females breeds, while heat development of the others is inhibited (*Hersteinsson and MacDonald, 1982*). It is possible that decreased reproductive performance under fur farm conditions also can be a result of social tension between the neighbouring individuals. However, more studies will be needed to clarify this hypothesis.

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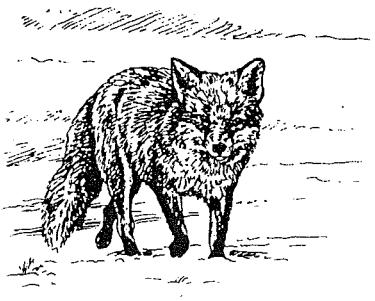
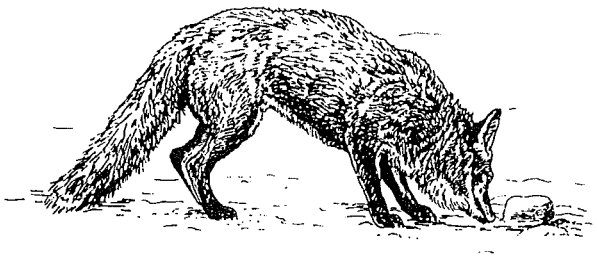
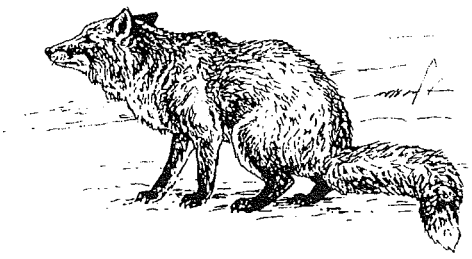






Evidence of decrease in brain size in ranch mink, *Mustela vison* f. dom., during subadult postnatal ontogenesis

Dieter Kruska

Total brain size and the volume of several brain parts were compared in male and female ranch mink of varying age and body size in an attempt to quantify postnatal maturation and growth processes in this altricial species. Volumes of fresh whole brains and of different brain parts were calculated from prepared histological sections from juvenile (2- to 3-months-old), subadult (5-month-old), and adult (older than 7 months) individuals. Allometrical calculations were performed on the basis of body weight. Changes in size of different parts of the brain obtained to different degrees were found to be dependent on age but independent of body size. From the juvenile stage to the subadult stage, total brain size remains unchanged, although most major brain parts increase in size, while the grey matter of the isocortex decreases. During subsequent development from subadult to adult, total brain size evidently decreases. Within the brain all major structures also decrease in size, except for the medulla oblongata and the mesencephalon, which remains relatively stable in size. The grey matter of the isocortex shows the greatest decrease, followed by the allocortex and corpus striatum, the cerebellum, the white matter of the isocortex, and the diencephalon, Thus, an unusual but evident "overshoot" in size of the total brain and certain parts apparently occurs in this species before adulthood is reached. This phenomenon is discussed in connection with size changes concomitant with domestication as well as with caging of individuals and with postnatal and seasonal size changes known from some soricid species as the so-called Dehnel phenomenon.

Brain Behav Evol, 41:303-315, 1993. 6 tables, 3 figs., 69 refs. Author's abstract.

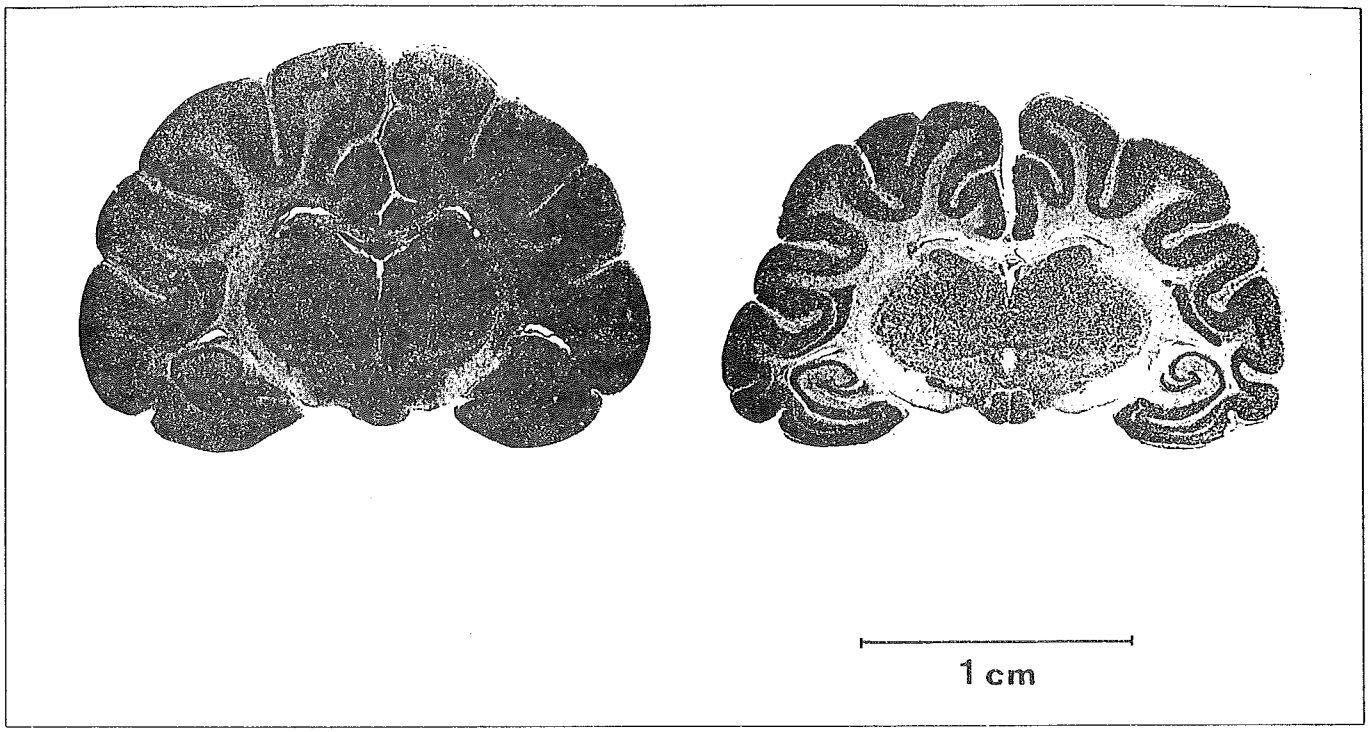


Fig. 3. Transverse 10-µm Nissl stained sections at comparable brain levels of a five-month-old female (left) and a seven-month-old female mink (right) showing the changes in brain size and proportions during this two-month phase of postnatal development. The brain of the subadult individual (left) was fixed in Bouin's fluid, that of the adult (right) in 4% formol. Both sections are roughly comparable. The animals were of approximately the same net carcass weight (tables 1, 2), and the values for shrinkage during fixation and histological processing are similar (52.2 and 48.2%, respectively). Note that decreased brain size during this phase is mainly due to a dorsoventral compression; the breadths of the total sections and the thalamic regions are the same. The grey matter in the isocortical and allocortical areas is well differentiated on both stages, but is clearly thinner in the adult.

Analysis of live weight growth of silver foxes

D. Mertin, P. Fl'ak, V. Parkányi, I. Tocka

We studied the live weight growth of silver foxes at the age from 30 to 180 days at the Department of Fur Animal Rearing of the Research Institute of Animal Production in Nitra during the years 1987-1989. The animals were clinically healthy and had the full-value nutrition.

The live weight of foxes ranged from 871 g to 942 g for males at the age of 30 days, and from 801 g to 919 g for females at the same age, and from 6319 g to 7186 g, and from 5200 g to 6583 g, respectively in the period of the fur maturity, approximately at age of 180 days.

We observed a significant influence of sex, and interaction of sex and age. Live weight growth estimated by means of linear regression showed the average daily gain at the age from 30 to 180 days expressed in the regress coefficient for males of 42 g, 34 g for females in 1987, 39 g and 38 g in 1988, and 33 g and 28 g in 1989. We observed also significant coefficients of the quadratic function in the years 1987 and 1989. The average live weight of males was 912 g at the age of 30 days, and 901 g of females, and 6815 g and 6387 g, respectively, at the age of 180 days irrespective of the years. We observed statistically significant differences between the years at the age of 90-180 days, and a highly significant sexual dimorphism at the age of 60-180 days, and the interaction of years x sex. The coefficient of the relative growth rate according to Minot irrespective of sex was R=1.507; and the coefficient of growth intensity acording to Fisher k = 0.0131. The live weight at the age of 180 days was 7.3 multiple of weight in the first month of age irrespective of the sex. We estimated 95% confidence intervals of live weight on the basis of our results. The live weight growth of silver foxes was caused, except for exceptions, with other experimental material in agreement with the cited authors, and therefore the estimated confidence intervals will serve in the control of live weight growth.

Journal of Farm Animal Science (Vedecké Práce VUZV Nitra), 25, p. 147-156, 1992. In SLOVAK, Su. ENGL. 5 tables, 7 refs. Authors' summary.

Artificial light may reduce the variation among litters

Ejner Hedegaard

A discussion. Trials carried out in Denmark indicate that mink females exposed to additional light during the mating season and gestation had a lower incidence of females failing to produce a litter, smaller litters and a lower incidence of late whelpings than controls given no additional light, but the number of kits per mated female was not affected by additional light.

Dansk Pelsdyravl 56, 2, p. 35, 1993. In DANH. CAB-abstract.

Fur animal breeders are the most important part of mink production

Steen Møller

Data on production from 23 mink farms in Denmark, each with 125-3000 breeding females, were analysed. For Scanblack females housed in sheds with 2 or 2 rows of cages, the percentage of females failing to produce a litter was 8.9 ± 2.9 and 12.8 ± 6.2 % resp., litter size averaged 5.5 ± 0.3 and 5.2 ± 0.3 at birth and 5.3 ± 0.3 and 5.0 ± 0.4 at the sexing of kits (both p 0.05) and kit mortality 3.6 ± 3.1 and 5.2 ± 2.6.

For females allowed no contact with males prior to the mating period, litter size was significantly lower at birth and sexing (5.2 ± 0.3 and 5.0 ± 0.3 resp.) than for females housed in cages adjoining those of males (5.6 ± 0.3 and 5.4 ± 0.3 resp.), but there were no significant differences between the 2 groups in the percentage of females producing a litter or in kit mortality.

Neither female fertility nor litter size were significantly affected by order of mating, and kit mortality was not significantly affected by litter size in litters of up to 8 kits.

Dansk Pelsdyravl 55, 11, pp 506-508, 1992, In DANH. 2 tables, 1 refs. CAB-abstract.

Pelt length is best predicted by mink body weight, and there is a negative correlation between pelt length and pelt quality

Anonymous

For Scanblack mink males pelted in Denmark in 1990-91, 0, 6.1 and 6.8 % resp. of pelts were size 00, 0 and 1 vs. 0, 10,6 and 21 % for Pastel, 8.3, 12.1 and 11.9 % for Scanbrown and 5.5, 11.9 and 12.4 % for Scanglow males. The correlation of fur quality evaluated on the live animal with pelt quality was 0.3-0.5, that of pelt length before pelting with that after pelting was 0.5-0.8, the correlations of pelt weight with pelt length and quality were 0.6-0.9 and -0.3 to -0.4 resp., and the correlation of pelt length with pelt quality was -0.1 to -0.2.

Dansk Pelsdyravl 55, 11, pp 513-514, 1992. In DANH. 1 table, 1 fig. CAB-abstract.

Association between live grading scores, skin characteristics and auction price in mink

H. Kenttämies

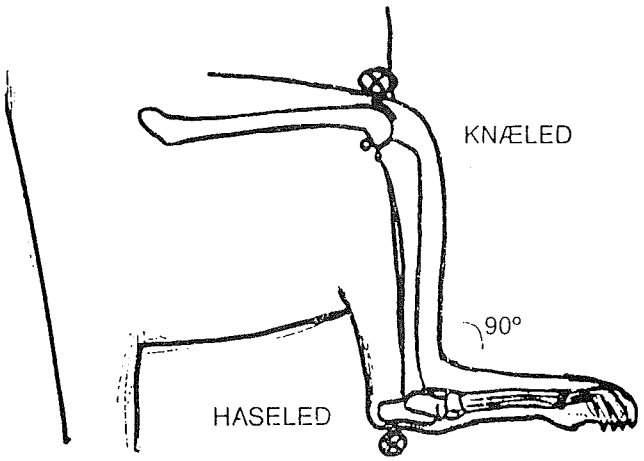
The relationships between scores for general appearance assessed in August and November and the size and quality of scanblack and pastel male pelts were studied. The size of the pelt was more closely associated with general appearance graded in August than in November. The reverse situation was found for the quality of the pelt. Fur defects observed in live mink reduced pelt quality. Size, quality and colour of pelts in scanblack males differed between farms, and in pastel males, differences between farms were found in pelt quality and clarity. The pelts of males with high scores in live animal grading were sold for 4-14 Finnmark more than medium or low scoring ones. Skin prices were more affected by the date of auction than by grading scores.

Acta Agric. Scand., Sect. A, Animal Sci. 42:185-190, 1992. 6 tables, 21 refs. Author's abstract.

More about long mink

H.J. Risager, T. Clausen

Immediately after slaughter, the leg length of 253 scanblack male mink was measured with a slide rule. At pelting body weight and length averaged 2104.0 g and 45.6 cm resp., leg length 8.0 cm and tail length 22.7 cm, and the av. body condition score was 46.1. After processing, pelt length averaged 75.6 cm, and av. pelt quality score (on a 15-point scale) was 8.5. The correlations of pelt length with body weight, body length, leg length, tail length and body condition score were 0.87, 0.62, 0.58, 0.40 and 0.78 resp., and the corresponding correlations for pelt quality were -0.42, -0.15, -0.23, -0.01 and -0.43. The correlation of pelt length with pelt quality was -0.37. It was concluded that body length measurements are easier to carry out and give more accurate prediction of pelt length than leg length measurements.



*Figur 2. Tegning af benets knogler der viser, hvilken del af »benet«, der måles. * angiver placeringen af skydelæren.*

Dansk Pelsdyravl 55, 7, pp 293-294, 1992. In DANH. 2 tables, 3 figs. CAB-abstract.

Factors affecting growth in polecats

H. Korhonen, M. Harri

From weaning to pelting, an unspecified number of polecats were housed in cages containing 1, 2 or 3 males (groups 1, 2 and 3), 2 or 3 females (groups 4 and 5) or 1 male and 1 female (group 6). Body weight was determined on 7 occasions, and animals were graded for temperament and social status. Final body weight in males was significantly affected by housing (ranging from 1852 g for group 2 to 2227 g for grop 6) and social status (ranging from 1834 g for submissive males to 2051 g for dominant males), but not by temperament; final body weight in females was not significantly affected by any of these factors. For males and females, 82.8 and 59.9% resp. of the total variation in final body weight was explained by a combination of housing group, size of litter, social status and temperament. Pelt quality score tended to be highest for males in groups 3 and 6 and for females in group 6, and lowest for males in group 1. Pelts of males in group 1 were significantly shorter than for males in group 6 (60.8 ± 2.9 cm vs. 66.0 ± 2.2), but pelt length of females was not significantly affected by housing group.

Finsk Pälstidskrift 26, 8-9, pp 202-204, 1992. In SWED. 2 tables, 5 figs., 2 refs. CAB-abstract.

A new production control system has improved the efficiency of breeders

L. Boekhorst

In 1992, in the Netherlands, the number of breeding mink females per farm averaged 1794, of which 53.5% were young females, and the number of females per male averaged 5.0. Of breeding females, 35.4 and 48.4% resp. were of the scanblack or scanglow colour types, the remainder being pastel, sapphire, pearl and crossbreds. The number of kits produced per female averaged 4.83 for young females and 6.01 for adult females, and the av. kit production of fertile young and adult females was 5.65 and 6.57 kits resp. The new production control system (introduced in 1987) is used by 25-30% of breeders and covers 30-35% of breeding females.

Dansk Pelsdyravl 55, 7, pp 295-296-1992. In DANH. Translation: Ejner Børsting. 4 tables. CAB-abstract.

Pollution of water by farms of canivorous furbearing animals

Leon Saba, Jerzy Slawon, Antoni Polinis, Hanna Bis-Wencel

The two large farms, one keeping 2500 mink and 400 blue polar foxes, and the other with 7500 blue and silver polar foxes, were the area of investigations on their influence on the pollution of top and underground waters. The farms had been exploited for 37 and 35 years. The samples of water were taken six times, each month from May to November. Water sampels were taken from hydrants which reached underground water 30 m below surface and from wells of 10 m depth which were localised on the farm, 150 m and 200 from the farm respectively. Moreover we analysed also water from the small river which run ca. 50 m from the fur animals farm. Samples were taken from the river in front of the farm, 500 m up and 500 m down that place. Physical and chemical properties in the water were determined, i.e. colour, reaction, turbidity, carbonate hardness, odour, amonia, nitrates, chlorides, Mn, Fe, BZT_5, oxidizability, as well as bacteriological properties - the general number of colonies on the agar in the temperature 20°C and 37°C, the titre and the type of coli.

The organoleptic indices of water were within the norm. It was stated, however, that the norm 0.5 mg/dm^3 NH_3 in the wells on the farms was exceeded several times (7.68 mg/dm^3 and 7.0 mg/dm^3), and the permissible nitrates concentration of 10 mg/dm^3 in the well on one of the farms and in the water reservoir was also surpassed (11.67 mg/dm^3 and 20 mg/dm^3). Both top

and underground waters in the area of the two farms contained too large quantities of the organic substance which influenced the many times excess of bacteriological norms

Medycyna Wet. 49(8), 365-367, 1993. In POLH, Su. ENGL. 3 tables, 13 refs. Authors' summary.

Pollution of soil and air by farms of carnivorous fur-bearing animals

Leon Saba, Jerzy Slawon, Antoni Polonis, Hanna Bis-Wencel

The object of the investigation was to study the influence of 35 years and 37 years utilisation of two farms with a few thousand mink and foxes on soil and air pollution in the area and nearby. The objects were situated on light soils classified as loose sands and poor loamy ones. Samples of soil and air were taken six times from May to November once per month. For the research concerning the mineral and parasitological composition, soils samples were taken three times at the peak of the vegetation season. The research material was taken on both farms in the same way, i.e. in the centre, 50 m and 200 m away from the farm. The level of organic substance in the soil was estimated as well as pH, the concentration of mineral elements i.e.: Ca, P, Mg, K, Fe, Zn, Cu, Mn, Mo, B, V and the level of nitrates and ammonia. By bacteriological examination of soil the coli titre and clostridium titre were determined. The contamination of the air with bacteria and fungi was measured. A growing amount of nitrates was found in the soils on the farms and nearby: from the level of 1.5 to 4.15 mg/100 g of the soil. The coli titre of the soil was exceeded in many samples. Eggs and larvae of parasites Toxocara sp., Toxascaris sp. and Ancylostoma sp. were found in the amount of 1 to 12 eggs per 100 g of the soil. There were also live larvae of Toxocara sp. In the air on the farms greater amounts of fungi and bacteria were observed than in the air nearby.

Stenciled report to be published by the Publ. house of Marie-Curie, Sklodowska University, Lublin, Poland, 12 pp. In POLH, Su. ENGL. 5 tables, 14 refs. Authors' summary.

Contamination of soil and air by fur-bearing animal farms

Leon Saba, Jerzy Slawon, Antoni Polois, Hanna Bis-Wenzel

The influence of a long lasting, over 35 year utilisation of fox and mink farms on the physical and chemical, mineral, bacteriological and parasitological parameters of the soil, as well as the bacteriological features of the air were investigated. It was found that in the soil on the farms and in the surroundings, large amounts of nitrates were accumulated from the level of 1.5 to 4.14 mg/100 g of soil. The soil coli titre was exceeded in many points. The occurrence of ova and larvae of Tococara sp., Toxascaris sp. and Ancylostoma sp. were found - 1-12 ova in 10 g of soil. The air in the farm area was found out to contain larger amounts of fungi and bacteria than their surroundings.

Universitatis Mariae Curie-skolodowska Lublin - Polinia, Vol. XI, 31, Sectio EE, 1993, pp. 215-222. In POLH, Su.ENGL. 5 tables, 14 refs. Authors' summary.

Waterproof manure beddings for farmed foxes

P. Niemelä, S. Kleemola, H. Korhonen

Experiments were carried out at the Kannus Fur Farming Research Station in Finland in an attempt to clarify the suitability of plastic bedding boxes for environmentally protective manure collection. Altogether 64 experimental beddings were kept beneath conventional fox cages between Oct 31th 1990 and Oct 29th 1991. Foxes were housed singly during the winter period. Their beddings were cleaned on Apr 18th 1991. Correspondingly, manure from the bedding boxes of whelped females (24 animals) and their unweaned whelps (250 animals) was collected on July 16th 1991. After weaning, there were a total of 128 whelps which were conventionally raised in pairs. The beddings were cleaned for the last time on Oct 29th 1991.

The bottom of each bedding box was covered with peat, including some chalk in the summer

time. Peat was added during manure collection, especially when the contents of the boxes became too slurry. During the growth period (Jul 16th-Oct 29th), some 23 liters of dry peat was used per each animal. Later, it was estimated that this amount was somewhat too little. The bedding boxes were conveniently and quickly emptied into a tractor wagon with bobcat equipment. Manure collection from the beddings proved to be too wet, which made its composting difficult. It can be concluded that the box type tested can be employed under such farming conditions where waterproof manure beddings are required.

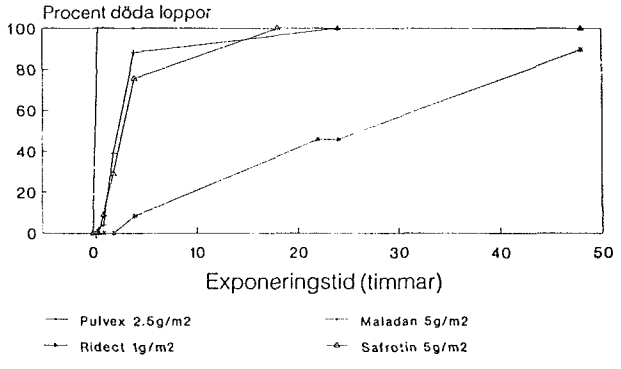
Vesi- ja ympäristöhallituksen monistesarja Nro 420. pp. 5-21. In FINN, Su. SWED. 4 tables, 3 figs., 3 refs. Authors' summary. Only abstract recieved.

Fleas and their control on mink farms

Kim Søholt Larsen

The flea most commonly found in mink farms is Ceratophyllus (*Monopsyllus*) sciurorum, which also has many other hosts; its life cycle is described and the stages illustrated. The insecticides that give good control are those containing pyrethrins (Telusol, Nippon, Sumsedin), permethrin (Pulvex) or tetrachlorvinphos (Ridect).

Figur 2



Vara Pälsdjur 63, 3, pp 84-86, 1992. In SWED. 1 table, 2 figs. Translation: T. Mejerland. CAB-abstract.

The watering trial was not effective

H.J. Risager

274 mink dams were given extra water twice daily during the preweaning period, and 287 controls were not given extra water. For experimental females, litter size at birth and at weaning at 42 days averaged 7.0 and 6.86 resp. vs. 6.8 and 6.64 for controls, and at 42 days dam body weight averaged 964 g vs. 981; body weight of male and female cubs averaged 357 and 305 g resp. for experimental and control females and 366 and 313 g for control females. Differences between groups were not significant.

Dansk Pelsdyravl 56, 4, pp 149, 1993. In DANH. 2 tables. CAB-abstract.

Fur bearer recording statistics in 1991

Anonymous

For 12,836 silver fox females in Norway mated with silver fox males and 8,835 and 2,028 blue fox females mated with blue or silver fox males, the percentage of mated females failing to produce a litter was 12.9, 13.7 and 16.9 resp., and litter size averaged 4.4, 8.3 and 7.4 at birth and 4.3, 7.3 and 6.5 at weaning. Litter size per mated female at 3 wk. averaged 3.1, 5.4 and 4.2 resp., and cub mortality from birth to weaning 16.2, 21.3 and 29.6 %.

Norsk Pelsdyrblad 65, 11, pp. 22-23, 1992. In NORW. 4 tables. CAB-abstract.

Research on martens at Kannus

P. Niemelä, H. Korhonen

An account is given of the housing, management, sexual behaviour, nutrition and reproductive physiology of martens at the Kannus Research Station in Finland, where breeding trials have been in progress since 1989.

At present there are 10 males and 13 females at Kannus, but no litters have been born in captivity so far.

Finsk Pälstidskrift 27, 3, pp. 48-50, 1993. In SWED. CAB-abstract.

Inauguration of a new research station at Kuopio University

M. Harri

Details are given of some current fur animal research projects in Finland, including work on the breeding of Angora rabbits and on behaviour, AI, embryo transfer and the effects of environmental factors and nutrition on female fertility in foxes.

Finsk Pälstidskrift 26, 11, pp 263-265, 1992. In SWED. 4 ill. CAB-abstract.

Pelt production in different districts in 1991-92

J. Mäkelä

In 1991-92, in Finland, the production of mink pelts totalled 1,359,209, representing a decrease of 18.7% compared with the previous year. Of the pelts produced, 49.9% were scanglow, 28.3% scanblack and 6.9% scanbrown. The production of fox pelts totalled 1,021,493, representing a decrease of 29.9% compared with 1990-91. The production of raccoon dog pelts was 35,905 and that of polecat pelts 80,927. Data are tabulated by farm size, pelt size and district, and economic aspects are considered.

Finsk Pälstidskrift 26, 12, pp 293-296, 1992. In SWED. 22 tables. CAB-abstract.

Mink production in Norway - important moments before the new season

Anonymous

In 1990-91, in Norway, the production of mink pelts totalled 268,876, of which 49% were scanblack, 31% scanbrown/scanglow and 11% pastel. Of pelts from scanblack and scanglow males, 32 and 50% resp. were top size. Production data are compared with those in the previous 4 yr, and economic aspects are considered.

Norsk Pelsdyrblad 65,10, pp 4-6, 1991. In NORW. 4 tables. CAB-abstract.

Recording of fur bearers in 1992

Anonymous

Of 10,736 mated mink females recorded in Norway in 1992, 9.4% failed to produce a litter. Litter size averaged 6.2 at birth and 5.8 at 3 wk of age, the number of kits per mated female at 3 wk 5.1 and kit mortality to 3 wk 9.2%. Of 10,753 silver fox females mated with silver fox males, 15,326 blue fox females mated with blue fox males and 1,060 blue fox females mated with silver fox males, 11.2, 13.3 and 12.4% resp. did not produce a litter, litter size averaged 4.4, 8.1 and 7.4 resp. at birth and 4.3, 7.0 and 6.1 at 3 wk. The av. number of cubs per mated female at 3 wk was 3.2, 4.9 and 4.1, and cub mortality to 3 wk 16.9, 28.2 and 33.3%. Data are tabulated by colour type.

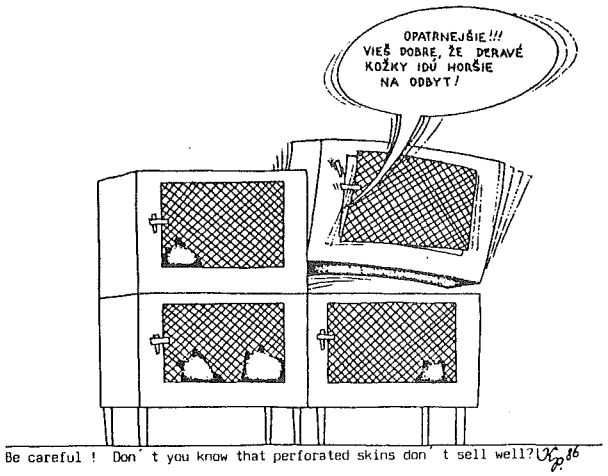
Norsk Pelsdyrblad 66, 11, pp 19-21, 1992. In NORW. 4 tables. CAB-abstract.

Fur farming in Norway in 1992

Anonymous

In Norway, in 1991, 274,890 mink pelts were sold, representing a decrease of 15% compared with 1990. 25,000 fox females on 650 farms were inseminated, and the av. CR was 78.4 and 83.3% resp. for blue fox and silver fox females inseminated with blue fox semen and 82.3% for silver fox females inseminated with silver fox semen. Brief details are given of current research on fur bearers.

Vara Pälsdjur 63, 5, pp 137, 1992. In SWED. CAB-abstract.



Be careful ! Don´t you know that perforated skins don´t sell well?

Dutch purebreds are best for breeding Mahogany mink

Janne Hansen

Ten breeding combinations for Mahogany mink are listed. It is suggested that the crossing of Mahogany purebreds with Standard or Demi mink, followed by back-crossing over 5-6 generations will produce the best results.

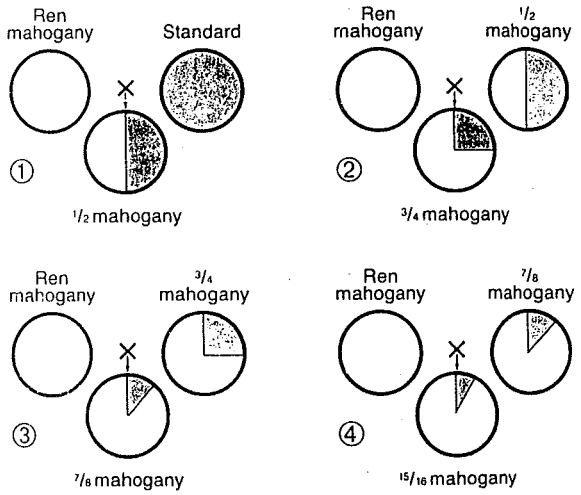


Fig. 1. Fortrængningskrydsning med mahogany på standard

Dansk Pelsdyravl 56, 2, pp. 36-38, 1993. In DANH. CAB-abstract.

Red, wrinkled mink. A new inherited disorder in wild-type mink

T.N. Clausen, J. Hansen, P. Henriksen

An illustrated account is given of a disorder that affected 35% of kits in 15 of 263 wild-type mink litters in Denmark, which were the descendants of mink imported from the USA in 1985. The skin of affected mink turned red and wrinkled at approx 2 wk of age, and their hair follicles were damaged. Hair regrowth occurred in early July in surviving kits, but affected animals were smaller and had poorer pelt quality than normal kits. It is suggested that the disorder is due to a recessive gene and that its mode of inheritance is similar to that of tyrosinaemia.

Figur 1. En angreben (øverst) og en rask hvalp ved 3 ugers alderen

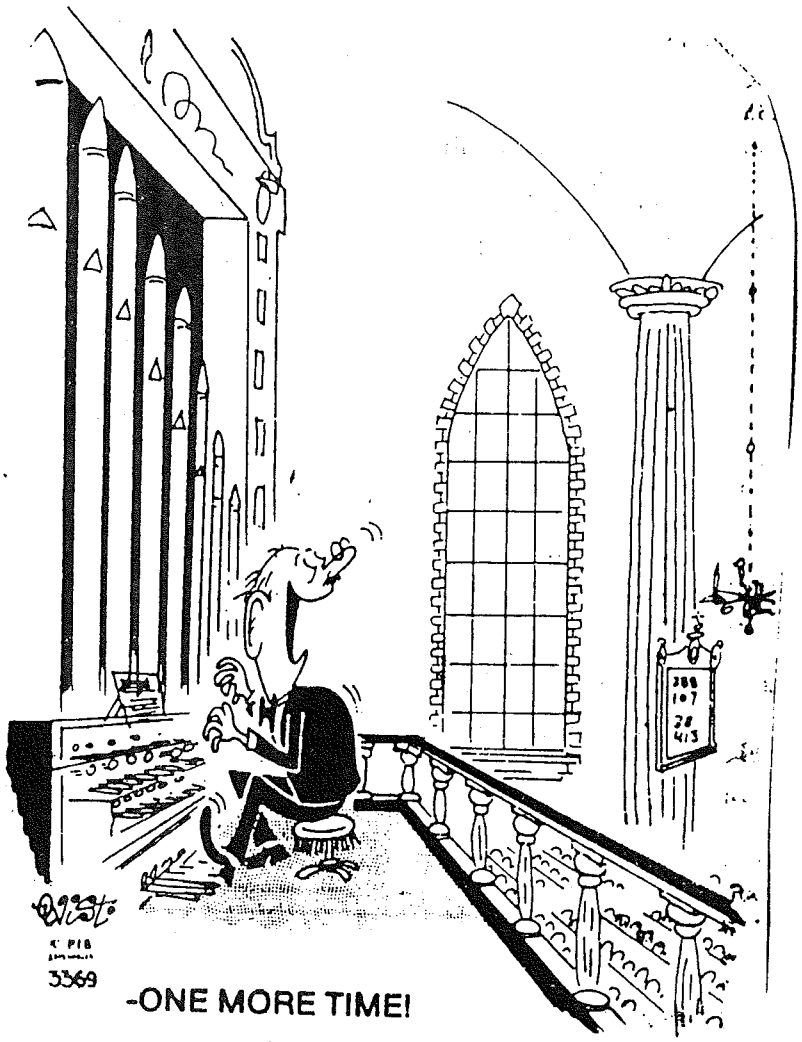
Dansk Pelsdyravl 55,1 1, pp 509, 1992. In DANH. 3 figs. CAB-abstract.

The Sampo breeding value evaluation programme

K. Smeds

The Sampo on-farm programme, based on a BLUP animal model, was introduced in Finland in 1991. In 1992, 36,000 foxes, 17,000 mink and 2,000 raccoon dog breeding animals on 43 farms were evaluated.

Finsk Pälstidskrift 26, 11, pp 256-257, 1992. In SWED. CAB-abstract.



Original Report

A bacteriological study of smears collected from mammary glands of polar fox females (Alopex lagopus L.) in various phases of lactation

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Summary

The study embraced bacterial strain identification, their susceptibility to different antimicrobial agents (antibiotics, sulphonamids and baytril) and the number of somatic cells in polar fox female milk in various phases of lactation. The milk was collected under germ-proof conditions, the samples of milk were smeared on an agar nutrient with a 5% supplement of ram blood and incubated at 37°C. 40 samples were analysed, collected from females in 1, 10, 20 and 30 days of lactation. The bacteria were found in 50% samples. The Staphylococcus intermedius and Streptococcus sp. α-hematolytic were found most often. A high susceptibility of the studied strains of bacteria to baytril was observed. The following limits of cells were recieved: from 5 x 10^5/ml to 1 x 10^6/ml and higher. There was no correlation between the number of cells and type of bacteria causing infection of the mammary gland.

Introduction

Mastitis frequently occurs in domestic animals and the scientific literature concerning this subject contains plenty of information. This ailment in cows affects a relatively large number of animals. It causes significant losses in productivity and results in lower quality of the raw milk. This milk is partly or totally unsuitable for milk products. Inflammation of the udder in pigs ("The MMA Syndrome") engenders lower reproductive utility particulary causing numerous losses in piglets.

Breeding in polar foxes which physiologically in many aspects resemble pigs (digestive tract, feeding proportion, high fertility and microscopic structure of mammary gland) mastitis-like ailments are also ascertained. They cause high losses revealing insufficient lactation or agalactia and high cub mortality. However, there is lack of knowledge as regards this subject. Therefore, it was advisable to examine smears from polar fox mammary glands for a better understanding of mastitis in these animals.

Materials and methods

The experiments were carried out on a farm of Siedlce Forest Industry "Las" in Brominy (near Warsaw) on primiparous females of polar fox in 1992. All females showed normal behaviour toward their cubs and fed them properly. The litter size per group fluctuated between 4 and 13 cubs. The milk was collected from each female

two times in 1, 10, 20 and 30 day of lactation. It was collected 40 samples together. The milk for the first smear was collected from the last right teat, for the second smear - from the total milk collected from 4 teats. The milk was always collected under germ-proof conditions. The smears were prepared maximum 3 hours after the collection of milk. The cytological studies were done in the same period. The samples of milk were smeared on an agar nutrient with the 5% supplement of ram blood. These smears were incubated for 24 hours in 37°C. Then, the first investigation of bacteria growth was carried out and some colonies were isolated for further identification. The second phase took place after 48 hours. The slower growing microbes were checked in this case.

The introductory identification was done on the basis of the estimation of the morphology of full-grown colonies (shape, size and appearance) and on the basis of the type of hematolysis.

Further investigations embraced microbes identification when various differentiating media were used. In questionable cases detailed biochemical tests were applied according to standard method accepted in diagnosis (*Bergey, 1984; Bassalik-Chabielska, 1990*).

In the case, when only one type of microbe was found in milk the infection was named homogenous. When two or more types of microbe were found this infection was "mixed".

Isolated strains of bacteria were examined as regards their suscetibility to antibiotics (penicillin, ampicillin, streptomycin, neomycin, gentamicin, chloramphenicol, erythromycin, oxytetracycline), sulphonamids (biseptol, sulphometaksazole, trimetroprim) and baytril.

Antimicrobial agents esistance was estimated by diffusion method. The cytological studies were carried out using microscope and Prescot-breed method (*Leidl et al., 1961*). The number of somatic cells was calculated using immersion objective. The following limits of cells were received: from 5 x 10^5/ml to 1 x 10^6/ml and higher.

Results and discussion

The results concerning the picture of microbes in milk in various phases of lactation are shown in table 1 and table 2. The microbes were detected in 50% of 40 analysed samples of milk.

Table 1. The homogenus and mixed infections observed in polar fox females milk in various phases of lactation

Examined samples	Samples not infected	Samples infected	Homogenous infection	Mixed infection		
Total				Total	Two species of bacteria	Four species of bacteria
40	20	20	9	11	10	1

Table 2. The frequency of occurence of various species of bacteria taking into account homogenous and mixed infection in polar fox females milk (the number if infected samples = 20)

Bacteria	Homogenous infection	Mixed infection
Staphylococcus intermedius	4	8
Staphylococcus aureus	1	0
Staphylococcus sp. coagul. (-)	3	4
Streptococcus sp. α-hem.	1	8
Streptococcus sp. ß-hem.	0	3
Escherichia coli hem.	0	1
Escherichia coli not hem.	0	1

In this number the distribution of homogenous and mixed infections was roughly fifty-fifty. Two types of bacteria was found in 90% of mixed infections cases. The Staphylococcus intermedius was isolated from 60% of samples. Streptococcus sp. α-hematolytic - from 45% of samples and Staphylococcus sp. coagulaso-negative - from 35% of samples. The remaining types of bacteria were as follows: Streptococcus ß-hematolytic (15% of samples), Staphylococcus aureus and Escherichia coli (5% of samples) (see table 2).

Taking into account the number of somatic cells as the indicator of mammary gland health it was ascertained that in 50% of cases where microbes were not detected the total number of cells in milk was lower than 5 x 10^5/ml. 20% of samples were classified between 5 x 10^5 and 1 x 10^6 per 1 ml (table 3). In the remaining 30% of samples without microbes the level of somatic cells was higher than 1 x 10^6/ml. Perhaps in this case the mastitis aseptica occured. It is linked with disturbances not caused by cicrobes (e.g. engendered by trauma) or somatic cells which appear in great number in infected tissue eliminated the infection agent. There was no found correlation between the number of cells and a type of bacteria causing infection of mammary gland in foxes. This relationship was found in cows (*Mierník, 1982*). These results require further confirmation on a greater number of animals and coordination with experiments concerning the mechanismus of local and system immunity in this specie of fur animals.

In the next phase of this work the isolated strains of bacteria were examined with respect of theirs susceptibility to some antibiotics, sulphonamids and baytril. The obtained results indicate that the great number of S.intermedius, Str.sp. α- and ß-hematolytic strains turned out to be susceptible to chloramphenicol, oxytetracycline, penicillin and erythromycin (table 4). The susceptibility to biseptol, sulphometaksazole and trimetroprim was weak. There is need to lay emphasis on the high susceptibility of studied strains of bacteria to baytril (Bayer). This preparation comprises active enrofloxacine, derivative of carboxylic acid (chinolanes) which blocks the enzymes of bacteria (*Mazurkiewicz et al., 1990*).

Table 3. The number of somatic cells from polar fox females infected and not infected mammary glands

Somatic cells count (cells/ml)	Mammary glands not infected (n = 20)	Mammary glands infected (n = 17)
$\leq 5 \times 10^5$	10	2
$\leq 1 \times 10^6$	4	8
$\geq 1 \times 10^6$	6	7

Table 4. The susceptibility of isolated bacteria strains in polar fox females milk in various phases of lactation

Antimicrobial	S.intermedius			Str. -hem.			S.sp.coagul.(-)			Str. -hem			E. coli		
Agents	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Penicilin	4	0	1	3	1	1	1	1	0	2	0	0	0	2	1
Ampicillin	0	0	5	2	1	2	0	1	1	0	0	2	0	1	2
Streptomycin	3	1	1	0	3	2	0	2	1	0	2	0	0	1	2
Neomycin	4	1	0	3	1	1	0	2	0	0	0	2	0	2	1
Gentamicin	3	1	1	3	1	1	1	1	0	1	1	0	1	0	2
Chloramphenicol	5	0	0	3	1	1	0	1	1	2	0	0	0	1	2
Erythromycin	4	0	1	3	0	2	1	0	1	2	0	0	0	2	1
Oxytetracycline	5	0	0	4	0	1	0	0	2	0	1	1	0	2	1
Biseptol	1	1	3	1	1	3	0	0	2	0	0	2	0	2	1
Sulphometaksazole	1	0	4	1	0	4	0	0	2	0	0	2	2	0	1
Trimetroprim	0	0	5	0	0	5	0	0	2	0	0	2	2	0	1
Baytril	5	0	0	5	0	0	1	0	1	2	0	0	2	0	1

1 - susceptibility
2 - variable
3 - not susceptibility

Conclusion

- The bacteries were found in 50% examined samples of milk, staphylococcus intermedius and streptococcus sp. α-hematolytic were found most often.
- The following limits of somatic cells in polar fox females milk were received: from 5 x 10^5/ml to 1 x 10^6/ml and higher.
- There was no correlation between the number of cells and a type of bacteria causing infection of mammary gland.
- It was observed the high susceptibility of studied strains of bacteria to baytril.

The carried introductory studies showed the scope of the problem concerning the infection of polar foxes mammary gland during lactation and pointed out the utility of selected pharmacological compounds in treatment of subclinical and clinical inflammations.

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Original Report

Hematological parameter values in polar fox females (Alopex lagopus L.) during the lactation period

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Summary

The state of the erythron and leukogram systems in polar fox females during the lactation period was analyzed. The hematological tests were done at the 1st, 10th, 20th and 30th days of lactation on 16 primiparous females which were normally rearing cubs. Litter size waved from 4 to 13. Erythron was qualified by: number of erythrocytes, hematocrit indicator (PCV), hemoglobin concentration, mean corpuscular volume (MCV), mean corpuscular hemoglobin per erythrocyte (MCH), mean corpuscular hemoglobin concentration per erythrocyte (MCHC), and morphological estimation erythrocytes. The state of the leukogram system was qualified by: estimate of total number of white blood cells (WBC) and number of each kind of leukocyte (Neutrophils, Lymphocytes, Monocytes, Eosinophils, Basophils). It was found that neither stage of lactation nor litter size (intensity of lactation) changed the hematological parameter values beyond the physiological norm considered for primiparous females.

Introduction

Estimation of hematological and biochemical parameters (which value depends on the state of health) is very important in fur animal breeding. Every change in parameter value gives information about the animals' welfare, condition and subclinical diseases. Hematological tests which estimate erythron and leukogram systems are easy to examine and are especially useful during lactation and the rearing cubs period. The aim of this work was to estimate elementary parameters in erythron and leukogram systems in polar fox females during the lactation period. In the bibliography there were not found any materials about the hematological parameters values during the rearing cubs period. Only hematological parameter values in fox females at different age were found (*Berestov and Brandt, 1989; Berestov, 1981*).

Materials and methods

The observations were carried out on a farm of Siedlce forest Industry "Las" in Brominy (near Warsaw) on 16 primiparous polar fox females in 1992. The animals were housed in pavilions and fed a diet typical for the conditions of Central Poland. 8 females were a control group. The experimental group consisted of 8 animals, normally rearing cubs with a typically maternal behaviour. Litter size varied from 4 to 13. The blood was collected from "vena saphena" and protected by potassium ethylenediamine (tetraacetic acid). The blood was collected from the control group once and from the experimental group on days 1, 10, 20, and 30 of lactation. The

blood was collected early morning before the animals were fed.

Erythron was qualified by the number of erythrocytes, hematocrit (paced cell volume - PCV) and hemoglobin concentration estimation and by mean corpuscular volume (MCV), mean corpuscular hemoglobin per erythrocyte (MCH) and mean corpuscular hemoglobin concentration per erythrocyte (MCHC) counting. Morphological estimation of erythrocytes and number of reticulocyte counting were done in smear. By using such parameters it was possible to estimate the functional state of the erythron system and the state of the water system in the organisms (*Willard et al. 1989; Shalm et al., 1975; Morris, 1990*).

The state of the leukocyte system was qualified by total number of white blood cells (WBC) counting and number and percentage of each kind of leukocyte (Neutrophils, Lymphocytes, Monocytes, Eosinophils, Basophils).

The number of erythrocytes and leukocytes was indicated by a coulter counter (Coulter Electronics, model DN, LTD Har penden Herts, England); hematocrit by the micromethod in hematocrit tubes. Hemoglobin concentration was estimated by cyanmethemoglobin method, percentage and kinds of leukocytes were calculated from smears by counting 200 cells, staining by Wright's method. Number of reticulocytes was counted in smears after blood incubation with 0.5% new methylene blue for 15 minutes (*Wilard et al., 1989; Schalm et al., 1975*). MCV, MCH, MCHC and number of every kind of leukocyte were calculated by typical methods (*Schalm et al., 1975; Berestov and Brandt, 1989; Morris, 1989*).

Table 1 The values for erythron data in polar foxes during lactation

Parameters		Days of lactation				
		Control	1	10	20	30
Erythrocytes	$x10^{12}/l$	5.78 ± 0.8	5.64 ± 0.7	5.93 ± 0.7	5.79 ± 0.3	6.07 ± 0.09
PCV	%	36.0 ± 4.0	30 ± 4.0	42.0 ± 4.0	41.0 ± 2.0	43.0 ± 1.0
	1/1	0.36 ± 0.04	0.39 ± 0.04	0.42 ± 0.04	0.41 ± 0.02	0.43 ± 0.01
Hb	g/l	155.4 ± 18.5	147.7 ± 22.2	133.0 ± 33.7[a]	137.4 ± 11.8[a]	145.6 ± 25.3
	mmol/l	9.64 ± 1.15	9.16 ± 1.38	8.25 ± 2.09	8.53 ± 0.73	9.04 ± 1.58
MCV	fl (um^3)	62.3 ± 5.1	70.03 ± 0.01	69.98 ± 0.01	70.01 ± 0.01	70.02 ± 0.02
MCH	pg	26.9 ± 0.60	26.1 ± 0.65	22.24 ± 3.04	23.72 ± 0.79	24.02 ± 4.57
	fmol	1.67 ± 0.10	1.62 ± 0.04	1.38 ± 0.18	1.46 ± 0.07	1.49 ± 0.28
MCHC	%	43.20 ± 4.3	37.35 ± 0.92	31.77 ± 4.33[b]	33.88 ± 1.14	34.30 ± 6.55
	mmol/l	27.89 ± 1.71	23.17 ± 0.59	19.72 ± 2.69[b]	21.03 ± 0-69	21.30 ± 4.07
Reticulocytes	%	0.0	0.0	0.0	0.0	0.1

PCV - packed cell volume (hematocrit); Hb - hemoglobin; MCV - mean corpuscular volume; MCH - mean corpuscular hemoglobin; MCHC - mean corpuscular hemoglobin concentration. Means with letters were significantly different from values of the control group (a = $p<0.05$; b = $p<0.01$).

Table 2. Leukogram data values in polar foxes during lactation

Parameters		Days of lactation				
		Control	1	10	20	30
WBC	$x10^9/l$	7.58 ± 2.03	9.4 ± 1.9	10.5 ± 6.9	7.9 ± 0.42	8.5 ± 3.8
Neutrophils: segmented	%	67.00 ± 6.3	71.0 ± 0.01	64.5 ± 0.7	69.5 ± 6.3	61.0 ± 1.4
	$x10^9/l$	5.07 ± 1.2	6.6 ± 1.4	6.75 ± 4.3	5.49 ± 0.7	5.16 ± 2.2
band	%	8.8 ± 2.1	15.5 ± 7.7	11.5 ± 0.7	6.0 ± 1.4	6.0 ± 0.1
	$x10^9/l$	0.66 ± 0.3	1.6 ± 1.03	1.18 ± 0.7	0.49 ± 0.08	0.51 ± 0.2
Lymphocytes	%	20.0 ± 4.1	9.0 ± 7.1[b]	19.5 ± 0.7	23.5 ↑1 6.4	28.0 ± 4.2[a]
	$x10^9/l$	1.52 ± 0.7	0.77 ± 0.4	2.07 ± 1.4	1.84 ± 0.4	2.64 ± 1.4
Monocytes	%	2.01 ± 1.0	4.5 ± 0.7	3.5 ± 0.7	1.0 ± 1.4	3.0 ± 1.0
	$x10^9/l$	0.15 ± 0.2	0.443 ± 0.2	0.35 ± 0.1	0.08 ± 0.1	0.25 ± 0.1
Eosinophils	%	2.2 ± 1.3	0[a]	1.0 ± 1.4	0[a]	2.0 ± 2,8
	$x10^9/l$	0.18 ± 0.2	0[a]	0.15 ± 0.2	0[a]	0.12 ± 0.1
Basophils		0	0	0	0	0

WBC - white blood cells (leukocytes). Means with letters were significantly different from values of the control group (a = $p<0.05$; b = $p<0.01$).

The results obtained were calculated statistically. Differences among means were tested statistically by analysis of variance and by Student's t-test.

Results and discussion

The results are shown in tables 1 and 2. There were found differences in hemoglobin concentration, MCHC value, lymphocyte and eosinophil percentage between the control and experimental groups. All values were in the physiologically normal range described for polar foxes (*Berestov and Brandt, 1989; Berestov, 1981*).

There were not found abnormal erythrocytes, granulocytes, lymphocytes nor monocytes in the smears.

Conclusion

All observed hematological parameter values were within physiological norms, considered for primiparous females.

There were not found differences in polar fox females hematological parameters between animals towards time of lactation and litter size (intensity of lactation).

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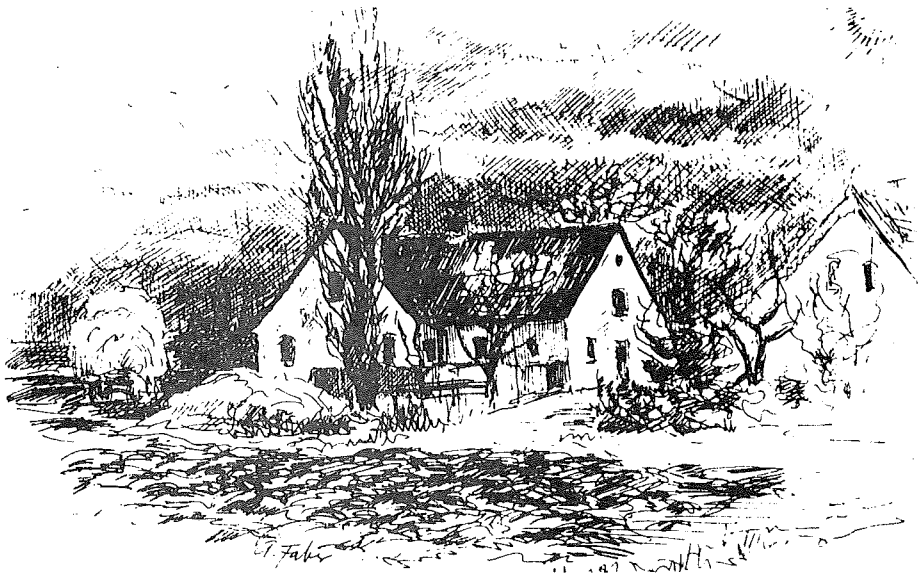

Original Report

Seasonal changes in testicular size and serum testosterone levels and the relationships between serum testosterone concentrations and reproductive performance in male raccoon dogs

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Summary

There were marked seasonal variations in testis widths and serum testosterone concentrations in adult male raccoon dogs. Testis widths and serum testosterone levels remained relatively low and stable during May and August. In late September, testis widths increased significantly, and one month later, in October, testosterone levels increased clearly. Both testis widths and testosterone concentrations reached the highest values in the early breeding season. An insignificant decrease in testis widths and a rapid decrease in testosterone levels were observed at the end of the breeding season. The monthly average testis widths correlated positively to the serum testosterone levels throughout the year. A higher serum testosterone level in early February indicated an earlier start and end of breeding season.

Introduction

The raccoon dog (*Nyctereutes procyonoides*) has been commercially farmed for its fur over a much shorter history than the mink and the fox. Knowledge of the reproductive characteristics of this species is rather limited except for few reports on the reproductive features of the female (*Valtonen et al., 1977 and 1978; Yongjun et al., 1990*). The raccoon dog as well as the fox belong to the family Canidae and they are classified as seasonal short-day breeders. The male raccoon dog produces mature sperm and shows sexual activity from the beginning of February to late March under farm conditions (*Shufang, 1964*). It has been demonstrated in earlier studies that the testicular development and blood testosterone levels show seasonal variations and are regulated by photoperiod through melatonin secreted by the pineal gland in the male red fox (*Maurel et*

al., 1984), blue fox (*Smith et al., 1985*) and silver fox (*Forsberg et al., 1990*). The status of testicular development may affect the breeding results. In male mink, blood testosterone levels in February are associated with the sperm quality during breeding season in March (*Sundqvist et al., 1984*). The aim of the present study was to establish the pattern of seasonal changes in testicular size and serum testosterone concentrations in male raccoon dogs and to investigate the relationship between testicular size, serum testosterone levels and reproductive performance in male raccoon dogs.

Materials and Methods

Animals, collection of blood and measurement of testis width

Ten 1-year-old males in May and another 10 1.5-year-old males in November with normal fertility in the previous breeding season were used at the research farm (latitude 44°03'N) of the Institute of Wild Economic Animal & Plant of CAAS, China. Blood samples were taken between 09.00-12.00 hr once a month, on the 15th from May to December (22nd in September) and on the 10th from January to April the following year. Testis width was defined as the horizontal width of the two testes together measured through scrotum. After centrifugation, serum was separated and stored at -20°C until assay. At the end of November (pelting time), testes of 23 other males were measured before pelting and weighed after pelting in order to estimate the correlation between width and weight of testes. All animals were housed individually in an open shed under normal farm conditions.

Determination of testosterone concentrations

The RIA Kit for testosterone (provided by the Endocrine Institute of Shanghai) was used to measure serum testosterone concentrations. Serum were extracted by ether, and the recovery rate was 100%. The inter- and intra-assay coefficients of variation were 8.1 and 10.2%, respectively. The sensitivity of the assay was 32 pg/ml.

Methods of mating and observation of reproductive performance

From the beginning of the breeding season each of the 20 males shared one cage with a female in estrus for at least 20 minutes every day. Once the first mating was successful, the female was remated by the same male another 2-3 times (once a day). After finishing the female's mating, the male was introduced to another female after a rest of 2-3 days. This procedure was repeated until the male lost its mating ability. Dates of first and last mating, number of matings of the males, and pregnancy rates and mean litter sizes of the females were recorded.

Statistical analyses

For data processing, the analysis of variance and linear correlation and regression were used. The results were expressed as means ± SEM.

Results

Seasonal changes in testis widths and correlation between testicular width and weight

Marked seasonal changes were shown in testis widths in male raccoon dogs throughout the year ($p<0.01$, Fig.1). Testis widths varied only little from May to August ($p>0.05$), but increased significantly in late September ($p<0.05$). Thereafter, the testis widths increased steadily until the beginning of the breeding season of the following year (early February) when they reached the highest values. At the end of the breeding season (March 10th), testis widths started to decrease. The decrease was clear in April ($p<0.05$), but the testes were still significantly larger than in May the previous year ($p<0.05$).

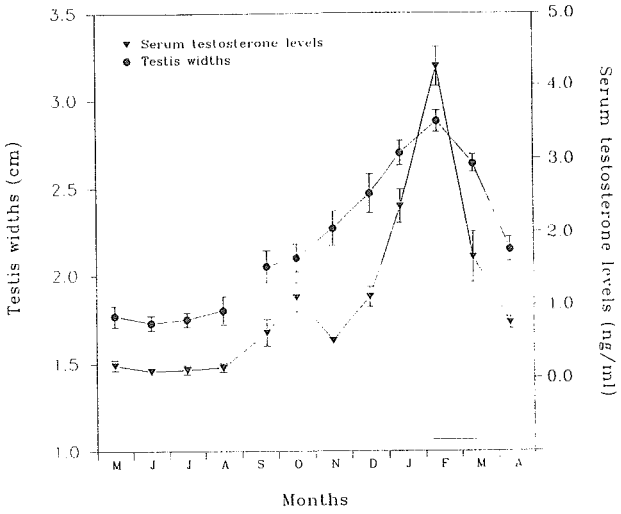

Fig. 1. Seasonal changes in serum testosteron levels and testis widths in male raccoon dogs. The number of animals was 10 from May to November and 20 from December to April. The horizontal line presents the breeding season. The values are expressed as means ± SEM

There was a strong positive correlation ($p<0.01$) between testicular width and weight (Fig.2), which means that the weight of a testis could be estimated indirectly by measuring its width.

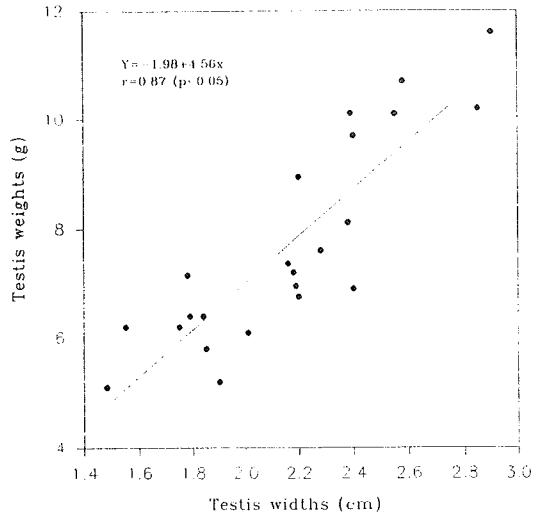

Fig. 2. Relationship between testis widths and weights in 23 male raccoon dogs at pelting in November

Seasonal changes in serum testosterone levels
There were significant seasonal changes in serum testosterone concentrations in male raccoon dogs ($p<0.01$, Fig.1). Like the testis widths, the serum testosterone concentrations were low during May-August. The testosterone concentrations showed a significant increase in October compared to May-August ($p<0.05$). However, an insignificantly lower value was observed in serum testosterone levels in November.

Thereafter serum testosterone concentrations increased rapidly and attained maximal values in the early breeding season (February 10th). At the end of the breeding season (March 10th) testosterone concentrations decreased rapidly, and a further decrease was observed after the breeding season.

Correlation between testis widths and serum testosterone levels
There was no significant correlation between testis widths and serum testosterone levels in individuals within each month ($p>0.05$). However, the monthly average testis widths significantly correlated with the monthly average serum testosterone concentrations throughout the year ($r=0.83$, $p<0.01$).

Correlations between testis widths or serum testosterone levels and reproductive performance
Of 20 males, 19 showed normal mating activity and each of the 19 males got all or a part of his females pregnant. Dates of the first and last matings and number of matings of each male, and pregnancy rates and mean litter sizes of females are shown in Table 1.

Table 1. The averages and ranges of dates of first and last matings, number of matings of males, and pregnancy rates and mean litter sizes of females (n=19)

	Date of first mating	Date of last mating	Number of matings	Pregnancy rates in females	Mean litter sizes
Range	Feb. 11-25	Feb.19-Mar. 14	3-15	50-100%	6.0-12.0
Means ± SEM	Feb. 16.1±4.3	Mar. 4.7±6.4	7.7±3.1	80±20%	8.4±1.6

Table 2. Correlation coefficients between testis widths or serum testosterone levels of males in the early breeding season and dates of first and last matings, number of matings, pregnancy rates and mean litter sizes of females (n=19).

	Testis width	Serum testosterone level
Date of first mating	-0.386	-0.525*
Date of last mating	-0.023	-0.476*
Number of matings	0.184	0.185
Pregnancy rate, females	-0.072	-0.201
Mean litter size, females	-0.071	0.045

* $P<0.05$.

A significant positive correlation was shown between the serum testosterone levels in the early breeding season and the dates of first and last matings ($p<0.05$, Table 2), i.e. the individuals with higher serum testosterone concentrations in the early breeding season reached and lost their mating ability earlier than the individuals with lower serum testosterone levels. There was no significant correlation between testis widths in the early breeding season and the dates of first and last mating ($p>0.05$, Table 2). There were also no significant correlation between either testis widths or serum testosterone levels in the early breeding season and number of matings, the pregnancy rates or mean litter sizes of females ($p>0.05$).

Discussion

Like other seasonal breeders, the male raccoon dogs showed marked seasonal variations in testicular size. After experiencing the quiescent period of about 5 months, the recrudescence of testes in male raccoon dogs occurred in late September which was earlier than in mink (*Onstad, 1967*) or blue fox (*Smith et al., 1984*) which was reported to occur in November. Likewise, the blood testosterone levels increased earlier in male raccoon dogs (October) than in mink (December) (*Boissin-Agasse et al., 1982*) and blue fox (December) (*Smith et al., 1985*). The testicular size and serum testosterone concentrations in male raccoon dogs reached the maximum in the beginning of the breeding season. This is consistent with earlier reports in male blue foxes (*Smith et al., 1985*) and in male silver foxes (*Forsberg et al., 1990*). The reason for a decreased testosterone concentration in November is unknown. There were obvious differences between individuals in the onset and termination of the reproductive period in male raccoon dogs. The serum testosterone levels in males in the beginning of the breeding season seem to correlate with the coming time of their reproductive period. Those with higher serum testosterone concentrations in the early breeding season entered their reproductive period earlier than those with lower serum testosterone concentrations. It seems that the testicular size and serum testosterone levels in the early breeding season do not influence a fertile male's libido during the mating period and the pregnancy rate and mean litter size of females mated by the male.

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This article is based on the results published in Acta Theriologica Sinica 12(1):14-18, 1992 in Chinese.

There is no immediate relationship between testis size and breeding ability in mink

Ulla Lund Nielsen, Niels Therkildsen

The testes of 88 male mink, used for matings with 172 females, were examined on 6 occasions from 15 Nov. to 24 Mar., and 1 semen sample was obtained from each male. Overall, the incidence of females failing to produce a litter was 13.5% vs 12.1, 10.1, 6.9 and 7.0% resp. When females mated with males with small testes on 2 Mar., a low sperm number, poor semen quality or poor semen quality plus small testes were excluded, and the corresponding litter size was 5.4 vs 5.3, 5.8, 6.1 and 6.0. It was concluded that mink males should not be culled exclusively on the grounds of small testes.

Dansk Pelsdyravl 55, 12, pp. 553, 1992. In DANH. CAB-abstract.

Recording of whelpings in 1992

O.A. Eldoy

For approx. 50,000 mink females recorded in Norway in 1992, litter size averaged 4.5, 4.7, 3.4, 3.5 and 3.9 resp. for Scanblack, Brown, White, Sapphire and other mink. For 28,000 silver fox females, litter size averaged 2.7 and 3.2 resp. for inseminated and naturally mated females and 14.7% of mated females failed to produce a litter. For 43,000 blue fox females, litter size averaged 4.3 and 4.8 resp. for inseminated and naturally mated females and 19.4% of mated females did not produce a litter.

Norsk Pelsdyrblad 64, 10, pp. 28-31, 1992. In NORG. CAB-abstract.

Reproduction in blue foxes

O.A. Eldoy

Data on 13,164 blue fox females mated or inseminated in 1992 at 266 farms in southern Norway were analysed. For naturally mated young and adult females, litter size averaged 3.69 and 4.92 resp. per mated female vs 3.47 and 4.86 for inseminated females. Mortality was 32.6% for the cubs of young females and 20.3% for those of adult females, and approx. 50% of deaths occurred at 1-3 days of age. The main causes of mortality were hot weather at the time of whelping, weak cubs and deficient milk production. Females given 2-2.5 kg feed per week during gestation and lactation had larger litters than those fed 1.5 or 2.5 kg but vitamin supplements had little effect on litter size.

Norsk Pelsdyrblad 67, 3, pp. 10-12, 1993. In NORW. CAB-abstract.

Whelping results in 1992

K. Eklund

The number of mink, polecats, blue foxes, silver fox x blue fox crossbreds, silver foxes and raccoon dogs born in Finland in 1992 totalled 1,649,599, 82,656, 1,046,639, 87,208, 224,294 and 55,156 resp., and the number of young born per mated female averaged 3.98, 5.76, 2.78 and 5.18 resp. for mink, polecats, silver foxes and raccoon dogs, and 5.45 and 4.24 resp. for blue fox females mated with blue or silver fox males. Data are compared with those for 1991 and 1990.

Finsk Pälstidskrift 26, 10, pp. 217, 1992. In SWED. CAB-abstract.

Results of the Articop inseminations in 1992

J. Meriläinen, J. Wilponen

Data on 758 fox females inseminated in Finland in 1992 under the Articop on-farm scheme were analysed. 33, 53 and 14% resp. of inseminations were of blue fox females inseminated with blue fox semen, silver fox females inseminated with silver fox semen and silver fox females inseminated with blue fox semen, and they resulted in 5.5, 2.5 and 4.2 weaned cubs per inseminated female. The CR ranged from 80 to 99% and the av. preweaning cub mortality was approx. 25%.

Finsk Pälstidskrift 26, 12, pp. 279, 1992. In SWED. CAB-abstract.

Artificial insemination of foxes in 1992

E. Smeds

In 1992, in Finland, 9,900 silver and 45,800 blue fox females were inseminated with blue fox semen and 16,700 silver fox females were inseminated with silver fox semen. For females in the 3 groups, the CR was 85, 88 and 83% resp.,

and the number of cubs born per inseminated female averaged 4.55, 5.35 and 2.65.

Finsk Pälstidskrift 26, 12, pp 278, 1992. IN SWED. CAB-abstract.

Reproductive performance in 1987-1992

Anonymous

For 2,027,532 mink females at 3404 farms in Denmark, mated in 1992, the percentage of infertile females was 8.9, and the number of kits born and weaned per mated female averaged 5.68 and 5.18 resp. Data are tabulated by colour type, district, farm size and feeding centre, and results are compared with those in previous years. For Blue/Shadow and silver fox females mated in 1992, 23.5 and 15.5% resp. failed to produce a litter, and litter size per mated female averaged 4.66 and 3.12 resp.

Dansk Pelsdyravl 55, 10, pp. 466-467, 1992. In DANH. CAB-abstract.

Use of frozen semen from elite males in 1991. Results and notes

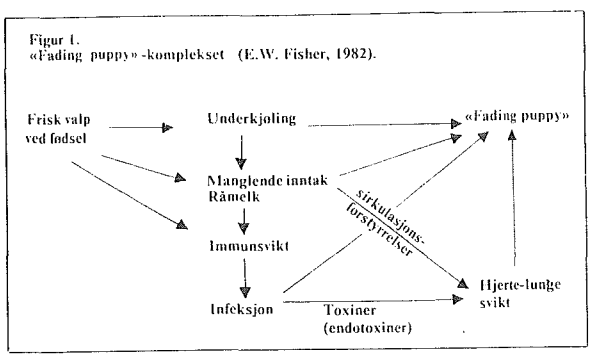
K.R. Johannesen

For 40 arctic fox females in Norway, inseminated with frozen semen from elite males in 1991, the CR to 1st insemination was 46.7% and that to 2 inseminations 80%. For 15 females inseminated once, litter size at 3 wk averaged 3.0, and the number of cubs that survived to 3 wk per pregnant female averaged 2.1 vs. 3.9 and 3.7 resp. for 25 females inseminated twice.

Norsk Pelsdyrblad 65, 12, pp 10-11, 1991. In NORW. CAB-abstract.

Problems of cub mortality in blue foxes

J. Fougner



Recent work on factors affecting embryo losses and preweaning mortality in blue foxes is discussed, with special reference to conditions in Norway.

Norsk Pelsdyrblad 65, 10, pp 6-10, 1991. In NORW. 2 tables, 1 fig. CAB-abstract.

The fertility index

K. Smeds

An account is given of the breeding value index for fertility of mink females in Finland, which is based on litter size at 2 wk. At present, approx. 20,000 breeding females at 150 farms participate in fertility tests, but it is expected that numbers of tested females will more than double within the next year.

Finsk Pälstidskrift 25, 6-7, pp 127-128, 1991. In SWED. CAB-abstract.

Evaluation of the relationship between social status and reproductive performance in farmed blue foxes

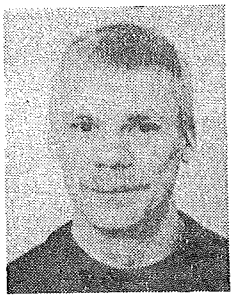
H. Korhonen, P. Niemelä

An experimental cage system was designed for evaluating the association of social status and reproductive performance in blue foxes under fur-farm conditions. The present test cage apparatus consisted of 6 small cages and 1 large cage that were connected. The small cages were utilized for males of different social status and the large cage for females coming on heat. The results showed that this type of testing apparatus can be used for evaluating a female's acceptance of males of different social rank. The locomotor activity of males significantly depended on their social status; thus the most active individuals in the test were the most dominant, and vice versa. Females most often accepted higher-ranking males. Juvenile males were the least dominant and also the least accepted by females. Urination activity was not necessarily related to dominance.

Reprod Nutr Dev 33, pp 289-295, 1993. 2 tables, 1 fig., 10 refs. Authors' summary.

Biopreservation of animal byproducts for fur animal feed - Fermentation and biological quality

Tor Mikael Lassén



Tor Mikael Lassén
Royal Vet.- & Agric. University
13 Bülowsvej
DK-1870 Frederiksberg

New doctor in the family. We congratulate Mikael with the Ph.D. title and the fine report.

The thesis is based on and contains the following papers, which is written in English:

Lassén, T.M. 1993a. Evaluation of conditions for biofermentation of fish offal. 10 pp.
Lassén, T.M. 1993b. Lactic acid fermentation of fish offal and chicken waste with different starter cultures. 12 pp.
Lassén, T.M. 1993c. Biological quality of biofermented fish offal and chicken waste. 10 pp.

These reports will be abstracted in Scientifur when published.

Summary

Fur animal feed is composed of waste products from the fish industry and from slaughterhouses. Unpreserved waste products provide a favourable substrate for growth of spoilage bacteria. Spoilage caused by bacteria is characterized by acute intoxication and accumulation of toxic decomposition products of protein and amino acids, mainly biogenic amines. In fermented and putrefied feed high levels of biogenic amines are usually found.

The present thesis deals with the use of lactic acid bacteria for biopreservation of fish offal and poultry waste and the use of the amino acids and biogenic amines to estimate feed quality. A literature review on spoilage of animal by-products, biopreservation and analysis of biogenic amines in relation to feed quality is described.

In experimental work lactic acid fermentation of herring offal with *Lactobacillus plantarum* was evaluated at substrate concentration (2, 5, and 10% dextrose), bacterial inoculation (10^7, 10^8, and 10^9 cfu/g), and different initial pH (6.8, 6.5, and 6.0). The most ideal fermentation was achieved with 10^8 cfu/g and 5% dextrose. Silage of different organoleptic quality to be used in biochemical studies on feed quality was produced in semi scale silo fermentation. Measurement of redox potential was used as a tool to estimate bacterial growth and bacterial spoilage of the silage.

Four different lactic acid bacteria cultures (10^8 cfu/g, 5% dextrose at 25°) were evaluated for biopreservation of herring offal and chicken waste. Successful fermentation, monitored by high lactic acid production, low and stable pH and redox potential was obtained by inoculation with *Pelzyme®*, and *Lactobacillus plantarum/-Pediococcus acidilactici.*

Biogenic amines are of great interest in relation to feed quality and animal health. Measurements of both free amino acids and accumulation of the corresponding biogenic amines, were shown to provide a useful tool for estimating biological quality of fermented fish offal and chicken/-

poultry waste. A new way of presenting biological quality, quality index, QI, was introduced. QI is based on calculation of the relation between some important amino acids and their corresponding biogenic amines. Simultaneous analysis of alanine content increases the informative value of QI. Group separation followed by HPLC analyses was a simple and cheap technique to measure free amino acids and biogenic amines in biological silage. Absolute concentrations ought to be given in μmol/g material or dry matter.

Thesis, 94 pp. Royal Vet.- and Agricultural University, 13 Bülowsvej, DK-1870 Frederiksberg C., Denmark, 1993. In SWED. 4 tables, 9 figs., 20 refs. 62 pp. Author's summary.

Utilization of flushing in mink nutrition

Dusan Mertin, Karin Süvegova

Half-starvation after which follows overfeeding before the estrous period and mating season positively influenced the results of reproduction in primiparous mink. Differences in the number of liveborn young per tested female are significant with flushing of mink.

Pol'nohospodárstvo 37, p. 824-829, 1991. In SLOVAK with abs. and subt. in ENGL. 6 tables, 6 refs. Authors' abstract.

Energy supply for mink and foxes

Eva Aldén

The norms valid since 1964 have been revised and updated by a Nordic working party. Digestibility coefficients obtained with mink are used. With the proposed new energy coefficients percentages of metabolizable energy (ME) from fat and carbohydrates but not protein, and total ME in feedstuffs and feed mixtures have increased slightly, so some amendments to tables will be needed. Weight curves for young mink and foxes and weight changes in adults, also energy intake, have been examined. Recommended percentages of ME from protein, fat and carbohydrate in each of the 4 modified production periods are shown for each species. Importance of amino and fatty acid composition is stressed.

Vara Pälsdjur 61, 8, pp. 238-239, 1990. In SWED. CAB-abstract.

Fat and carbohydrate in feed for foxes and mink

A. Skrede, Ø. Ahlstrøm

From July/August till pelting in November 6 groups of each 20 blue foxes or 64 dark mink, with 2 per cage, were given once daily almost to appetite feed containing protein providing 30% of metabolizable energy (ME) and, mainly by adjustment of proportions of carbohydrate feed, extruded maize, animal fat and soybean oil, a fat:carbohydrate ratio from 65:5 to 40:30. Growth and health were good. It was concluded that the ratio could be shifted outside the usual range from 45:25 to 55:15, if the raw materials were of good quality. With increased ratio feed cost could, at current prices, be reduced even if ME consumption increased somewhat. In foxes weight gain was faster and pelt length greater with high ration and pelt characteristics was not impaired, but fat deposition might affect reproduction. Ratio did not affect weight gain of mink, but there was risk of reduced guard hair length and poorer pelt quality if fat proportion was high. Digestibility was tested.

Norsk Pelsdyrblad 66, 6, pp. 11-13, 1992. In NORW. CAB-abstract.

Fish-farm waste as feed for blue foxes and mink in the growing period

Ø. Ahlstrøm, A. Skrede

From July till pelting, 432 standard brown and 240 dark mink and 100 blue foxes in up to 9 groups were given diets containing up to 28% and for brown mink an additional diet with 14% fish-farm waste, consisting of guts, trimmings, and rejected whole fish at the expense of cod trimmings and animal fat, or the unchanged

control diet. The waste, mainly of salmon, came from 2 suppliers and was preserved with formic or sulphuric and acetic acid or was frozen. Protein supplied 30% and fat and carbohydrate 52 and 18% of feed energy. It was concluded that fish-farm waste was suitable for fur animals after weaning depite the excessively low pH in feed with high level of acid-preserved material. In mink palatability and appetite were impaired by feed pH under 5. Balanced composition of feed mixtures, despite high proportion of waste, might have contributed to the relatively good results for weight gain and pelt quality. Liver vitamin E, tested in 4 per group, was increased by salmon waste.

Norsk Pelsdyrblad 66, 2, pp. 18-20, 1992. In NORW. CAB-abstract.

Offal from farmed fish as a basis for fur animal feed

Ø. Ahlstrøm

For blue fox females (8-9 per group) fed diets containing 7, 14 or 21% silage made from farmed salmon offal from 30 Jan. to the weaning of their cubs in June-July, litter size at birth averaged 6.5, 8.6 and 8.7 resp. vs. 12.6 for controls fed standard rations, and litter size at weaning averaged 4.0, 5.4 and 4.0 vs. 10.4. The weight of cubs from the 3 experimental groups averaged 76.6, 73.5 and 78.5 g resp. at birth and 1867, 1652 and 1699 g at weaning vs. 75.5 and 1590 g for controls. For 144 mink females fed the 3 diets, the precentage of infertile animals was 9, 3 and 25 vs. 6 for controls, and litter size averaged 5.9, 5.9 and 6.1 resp. at birth and 5.2, 5.0 and 5.0 at weaning vs. 6.4 and 5.6 resp. Kit birth weight averaged 9.3, 8.9 and 9.2 resp. vs. 8.3, and weaning weight 359.6, 354.4 and 342.2 g vs. 342.8. In a separate trial, 672 mink kits and 100 blue fox cubs were fed diets with 14 or 28% salmon offal silage, frozen offal or a standard diet from weaning to pelting. There were no significant differences in growth between the foxes, fed the 3 different salmon offal diets, but controls, tended to have a lower growth rate than experimental animals. Foxes fed salmon offal preserved using sulphuric acid had significantly poorer pelt quality than those given offal preserved using myric acid and those given frozen offal. Mink fed diets containing 28% salmon silage had a poorer growth rate than other mink, and pelts of the experimental animals were shorter than those of controls ($p < 0.05$). Diet had no significant effect on mortality. It was concluded that frozen salmon offal and salmon silage prepared with myric acid are suitable for growing animals, and may be used at low concentrations for breeding females.

Norsk Pelsdyrblad 66, 5, pp 11-13, 1993. IN NORW. 3 tables, 3 refs. CAB-abstracts.

Weight control and restricted feeding. Will there be a lot of undersized pelts?

G. Hillemann

As pelt quality is impaired by flat hindquarters, seen mainly in very fat mink, regular weighing of a number of individuals during the growing season and adjustment of feed supply accordingly and feed restriction after a certain date have been tested or practised. Factors other than diet or feeding are thought to be implicated in the defect and there is no clear evidence that these methods improve pelt quality, whereas size may well be reduced. Suppression of hereditary size variation would be a major problem. Weaknesses of the methods are discussed.

Dansk Pelsdyravl 54, 5, pp 196-197, 1991. In DANH. 1 table. CAB-abstract.

Ground seal waste as the basis of feed for fur bearers

A. Skrede

Of 31 mink females fed a diet containing 8.6% ground seal waste (offal from seals) during the mating period and gestation, 3 failed to produce kits vs. 0 of 32 females fed a control diet containing no seal waste; litter size at birth averaged 6.4 vs. 6.3, litter size at weaning 5.1 vs. 4.5, the number of kits weaned per mated female 4.6 vs. 4.5, preweaning mortality 20 vs. 29%, and body weight of kits at birth, 21 days and 49 days of age 10.5, 121 and 482 g resp. vs. 9.5, 115 and 462. The differences between the 2 groups were not significant.

Norsk Pelsdyrblad 65, 3, pp 18-19, 1991. In NORW. 3 tables, 1 ref. CAB-abstract.

Digestibility and energetic value of feed mixtures for chinchilla

Christian F. Børsting, Bjørn O. Eggum, Jørgen Nordholm

The 6 types of chinchilla feed pellets available in Denmark in 1990, a rabbit pellet from the Foulum Research Centre and hay were fed to adult male chinchillas in digestibility trials and to rats in balance trials. Energy digestibility was 61 to 75% of the 6 chinchilla pellets and of hay was 44%. Energy values in rats were about 7 percentage units lower than values measured in chinchillas whereas protein digestibility was about 2 percentage units higher in rats. Despite the difference in energy digestibility between the 2 species, there was a high correlation (R2=0.96) between rat and chinchilla, whereas the correlation was lower for protein digestibility (R2=0.73). Digestibility coefficients and energy values in chinchillas were compared with those for mink and cattle. It was concluded that table values for mink were useless in predicting energy values for chinchillas, mainly due to a much lower carbohydrate digestibility in mink. Table values for cattle were also inapplicable, because cattle have higher crude protein digestibility than chinchillas and due to interaction between carbohydrate composition and the difference in carbohydrate digestibility between cattle and chinchillas. A large proportion of the variation in crude protein and crude fat digestibilities could be ascribed to the concentration in the mixtures of crude protein and crude fat, resp. There was also a correlation between digestibility of crude carbohydrates and the concentration of crude fibre in the mixtures. Due to these correlations it appears possible to estimate the digestibility of nutrients from the chemical composition of the feed.

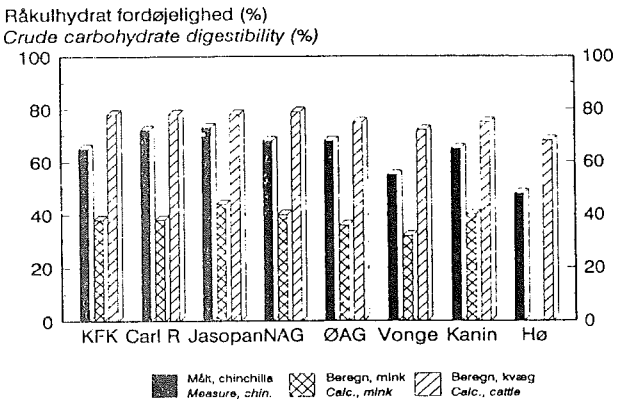
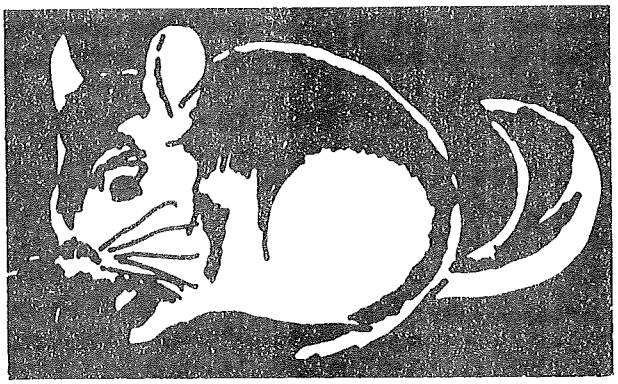


Fig. 6. Crude carbohydrate digestibility measured in chinchilla, and calculated for mink and cattle

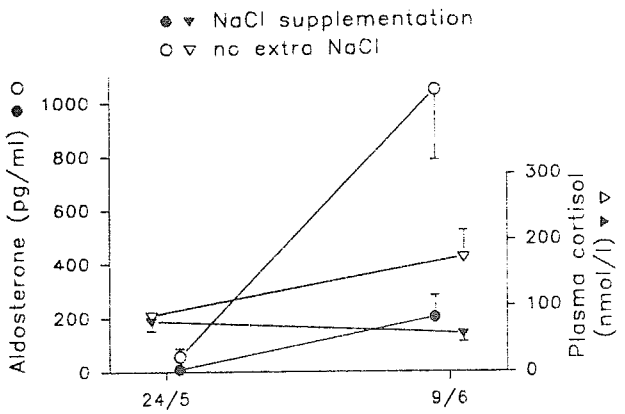
712 Report from the National Institute of Animal Science, , 32 pp, 1992. 5 tables, 8 figs. 17 refs. CAB-abstract.



The etiology of nursing sickness. Electrolytes in normal, lactating mink towards the end of the nursing period

Otto Hansen, Tove N. Clausen, Søren Wamberg

Figur 3. Plasmakoncentration af kortisol og aldosteron



Plasmakoncentrationen af kortisol og aldosteron hos 2 hold lakterende minktæver målt 14 dage før fravænningen og på fravænningstidspunktet, jvf. i øvrigt fig. 1. De lodrette streger angiver fejlen på middeltallet. (Plasma concentrations of cortisol and aldosterone measured 2 weeks before and at weaning in 2 groups of nursing mink dams, cf. Fig. 1. Bars indicate SEM).

Two groups of mink dams were given feed mixtures containing 0.26 g NaCl/100 kcal and 0.41 g NaCl/100 kcal, respectively, during the nursing period. Among them 2 x 10 dams raising more than 6 kits per litter were selected, since litter size is one of the major determinants for the development of nursing sickness. During the last 3 weeks of the lactation period the urinary osmolality and the concentration of Na^+ and K^+ were monitored in these dams. Also the plasma concentration of cortisol and aldosterone and at weaning the plasma concentration of Na^+ and K^+ were measured. None of the dams developed clinical symptoms of nursing sickness. However, irrespective of salt intake, trends towards the deviations characteristic of this ailment were noticed during the last weeks of the lactation period, especially declining urinary Na^+. At weaning the urine was almost devoid of Na^+ in the group with low salt intake. In this group, also plasma Na^+ and urinary osmolality were reduced. Huge increases in plasma cortisol and aldosterone were noticed during the last weeks of the nursing period and at weaning the group with low salt intake had significantly higher hormone concentrations. Irrespective of the cause of nursing sickness, which may be inanition rather than lack of Na^+ in the feed, supplements of salt in the feed or drinking water may prevent development of the disease. Reduced urinary osmolality and urinary Na^+ may be signs indicating developing nursing sickness.

Dansk Veterinærtidsskrift, 76, No. 20, p. 877-880, 1993. In DANH, Su. ENGL. 3 figs., 7 refs. Authors' summary.

Parasites of farm mink and farm foxes in Iceland

Karl Skírnisson, Guorun Lára Pálmadóttir

Objective

The objective was to survey the internal parasites of mink kits (*Mustela vison*), blue fox pups (*Alopex lagopus*) and silver fox pups (*Vulpes vulpes*) on Icelandic fur farms. This is the first organized study of the parasites of farmed mink and foxes in Iceland.

Methods

At the end of June 1991 and in July 1992, fresh droppings from 145 mink pups, 130 blue fox pups and 54 silver fox pups were collected on 19, 15 and 7 fur farms, respectively. The age of the pups varied between 8 and 10 weeks. The faecal samples were examined for the presence of protoxoans and helminth eggs using the formalin-ethylacetat concentration method.

Results

The only parasites found were coccidians. There were three species of coccidia in mink and two species in foxes. In the mink kits we found *Isospora laidlawi* (with a prevalence of 19%), *Eimeria mustela* (14%) and *Eimeria vison* (6%). About one third of the mink kits harboured one, two, or all three of these species.

In the fox pups we found *Isospora canivelocis* and *Isospora vulpina*. The prevalence of *I. canivelocis* was 9% in the blue foxes and 8% in the silver foxes. The prevalence of *I. vulpina* was 19% and 15% in the blue foxes and silver foxes, respectively.

Conclusion

All the coccidians found in this survey, their prevalences varying from 6% to 19%, are well known parasites of mink and foxes in Eurasia

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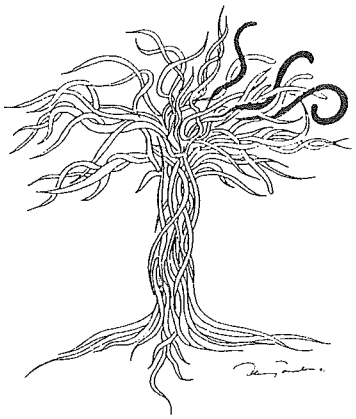
and America. However, none of the above mentioned species have been recorded previously in Iceland.
Icelandic mink and fox breeders will be encouraged to pay attention to these new results as some of the coccidian species found in this survey, e.g. *E. vison*, are pathogenic and may cause mortality amongst mink.



PROCEEDINGS OF THE XVI SYMPOSIUM OF THE SCANDINAVIAN SOCIETY FOR PARASITOLOGY, NORWAY, 30 SEPT. - 2 OCT. 1993
Vol. 3 No. 2 1993,

Bulletin of the Scandinavian Society for Parasitology, Vol. 3, No. 2, 1992. Poster. 10 ill. In ENGL. Authors' text.

Prevalence of *Encephalitozoon cuniculi* antibodies in terrestrial mammals in Iceland, 1986 to 1989

P. Hersteinsson, E. Gunnarsson, S. Hjartardóttir, K. Skirnisson

Antibodies to *Encephalitozoon cuniculi* were found in wild arctic foxes (*Alopex lagopus*), feral mink (*Mustela vison*), wood mice (*Apodemus sylvaticus*) and house mice (*Mus musculus*) in Iceland. Animals with antibodies were found throughout the country. No lesions attributable to encephalitozoonosis were found in adult animals necropsied. However, one arctic fox cub with a neurological disorder had pathological and serological evidence of encephalitozoonosis.

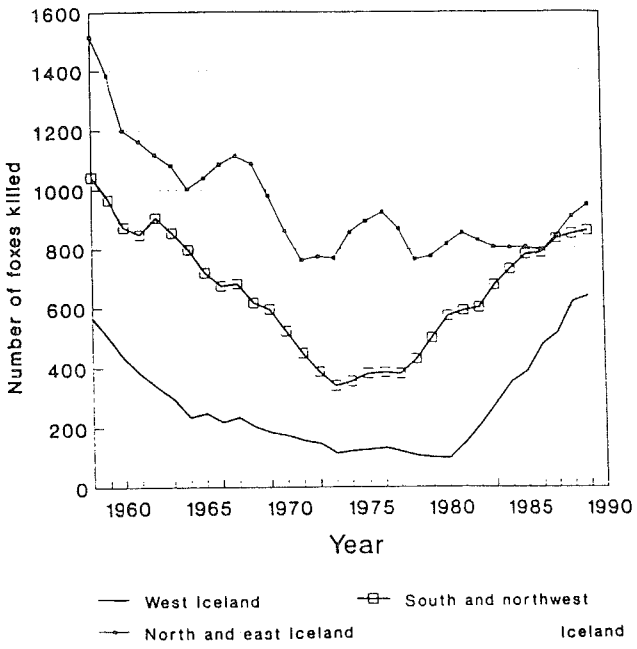


Fig. 2. Three-year running means of th annual hunter take of arctic foxes during 1958 to 1989 in Iceland

Journal of Wildlife Disease, 29 (2), pp. 341-344, 1993. 1 table, 2 figs., 23 refs. Authors' abstract.

Parasites of the arctic fox (*alopex lagopus*) in Iceland

K. Skirnisson, M. Eydal, E. Gunnarsson, P. Hersteinsson

Forty-four of 50 arctic foxes (*Alopex lagopus*) in Iceland harbored 15 species of intestinal parasites, including Protozoa: *Eimeria* sp. or *Isospora* sp. (in 4%); Trematoda: *Cryptocotyle lingua* (24%), *Plagiorchis elegans* (4%), *Brachylaemus* sp. (12%), *Tristriata* sp. (10%), and *Spelotrma* sp. (8%); Cestoda: *Mesocestoides canislagopodis*

(72%), *Schistocephalus solidus* (2%), and *Diphyllobothrium dendriticum* (4%); Nematoda: *Toxascaris leonina* (50%), *Toxocara canis* (2%), *Uncinaria stenocephala* (4%), and eggs of the lung worm *Capillaria aerophila* (6%); and Acanthocephala: *Polymorphus meyeri* (8%) and *Corynosoma hadweni* (2%). Only four of the species had previously been recorded in Iceland. Eleven species are new records in Iceland and six appear to be new host records. Two additional nematodes, *Stegophorus stercorarii* and *Syphacia* sp. probably were ingested accidentally with the prey. Foxes from coastal habitats harbored 14 parasitic species while only five species were found in foxes from inland habitats. Arctic foxes from coastal habitats generally had higher helminth burdens and harbored more parasitic species per fox than foxes from inland habitats.

Journal of Wildlife Disease, 29 (3), pp. 440-446, 1993. 1 table, 44 refs. Authors' abstract.

Skin disorders of small mammals

D.H. Scarff

Small mammals are frequently presented to the veterinary surgeon for skin disorders as children's pets, laboratory animals or commercial breeding groups. The role of the veterinary surgeon in these different categories is examined. Investigation and management of these disorders is discussed placing particular emphasis on a diagnostic approach and highlighting those areas which differ from canine and feline dermatology. Common dermatoses of these animals are described on an aetiological basis.

Journal of Small Animal Practice, 32, pp. 408-412, 1991. Review. 11 refs. Author's abstract.

Plasmacytosis control 1992

E. Smeds

In 1991, 300,000 blood tests for Aleutian disease were carried out in Finland; compared with the previous year the number of breeding animals was reduced by 12% and the number of farms by 17%. Over 200 farms were free of the disease.

Finsk Pälstidskrift 26, 1, pp. 16-17, 1992. In SWED. CAB-abstract.

Diseases of furbearing animals in 1992

Mogens Hansen

In this review of the disease situation among furbearing animals in Denmark in 1992, a single outbreak of distemper was recorded in mink in August; there were 98 outbreaks of mink enteritis virus, 15 cases (all mild) of lung inflammation (Pseudomonas infection) in mink; and 15 farms had Aleutian disease (plasmacytosis) confirmed. In general, the situation was good and the possible contributing roles of vaccination, health programmes (80% of farms are now free from Aleutian disease), and production methods are discussed.

Dansk Pelsdyravl 56, 1, pp. 14-16, 1992. In DANH. CAB-abstract.

Control of plasmacytosis. A review of test results in northern Europe

Å. Uttenthal, M. Hansen

In 1991, 3,831,000 blood samples from 3,175,000 female mink (5623 farms) were tested for Aleutian disease; 2,700,000 of the samples were from Denmark and the others from the Netherlands, 640,000; Finland, 300,000; Sweden, 240,000 and Norway, 66,000. The percentages of A-category (plasmacytosis-free farms) in the 5 countries were 69, 32, 16, 13 and 51, resp. Other categories included farms with positive animals, farms with a single or 2% positive animals and those that had became reinfected during 1991. Based on 494 blood samples from 256 farms in Denmark, the percentages of false-positive and false-negative reactors among the different categories are presented. The results are discussed.

Dansk Pelsdyravl 55, 8, pp 331-332, 1992. In DANH. 5 tables. CAB-abstract.

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NJF-seminar no. 239, 1993

Stereotypies and stress in farm mink

Leif Lau Jeppesen

The correlation between frequency of stereotypies and feed intake, litter size, stress, and a number of other parameres was described, and the possible causal relations were mentioned. The relevance of stereotypies for the evaluation of animal well-being, and for the ethical and political discussions of animal welfare, was considered.

9 refs. In DANH, 7 pp. Code 11-M.
NJF-proceedings, No. 92, 1994, Oslo, Norway.

Attempts to characterize temperament of blue and silver foxes by using different behavioural tests

Mikko Harri, T. Rekilä, J. Mononen

The temperament of an animal is influenced by heredity but also by the environment. The temperament has practical consequences; not only are some individuals more difficult to handle than others but also the reproductive success of silver fox vixens seems to be dependent on their character. The temperament can be assessed by using different behavioural tests. Some of these are laborious and require special set-ups but some are simple and easily performed. In fact, each time a farmer opens the cage door he estimates the behaviour of the animal in question - he makes the behavioural test. The aim of this study was to develop and test methods for an automatic sampling and analysis of open field data and to compare the results of different tests.

The behaviour of 127 adult silver foxes and 131 blue foxes was assessed in the open field. Most animal were females. Their reaction towards humans was scored as fearful, curious or aggressive (human test), and the time from the opening of the cage door until a capture with neck tongs was successive was recorded (capture time).

The behaviour of the animals in the open field could be described by two factors, factor 1 being correlated with total activity and factor 2 with initial activity. An exposure for 5 min was sufficient to yield the result. The open field behaviour was not correlated with the results of human test or capture time test. In both fox species the two open field factors accounted for almost 70% of the variance.

In spring compared with autumn, more silver foxes did not come to the open field at all, were less fearful, and their initial activity was less. Blue foxes, on the other hand, were less fearful in spring but they displayed higher initial activity. In both species, young animals were less active in the open field. Young blue foxes did not want to come to the open field and their capture time was longer.

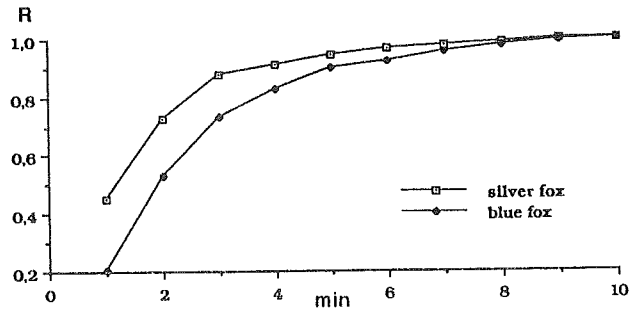


Fig. 1. Correlation between total open field activity and cumulative activity with time in silver and blue foxes

Capture time was longest in animals having access to nest boxes: 60 s for silver foxes and 31 s for blue foxes. However, the capture time was not a behavioural test; one learns very soon that it simply is more easy to catch a fox from an empty cage, rather than from the narrow entrance tunnel of the nest box in which the animal is hiding. In blue foxes, there were more fearful animals in the control group than in the platform or nest box groups.

Generally, the access to nest box or platform did not modify the temperament of silver foxes: only animals with platforms showed slightly less initial activity in the open field. The results show that provision of nest box or resting platform have an impact on foxes' temperament but seasonal and age-dependent changes in temperament are more pronounced.

1 fig., 4 tables, 8 refs. In ENGL, 8 pp. Code 11-F. NJF-proceedings No. 92, 1994, Oslo, Norway.

Eating behaviour of mink females and kits in relation to the placement of the feed in the nursing period

Steen Møller

The eating behaviour of farm mink has not been subjected to intensive research. It is known that mink kits start eating at the age of approx. 4 weeks after birth, that adult mink eat 6-12 times distributed over 24 hours, and that the female moves feed to the kits. The eating behaviour of mink females and kits has here been investigated by placing the feed either on the cage or on the lid of the nest in the nursing period.

Most of the females moved feed to the kits, especially when feeding on the cage. Most often the feed was placed outside the nest, but most of the females fed on the cage also placed feed in the nest. Females fed on the cage started placing feed in the nest one week before females fed on the nest. The females did not move kits to the feed.

Kits fed on the cage ate more often from moved and fallen feed, but not very often from the feed ration itself, in relation to kits fed on the nest. All in all kits fed on the nest were seen eating most often. Kits fed on the cage started eating from the feed ration a little more than a week later than kits fed on the nest.

Almost all females moved feed to the kits, but females fed on the cage most often placed the feed in the nest. When feeding on the nest box lid, the kits could reach the feed a little over a week before the kits fed on the cage. Kits fed on the cage therefore had less feed even though they more often ate from feed moved to them by the female. The increased replacement of feed into the nest could thus not compensate for the fact that the kits could not reach the feed ration themselves.

In DANH. 2 tables, 7 refs, 5 pp. Author's abstract. Code 11-5-6-M. NJF-proceedings No. 92, 1994, Oslo, Norway.

Evaluation of the welfare of farmed foxes based on behavioural and physiological measurements

Vivi Pedersen

Welfare of farmed foxes is influenced by their state of health and the state of their physical and social environment. Basal requirements should be met, such as frequent feeding, access to water, and adequate cleaning of the cage and foxhouse. But what about the physical and social environment? During the welfare research of farmed foxes in the Nordic countries various potential measurements of impaired or improved welfare have been examined in relation to the foxes' physical and social environment.

Behavioural parameters such as levels of fear, when exposed to different degrees of human contact, and activity in a novel environment have been used as well as physiological parameters: concentrations of plasma cortisol, urine cortisol, eosinophil leucocytes, occurrences of gastric ulcerations and adrenal weights. Additional measurements such as reproductive succes, growth, pelt-size and pelt quality were registered.

An overall conclusion of the studies: 1) Whole-year shelters improved the welfare of farmed foxes, as shown by low levels of fear, low base levels of cortisol and eosinophil leucocytes. 2) Preference for a floortype depended on the former experience of the fox, but wire-mesh as a floor type did not seem to be avoided. 3) Visual isolation of pregnant and lactating vixens did not contribute to a better reproduction, possibly not a better welfare either. 4) Early experience with humans or the farm environment had a

reducing effect on the later fear-responses of foxes; handled foxes showed a low stress-sensitivity, high reproduction and low adrenal weights, which means a better adaptation to the farm environment, and thus an improved welfare. 5) Norwegian research has revealed that the social grouping of breeding vixens have a great impact on the reproductive success of silver foxes.

Thus, by small modifications of the existing physical and social environment in fox farming, it is possible to improve the welfare of the foxes. The welfare research has, as well, been able to show that some modifications, although wanted by critics, have no relevance for the improval of the welfare of farmed foxes.

In DANH, 7 pp. 17 refs. Author's summary. Code 11-10-12-F. NJF-proceedings No. 92, 1994, Oslo, Norway.

The effect of various stressors on silver foxes.

Morten Bakken, Randi Moe, Gunn-Marit E. Selle

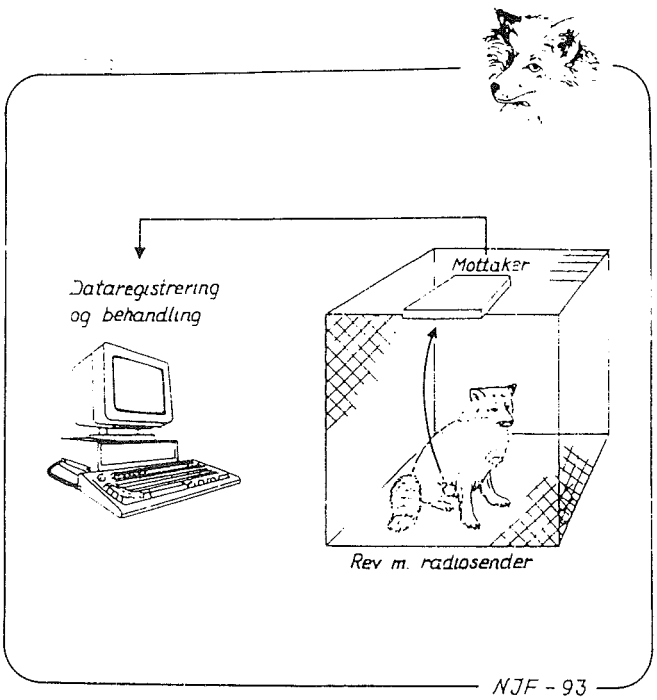


Fig. 1. Figuren viser registreringssytemet fra radiosenderen i ræven, via modtageren i burtaget, til datamaskinen

Earlier studies at the Agricultural University of Norway have indicated that social stress in the gestation period of silver fox vixens may affect frequency of infanticide females, sexual ratio of the litters, and later growth of the kits. From literature we know that various types of stress may affect the reproduction of animals, and in many cases we find that social and non-social stress can have the same effect on reproduction. To illustrate the environmental components, to which the foxes react, and to solve problems in this connection is important as regards animal welfare as well as economy. The first study in this series was started in the autumn of 1992. The objective was to illustrate the reaction of fox vixens to various stressors which may occur in a farm environment. As indicator of stress we used the behaviour of the animals as well as changes in their body temperature 90 minutes after stimuli. In the experiments 20 different stressors were tested on six two-year old silver fox vixens within the main groups: 1) acoustic stressors (noise from airplanes, explosions, machinery etc.), 2) man as a stressor (handling, removal of other animals from the cage, removal of neighbouring animals, open cage doors, groups of people, and people in the farm system etc.), 3) other animals as stressors (male/female as new neighbours and male in the cages). Three of the vixens were previously reproducing normally and three were previously infanticide. The vixens carried radio transmitters in the abdominal cavity recording the animals' activity and body temperature. The behaviour of the animals during the experiment was videotaped. During the experiment the vixens were isolated from other animals not included in the experiment and from other external influence.

No reactions of panic were recorded in any of the animals during the experiment. But even without reactions of panic we found distinct differences in the animals' reactions to the various stressors. The strongest reactions, with regard to temperature as well as behaviour, were found in the tests with human beings and in the social tests, generally with stronger reactions from the previously infanticide vixens than from the normally reproducing vixens. The acoustic stressors caused only weak or no reactions from both groups of vixens. In the tests with human beings, the reactions increased in strength with increased duration of human contact and when the distance between fox and man was reduced.

The experiment showed that even foxes used to human beings and not showing any strong excape behaviour in contact with man were affected by the tests with human beings. Possible effects on reproduction of a bad or good animal-man relationship will be illustrated in experiments now started at the Agricultural University of Norway. The experiment also shows that continued research to improve the animal-man relationship will also in future be of great importance.

In NORG, 10 pp. 1 table, 5 figs. Abstract: Hanne Artved. Code 11-10-12-F. NJF-proceedings No. 92, 1994, Oslo, Norway.

Effects of early handling on later behaviour and stress response in farm mink

Steffen W. Hansen, Birthe Houbak, Birthe M. Damgaard

The objective was to examine if increased human contact with the kits in the nursing period would reduce the animals' later fear of man and reduce their general sensitivity to stress.

Handling of the kits was started when they were three weeks old and continued until they were seven weeks old. In group 1 kits were fondled twice daily for 5 min. In group 2 the kits were placed individually in a closed, cooled box twice daily for 5 min. As a control, 40 kits were kept under normal conditions.

The response of the kits to human contact was tested regularly by means of the "stick test" and their general sensitivity to stress was examined in August and October in a 10 min "open-field" test or by a 10 min stay in a mink trap. Blood samples were taken from half of the animals before the open-field test or the mink trap test. Blood samples were taken from all mink immediately after the test as well as 3 and 24 hours later.

In ENGL, 2 pp. Authors' abstract. Code 11-10-12-3-M. NJF-proceedings No. 92, 1994, Oslo, Norway.

Evaluation of inbreeding experiments at the Research Farm South.

Ulla Lund Nielsen, Peer Berg

In the years from 1986 to 1992, an inbreeding experiment was carried out at the Research Farm South (Denmark). Each generation consisted of approximately 105 breeding females and 35 breeding males. In the first 4 years, half-sib matings were used systematically, where each male could mate 3 of his half-siblings. In 1991, inbred breeding animals were mated with non-related animals, and the offspring hereof therefore had no coefficient of inbreeding. In 1992, offspring from the matings in 1991 were mated with non-related individuals, and thus neither breeding animals nor offspring had any coefficient of inbreeding.

The results showed that at coefficients of inbreeding above 20% the proportion of both unmated and barren females increased. However, the proportion of both unmated and barren females remained at an unacceptably high level even after two generations of outbreeding with non-related individuals. The experiment gave no unambiguous answer to the question of whether inbreeding affects mating willingness and fertilizing capacity alone.

However, the results showed clearly that inbreeding of breeding females has a negative effect on litter size. When the coefficient of inbreeding of breeding females increases by 10%, the litter size is reduced by 0.5 kit.

A generation of outbreeding caused an immediate increase in litter size, which increased further after two generations of outbreeding. If the inbreeding of kits increased by 10%, however, litter size apparently also increased and the number of barren females decreased - a somewhat surprising result.

The results show no clear tendency of the influence of coefficient of inbreeding on number of stillborn kits, viability of the kits or on the fur properties of the kits.

In DANH, 6 pp. 4 tables, 2 refs. Authors' abstract. Code 4-M. NJF-proceedings No. 92, 1994, Oslo, Norway.

Effect of inbreeding on reproduction performance of blue fox vixens.

Nina M. Valberg Nordrum

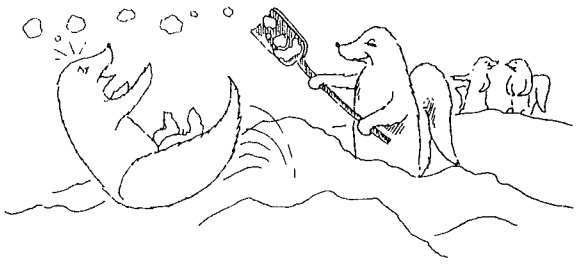
In most animal species, inbreeding will result in reduced litter sizes. Litter size is, however, a complex factor which is chronologically determined by: ovulation, fertilization, survival capacity of the embryos, implantation, vitality of the fetus, birth, and the kits' capacity for survival after birth. Number of kits at each of these stages is therefore determined by the level at the preceding stage. Number of ova decides the upper limit of number of kits possible.

Reduced litter size caused by inbreeding may therefore be determined partly by reduced fertility of inbred mothers and partly by reduced vitality of inbred fetus.

In this examination, the effect of inbreeding on litter size in blue foxes was studied. Furthermore, it is examined at which stage - from mating til weaning - inbreeding affects the number of born and weaned kits.

The investigation showed that inbreeding has a negative effect on the reproductive traits of blue fox vixens. Maternal inbreeding depression resulted in an increased loss of ova and/or embryos before implantation. Inbreeding of fetus gave increased mortality in the period after creation of implantation zones and a reduced capacity to survive the first days after birth. Genes affecting the survival capacity before birth and just after birth seem to show an effect of dominance. The effects observed of inbreeding on the various components of litter size in blue foxes correspond with the results found for other multiparous species.

In NORG, 11 pp. 25 refs. Abstract: Hanne Artved. Code 4-5-F. NJF-proceedings No. 92, 1994, Oslo, Norway.



Consequences of inbreeding - does inbreeding last forever?

Hans B. Bentsen, Einar J. Einarsson

Many formulas for breeding in closed populations presuppose that the degree of inbreeding increases inexorably as time goes by and that only the speed of the inbreeding increase can be affected, for instance by increasing the size of the population. Sooner or later all closed populations will be completely inbred according to the formulas - with the consequences hereof on the various traits. Reality suggests that this is an unreasonable conclusion. Somehow mechanisms exist which "clean out" old inbreeding with the result that the effects of inbreeding depression will not turn out as claimed.

Genetic variation within and between populations will depend on the base population, migration, mutations, selection and genetic drift through allelic, genetic and/or genotype value variation.

Inbreeding and genetic variation has been discussed in relation to various population categories. Furthermore, mutations and selection have been discussed as regards inbreeding and effects on and of inbreeding.

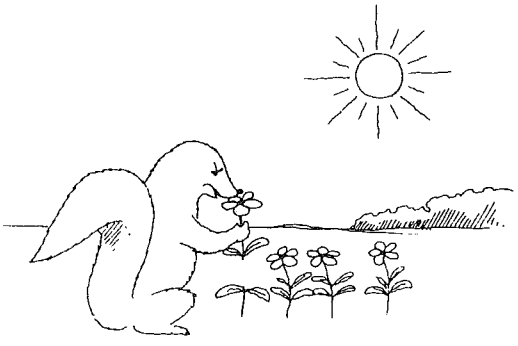
In NORG, 5 pp. Abstract: Hanne Artved. Code 4-M-F-O. NJF-proceedings No. 92, 1994, Oslo, Norway.

Endocrine control of the development of the digestive organs in mink kits.

Jan Elnif, Per Sangild

Introduction

The time when mink kits start eating and later on are weaned are periods of great physiological strain. Increased knowledge concerning these periods is essential for an optimal feed composi-



tion. Simultaneously, these periods are most important for the growth rate and health status of the kits including many cases of diarrhea and the "sticky kit" syndrome. The first weeks after weaning are likewise critical not only because of acute problems in the production but just as much because of problems which can be related to the natural development of the digestive organs and their capacity. Earlier investigations concerning the development of the digestive system in Mustelids have shown that the digestive tract in this carnivorous genus is developed relatively late compared to other animal species (Elnif et al., 1988).

The objective of this experiment was to investigate whether cortisol, as shown for other species, has any influence on the development of the digestive organs in mink kits.

Materials & Methods

110 mink kits of the pastel type from 20 litters with litter size between 4-7 were used. The kits were distributed to five age groups consisting of 4 litters in each. The kits were at the start of the experiment 1, 3, 5, 7 and 9 weeks old, respectively, and they were injected daily at 9 a.m. for 7 days as follows: **Group 0** control; **group S**, isotonic NaCl; **group A**, 0.5 µg ACTH/10 g; **group H**, 0.5 mg hydrocortisone-acetate/10 g. Blood samples were analyzed for plasma cortisol and the following digestive organs were taken out, rinsed and weighed: The ventricle, the pancreas and the intestine. For the latter, the length was measured as well.

Conclusion

As has been shown for other animal species such as rat and pig, cortisol has a stimulating effect on the growth rate of the pancreas and intestine in mink kits. However, the effect was relatively late in the course of development, namely not until the mink kits were 6-10 weeks of age. The weight of the ventricle was not affected by the treatment in any of the periods studied. Cortisol had a strong negative impact on the growth of the kits in the first 4 to 6 weeks. This is explained by a high somatic sensitivity and a low metabolic rate of the hormone in this period. It is concluded that the pituitary-suprarenal gland-axis is relatively late developed in mink kits and that their sensitivity for cortisol is subjected to great variations during the first 10 weeks of life.

The growth and development of mink kits is of direct importance for the final production result. It is therefore of utter importance to have a firm knowledge of the anatomical and physiological development in this critical period. It can be pointed out that future experiments on the early development of mink kits should include the relationship between mother and offspring.

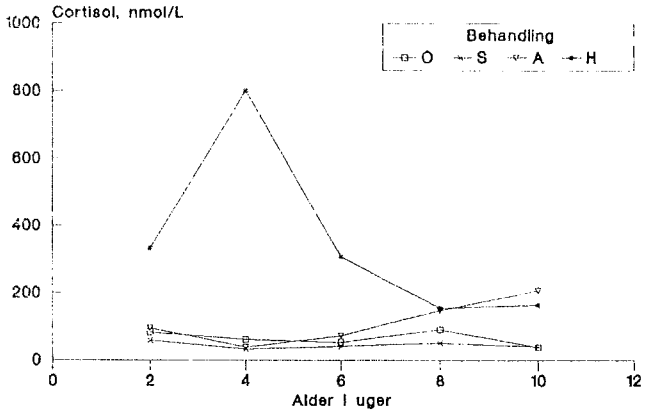


Fig. 1. Koncentrationen af cortisol i plasma hos minkhvalpe på 2, 4, 6, 8 og 10 uger. Hvert punkt repræsenterer gennesnit (n=4-7)

In DANH. 13 pp. 1 table, 6 figs., 25 refs. code 3-6-M. Authors' summary. NJF-proceedings No. 92, 1994, Oslo, Norway.

The influence of amino acid supply on the production results of mink

Christian Børsting, Carsten Riis Olesen

Since 1990, a project for determination of the requirements of mink for the individual essential amino acids has been carried out in cooperation between the Research Farm Vest and the Department for Research in Fur Animals, Research Centre Foulum where the Research Farm Vest handled the production experiments and Foulum the more basic examinations.

In the experiment of the first year it was demonstrated that the amino acid composition of the feed is of great importance to pelt quality. The maximal pelt quality was obtained with 30% of metabolizable energy (ME) from modern

sources of protein with a relatively high content of essential amino acids, but with as much as 40% of ME from protein with the old fashioned feedstuff composition with a lower share of essential amino acids.

The experiments of the next two years showed, for standard as well as wild type mink, that with the modern feedstuff composition maximal pelt quality is obtained with 30% of ME from protein, even with a tendency towards a reduction of quality at higher levels. One year also skin length culminated with 30% of ME from protein, whereas the second year showed a slight tendency towards longer skins at higher protein levels.

In 1991 and 1992 two experimental series were run where up to half of each of the essential amino acids was given in synthetic form with a possibility of removing the amino acids individually, while the requirements for the other amino acids was at the same time met. It proved possible to use this concept when a basic mixture with only 15% of ME from protein was used which permitted deficiencies of the individual amino acids to show significant reduction in performance.

As previously found, deficiency of sulphur containing amino acids resulted in the most pronounced effects on pelt quality. It was, however, also possible to show negative effects on pelt quality, pelt length or health due to deficiencies of the other essential amino acids. In the paper for this lecture, suggestions have been given for recommendations for all essential amino acids based on these results as well as on previous findings.

In DANH, 4 pp. 1 table, 3 refs. Authors' abstract. Code 6-2-M. NJF-proceedings No. 91, 1994, Oslo, Norway.

The influence of protein supply on the clinical parameters of mink.

Tove N. Clausen, Birthe M. Damgaard

In 1991 a cooperation was started between the Research and Advisory Units of the Danish Fur Breeders Association and the Research Centre Foulum to investigate the effect of feeding with low, respectively high, protein levels on the health condition of the animals in the period from July 7 until pelting. Two groups were used in the experiment, one group with an energy distribution of protein:fat:carbohydrates of 20:-63:17 and 262 kcal/100 g. Correspondingly, group 6 was given a distribution ratio of 45:43:12 and 171 kcal/100 g.

Blood and liver samples were taken throughout the entire growth period and at pelting. The results showed an increase in the blood content of ALAT, bile acid, total lipids, and triglycerides in group 1 as compared with group 6. At pelting, very large livers with a considerable degree of fat infiltration were found in group 1 .

During the entire growth period an increased mortality rate was seen in group 1 mainly with the diagnosis: extremely enlarged fatty liver. Furthermore, at pelting a high frequency of wet belly was found in group 1 as compared with group 6.

In DANH. 3 pp. 5 refs. Code 6-3-M. Authors' summary. NFJ-proceedings No. 91, 1994, Oslo, Norway.

Digestibility and utilization of nutrients in mink and foxes

Anders Skrede, Øystein Ahlstrøm

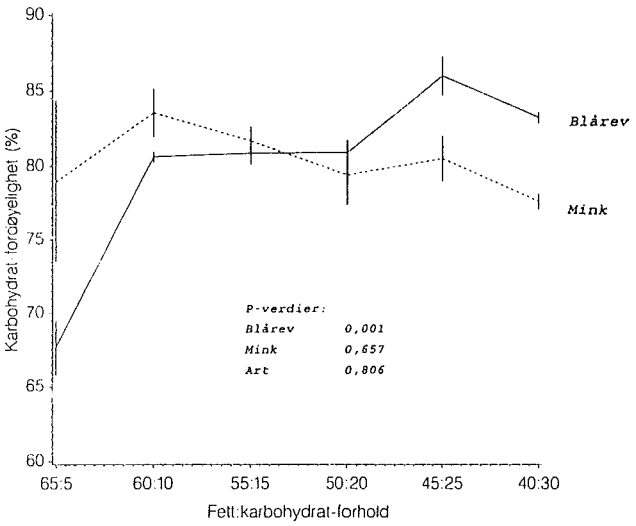


Fig. 3. Fordøjelighed af karbohydrater hos blåræv og mink

Nutrient requirements and feed ingredient tables for fur animals are based on digestibility values obtained with mink, although there may be considerable differences between different fur animal species. In particular, there is a paucity of data for the two fox species. The present study was carried out to investigate digestibility and metabolizable energy in blue foxes and mink fed diets with fat:carbohydrate ratios varying between 65:5 and 40:30 on an energy basis.
The protein digestibility in blue foxes and mink was on average 86.8 and 79.2 percent, respectively. The difference increased with enhanced carbohydrate levels in the diets. Comparison of amino acid digestibility revealed, in most cases, higher levels for blue fox than for mink. The fat digestibilities were considerably higher in blue foxes than in mink. This was most distinct with low fat:carbohydrate ratios. Also, the digestion of carbohydrates appeared to be more efficient in blue foxes than in mink when the dietary carbohydrate levels were high. Due to the differences in digestibility, the average figures for metabolizable energy were 6 percent lower in mink than in foxes. It is concluded that feed evaluation for foxes on the basis of mink digestibility is insufficient, and that more data on fox digestibility are urgently needed.

In NORG, 10 pp. 2 tables, 3 figs., 8 refs. Authors' abstract. Code 6-M-F. NJF-proceedings No. 92, 1994, Oslo, Norway.

Dietary fat: carbohydrate ratios for foxes and mink

Øystein Ahlstrøm

Use of fat in fur animal diets has increased substantially during the last years to reduce feed costs. The effect of different dietary fat:carbohydrate ratios (F:C ratio) on growth and fur quality in blue foxes and mink in the growing-furring period have been investigated in two experiments. The experiments were carried out in 1989 and 1992 and comprised all together 312 blue foxes and 864 mink. The dietary F:C ratios varied from 65:5 to 40:30 in both experiments. The ratios are given as percentage of metabolizable energy. Lard and soybean oil were used as main fat sources in experiment 1 and afish oil was the main fat source in experiment 2. Precooked wheat/oats and extruded corn were the carbohydrate sources in both experiments.

For blue foxes, higher dietary F:C ratios resulted higher energy consumption, increasing growth rates and higher final body weights. This was reflected in increased skin length in experiment 1, while the fur quality parameters were equal among the groups. In experiment 2 only inor differences were observed in skin length and fur quality. The dietary F:C ratios 65:5 and 60:10 reduced the feed costs by about 10-15% compared to 40:30.

The energy consumption and growth in mink were little affected of the dietary F:C ratios. However, the highest dietary F:C ratios gave the lowest feed costs. Increasing dietary F:C ratio influenced the fur quality by reducing the length of the guard fur in both experiments. The results indicate that there is a risk of reduced fur quality in mink fed high dietary F:C ratios.

In NORG, 20 pp. 11 tables, 8 refs. Author's summary. Code 6-M-F. NJF-proceedings No. 92, 1994, Oslo, Norway.

Hair cycle in the ferret

Leena Blomstedt

The hair cycle in the ferret has not histologically studied in detail until now. Skin biopsies from the hips of three male ferrets were taken at 0.5 to 1 month intervals, starting at age 9 weeks and continuing for 17 months. The animals were tranquilized with xylazin (4 mg/kg i.m.). The samples were processed with paraffin technique for light microscopy. Hair bundles were studied from cross sections, and the bundle means of growing and mature underfur hairs for each sampling were counted. The guard hair cycle was expressed by calculating the percentage of bundles containing a growing, and the percentage of bundles containing a mature guard hair.

The development and moulting of guard hairs and underfur hairs was slightly asynchronous. The guard hairs in the young ferret grew and moulted between August and December in three separate waves, during which time the underfur moulted only once. Despite this, both hair types

in the winter fur reached maturity simultaneously in mid December.

In the adult ferrets, the growth of guard hairs peaked during three periods, the first in June, the last in October. The summer underfur hairs in two of the animals grew in two separate waves between June and September. In the third animal the growth peaked only once, late in August. At the same time the moulting in this ferret ended, having continued from the beginning of the year. The two other ferrets had a spring and a summer moult. In all three ferrets the summer fur moulting ended in late October, when the number of growing winter underfur hairs peaked. The guard hairs and the underfur hairs matured at the same time after mid December.

Hair bundles in the mature winter fur contained a guard hair, the diameter usually ranging from 20 to 25 μm. The mean number of underfur hairs per bundle was 16. A medulla could be seen in the underfur hairs during their growth phase. The number of underfur hairs per bundle tended to be smaller with increasing guard hair diameter.

In SWED, 9 pp. 3 tables, 7 refs. Author's summary. Code 2-O. NJF-proceedings No. 91, 1994, Oslo, Norway.

Some hair type mutations on mink. Inheritance and morphological characterization

Outi Lohi, Palle V. Rasmussen

Many gene mutations are known in mink (Mustela vison). Most of them affect fur colour but also some causing changes in hair type are known. Two hair type mutations are described in the article.

Guard hairs of a recessive, long haired type known as "sami" or "angora" were studied microscopically in regard to total hair length and lancet cross section area and shape. Comparison with normal mink guard hairs revealed that the average length of female guard hairs were 40 mm, 28 mm and 26 mm in homozygous sami, heterozygous sami and normal mink respectively. The lancet cross section area was smaller and the shape more round in sami mink than in normal mink.

A mink type with curved and abnormally short guard hairs appeared on a Danish mink farm in 1991. In test matings autosomal dominant inheritance was documented. The hair type thus resembles the "seal" mutation, which in 1960's appeared in South Dakota.

In DANH, Subtitles in ENGL. 2 tables, 3 pp. Authors' abstract. Code 2-4-M-F. NJF-proceedings No. 92, 1994, Oslo, Norway.

Some comments on calicivirus in mink.

T. Mejerland

The importance of calicivirus in mink has often been questioned over the latest 10-15 years. The occurrence of this virus is very common. That calicivirus should be completely without significance, is unlikely. It is more likely that this virus contributes to diarrhoea in mink. Research into this complex question can therefore not be considered as completed.

In SWED, 2 pp. 5 refs. Abstract: Hanne Artved. Code 9-M. NJF-proceedings No. 92, 1994, Oslo, Norway.

Metritis in blue fox (*Alopex lagopus*) female caused by Pseudomonas aeruginosa

Erik Smeds

Metritis caused by Pseudomonas aeruginosa has been diagnosed for about twenty years in 1 to 10 farms yearly. The severity and the prevalence of the disease increased when the heat detector was taken into use on blue fox farms. That happened in the early 80ies. There were prevalences of the disease of more than 20 % on some farms. The mortality was about 5 %. After the farmers started using artificial insemination of foxes, there were serious outbreaks on some farms. On some farms the morbidity reached 70 % and the mortality 50 %.

Symptoms
The animals get signs of disease 10 to 25 days after heat. The symptoms are: lost appetite, dullness, mild jaundice and yellow vaginal flow. Some animals die some days after the symptoms appear. The illness may last several weeks before the diseased animal dies.

Causes
It is obvious that an improper use of the heat detector causes damage to the vaginal mucosa, which enables the growth of Pseudomonas aeruginosa. When an artificial insemination catheter is brought into an infected vagina, the bacterial mass is put into the uterus and the infection will be established.

Treatment
There is no effective treatment available. The bacteria is very resistant to most antibiotics. Colistin and neomycin have proved some potency when given parenterally. Successful treatment only helps the animals to survive but they do not get pups.

Prevention
In order to prevent the disease the heat detector must be cared for and used in accordance to the instructions. The probe of the detector must be allowed to stand in the desinfectant at least 30 seconds between the measurements. All equipment for artificial insemination should be sterile at the time of use.

Theoretically, it could be possible prevent the disease by vaccination. There have been isolated several serotypes of the bacteria. The most common types are O_3 and O_6 (Diffco); $O_{1,4,7}$ and $_9$ have been isolated too. Till now we have no experience from vaccination against Pseudomonas aeruginosa in the blue fox.

A farm case
On a large Finnish blue fox farm there was an outbreak of metritis which was verified on the 14 th of April. At that time about two thirds of the animals had been artificially inseminated. A total of 20 % of these animals died. The same catheter had been used for the insemination of several females without preceding sterilisation. By improving the use of the heat detector and the routines of the artificial insemination the mortality decreased to 4 % in the remaining group.

In SWED, 7 pp. 3 tables. Authors summary. Code 9-M. NJF-proceedings No. 92, 1994, Oslo, Norway.

Jaundice in blue fox

Louise Treiberg Berndtsson

During springtime 1993, the National Veterinary Institute received eleven blue foxes for postmortem examination. The animals came from two different farms. Eight of the foxes were from a farm in the northern part of Sweden, and three from a farm in the middle of Sweden. Both silver and blue foxes were kept on the farms. The food was prepared on the farms.

In April 1993 some of the female blue foxes lost their appetite. Some of them became yellow in the mouth and got conjunctivitis and some became lame in the hindlegs. The farmer treated them with penicillin but no recovery was seen. All silver foxes and male blue foxes were healthy.

At the postmortem examination the animals were in very good nutritional status. They had normal furs. Seven of the eight foxes had jaundice. Two of the animals were very yellow like saffron, the rest had a milder yellow colour.

The condition of the intestine varied between the animals. The icteric animals all had inflammatory reactions in the intestine and hepatosis and fatty degeneration in the liver. All examined foxes were negative for fox encephalitis and distemper.

The cause to the illness is still unknown.

In SWED, 3 pp. 2 tables. Author's summary. Code 9-F. NJF-proceedings No. 92. 1994, Oslo, Norway.

Sex ratio variation and maternal investment in relation to social environment among farmed silver fox vixens (*Vulpes vulpes*) of high competition capacity

Morten Bakken

Studies of farmed silver fox vixens indicate a relationship between the females' ability to

compete for food and their later reproductive success (*bakken, 1993; Bakken, in press*). Vixens of high competitive capacity (HCC) weaned more cubs than vixens of low competitive capacity (LCC), both groups, however, adjusting the number of cubs weaned according to social environment during reproduction (*Bakken, in press*). The aim of this presentation is to give supplementary information about sex-ratio variation and weight differences between male and female cubs in litters from these HCC vixens living under different neighbouring conditions.

The material is based on information from 17 HCC that delivered cubs. Eleven vixens had HCC neighbours (HCC/HCC), while six HCC vixens had only LCC neighbours (HCC/LCC). The vixens were from October to the end of the reproductive season kept singly in commercial breeding cages, being separated from their neighbours by double wire-netting. The cubs were counted as soon as possible after delivery, sexed and weighed when thirty days of age, a few days after they had started eating supplementary food.

Four of eleven HCC/HCC and all the LCC/HCC vixens either lost or killed all their cubs just after birth, but none of the HCC/LCC vixens. Of HCC vixens successfully weaning cubs, the HCC/LCC vixens gave birth to and weaned bigger litters, both with a higher proportion of males and with more males than the HCC/HCC vixens. (HCC/LCC: 73% males, HCC/HCC: 31% males). The results also indicate that average body weight differences between male and female cubs were greater among the HCC/HCC cubs than among the HCC/LCC cubs.

These results, together with earlier presented results (*Bakken, 1992; Bakken, 1993; Bakken, in press; Braastad & Bakken, 1993*), indicate that social factors are of great importance in the regulation of sex-related prenatal mortality, maternal infanticide and periparturient behaviour in farmed silver foxes.

Before reproductive problems in farmed silver foxes are to be solved more knowledge is needed about the relationship and interaction between environmental cues, the physiological mechanisms in the vixens, and how the physiological environment during embryogeny, directly or indirectly influence the cubs' behaviour ontogeny and subsequent reproductive behaviour.

Poster in ENGL, 4 refs. Author's abstract. Code 11-5-10-F. NJF-proceedings No. 92, 1994, Oslo, Norway.

Man-animal relationships

Morten Bakken, Randi Oppermann Moe, Adrian Smith

Whenever farm animals are handled, it is important to use methods that expose them to as little stress as possible. Previous studies of farmed foxes have shown that a large percentage of animals react agonisticly towards humans. Foxes reared in captivity receive mainly positive contact with the farmer, but it is occassionally necessary to take the animals out of their cages for heat detection, movement from one cage to another, and disease treatment. Most foxes resent strongly any form of handling. One possible reason for their agonistic behaviour towards humans could be that they are uncertain about the farmer's intentions, pleasant or unpleasant, when present in the farm. The purpose of the present study was to investigate whether silver foxes could learn by conditioning to distinguish between humans, who are about to perform pleasant or unpleasant tasks, based on their clothing. This could be a method for improving the general relationship between farm foxes and man.

Radio transmitters (Mini-Mitter, Portland, Oregon, USA: type TA10CTA-D70-L60) were implanted in 6 two-year-old silver fox vixens. These transmitters enable recording of, among other things, deep body temperature, which increases during stress. The study took place during 12 days which were divided into 3 periods. Period 1: During the first 5 days the foxes were given a dog biscuit daily by a person wearing a blue overall. Period 2: For the next 5 days, in addition to daily administration of a dog biscuit by a person dressed in blue, they were once a day taken out of their cages with a neck-tong by a person wearing a white coat. Period 3: On days 11 and 12, the animals were merely exposed to the sights of persons wearing blue overalls or dressed in a white coat. During all three peri-

ods the animals were exposed to humans for ca. 3 minutes and each animal was handled for 30 seconds. The animal's position in the cage (i.e. front or back) during the first seconds after human exposure was observed and body core temperature was measured for 54 minutes thereafter.

Body temperature increased in Period 1 & 2 both during administration of the dog biscuit and handling. The increase was, however, greatest and of longest duration during handling. A gradual reduction in the magnitude of the increase in temperature was observed during administration of the dog biscuits during Period 1 and in the end of Period 2, but with an increase in the start of Period 2. A large increase in body temperature was seen during the first few days of Period 2 during handling. In Period 3, the increase in body temperature was significantly greater and the proportion of the animals at the front of the cages were lower when the animals were exposed to the sight of persons dressed in white coats (25% at the front position) than by the sight of those dressed in blue overalls (75% at the front position). The animals placed at the back of the cages showed on average a significantly higher increase in core body temperature compared to the animals at the front, except for the two first cases when negatively handled, where the animal in the front had the highest increase in temperature.

The study showed that foxes can learn by conditioning to distinguish between humans performing pleasant or unpleasant tasks by means of their clothing. Likewise, it appears to be possible to improve the general relationship between farm foxes and man if the farmer clearly indicate his intentions, positive or negative, before approaching the animal. The experiment also indicated that the greatest stress response was found when animals with a positive expectation to the humans were given a negative experience, as done on the first day of handling.

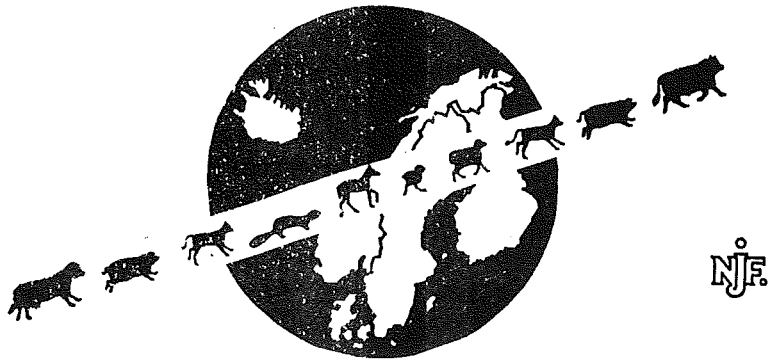
Poster in ENGL. Authors' abstract. Code 12-11-14-F-O. NJF-proceedings No. 92, 1994, Oslo, Norway.

Use of resting shelves by farmed blue foxes

Hannu Korhonen, Paavo Niemelä

Two experiments were performed on the use of shelves by farmed blue foxes. In Exp. 1, the use of three different shelf types (L,E,V) was studied from weaning until pelting in juveniles. Type V was the most favored, with amount of use being 34.1%. Types E and L were used 12.3% and 22.6%, respectively. There occured great individual variation in the amount of shelf usage. Those foxes that were interested in the shelves used them for 307 ± 184 min/24 h on average. Females used the shelves more than males. Shelf usage in general was the highest in summer and declined significantly towards winter. The colder the ambient air temperature was, the less the shelves were used. The condition of the shelves remained rather clean and unbitten throughout the experiments. The extent of wearing of the ventral side in the furs of shelf foxes was twice as much as that of the controls. Exp. 2 (adults) lasted from mid-winter to weaning in July. Males typically used shelves less than females. The use of shelves was very slight (8.1%) between January and March. Those foxes that were interested in the shelves used them for 54 ± 1133 min/24 h on average (median 18 min/24 h). Thereafter, usage markedly increased being 20.2% in males and 18.1% in females, respectively, in June. Shelf use dramatically decreased after whelping nest boxes were given to the females as they preferred the nest box rooves. The locomotor activity of the shelf foxes was somewhat less than that of the controls. No marked differences existed in the whelping results between the groups. The foxes did not markedly utilize the shelves for observation or as a hiding place. The question of whether shelves affect the temperament or wellbeing of foxes remained open.

Poster in ENGL, 12 pp. 9 tables, 1 figs., 5 refs. Authors' summary. Code 10-11-12-5-F. NJF-proceedings No. 92, 1994, Oslo, Norway.



Resting platforms for foxes

J. Mononen, T. Rekilä, M. Harri

The use of resting platforms by farmed blue foxes of both sexes was studied in September-October (2-3 months after providing the animals with the platforms) with the aid of i) repeated "walk tests" (human walks through the shed and notes each animal's position in the cage) and ii) video recordings.

Ten out of 24 young blue foxes (age <6 months) used the platforms at least in five of the six walk tests, whereas five foxes never used them. Open platforms (=without walls) were used more during the walk tests than platforms with three walks: 5.4 ± 1.0 (n=7) vs 2.9 ± 0.6 (n=17) times (mean ± SD) out of the six walk tests, respectively. During the 24-h recordings, young animals used more the open platforms than the ones with walls: 570-1090 (n=6) and 10-180 min/d (n=13) (25th-75th percentiles=Q1-Q3), respectively. The open platforms were used more during evenings and nights than during working hours: 48-90% and 24-59% of time (Q1-Q3), respectively. The more an animal rested on the platform in the evening and at night, the more it used the platform during the walk tests (r=0.46, n=19). The use of the platforms with walls in the walk test correlated positively with the animals' total activity outside working hours (r=0.72, n=13); this correlation was not found for the open platforms, because most animals used them almost in all walk test situations.

Old blue foxes (age>1 year, n=13), with experiences of the platforms in their youth, used neither open platforms nor the ones with walls during the walk tests.

It is concluded that i) open platforms may function as an observation place, ii) platforms with walls do not function as a hiding place, iii) in the presence of man, active animals tend to use the platforms more than less active animals, iv) the walk test gives only a very rough estimate of 24-h use of platforms and v) there are elementary differences between juvenile and adult animals in the use of the platforms.

Poster in ENGL, 3 pp. 5 refs. Authors' abstract. Code 10-11-12-F. NJF-proceedings No. 92, 1994, Oslo, Norway.

Different handling procedures. Effects on behaviour and reproduction in silver fox vixens

Vivi Pedersen

It has been demonstrated in earlier studies that handling of silver foxes reduces their later fear responses towards various stimuli. The present study examines the effects of forced handling compared to gentle, unforced and no handling. Effects of the different handling procedures were measured on various behavioural and physiological levels. Vixens were kept for breeding purposes and reproductive performance and behaviour during and after the breeding were registered. Forced handling produced foxes which showed: less fear in most test situations, high reproductive performance and reduced adrenal size. It was concluded that an early and short term "stressor" influenced the later behaviour and stress-sensitivity of foxes, making them better adapted to the farm environment. Gentle unforced handling had a reducing effect on the fear levels of foxes on a short term basis, but the effect of different management routines overshadowed this positive effect. Non-handled foxes showed high levels of fear in most test situations and enlarged adrenal sizes, indicating that their welfare was impaired.

Poster in ENGL. Author's abstract. Code 11-10-12-5-F. NJF-proceedings No. 92, 1994, Oslo, Norway.

Sampo and RehuValio - computer aid used on Finnish fur farms

Kerstin Smeds, Ilpo Pölönen

Computer programs for fur animal breeding and ration formulation, Sampo and Rehuvalio (Ration), respectively, were developed for the Finnish Fur Breeders Association. Both Sampo and RehuValio work in PC's and are programmed in FoxPro. In addition to Finnish and Swedish, RehuValio is also available in English.

The latest version of Sampo has been in use for 2 years. Currently, about 130 fur farms use it, i.e. over 50.000 breeder females. Sampo is mainly utilized via local consultants, and about 50 fur farmers use Sampo in their own computers. The basic visible function Sampo does is

produce breeder and kit cards on which individual breeding indexes are printed. Calculations are based on the animal model "BLUP". A total of 11 indexes are available; one for reproductive performance, 6 for farmers to grade characteristics of their animals and 4 for sorted characteristics of the pelts. A bar code system is exploited in TD specifications both on breeder and kit cards which makes data collection convenient by using a portable reader unit, even in winter conditions. For those farmers who want to include sorting information in the breeeding calculations Finnish Fur Sales prints special pelt labels to be attached to the pelts. Starting in 1994 breeding results on Sampo farms will be pooled and published annually.

RehuValio was initially developed 10 years ago to be used in feed consulting and especially in planning experimental rations. While computers have become faster new versions of RehuValio have been developed and new features added to it. In addition to formulating feed rations, RehuValio can be used in ranking raw materials based on the price of digestible protein, metabolic energy or dry matter, for example. The advanced part of RehuValio is the so-called least cost feature. With given prerequisites RehuValio calculates the cheapest ration according to feed energy price. The user can choose prerequisites for the desirable ration from a list (species & season) or define them by himself. In addition to raw material percentage limits changeable requirements include feed energy level, energy distribution percentages, ash and dry matter. Contents of minerals and some amino acids are also taken into account in raw material tabulation and can be printed for the ready made ration on an optional sheet. A special production planning feature is added in RehuValio for larger scale feed manufacturers. According to type, number and breeding results of the animals on client farms, the need and storing of raw materials can be optimized in advance.

Poster in SWED. Authors' abstract. Code 12-13-14-M-F-O. NJF-proceedings No. 92, 1994, Oslo, Norway.

Recently published

Biotechnology applied to the diagnosis of animal diseases

Office International des Epizooties

The considerable contribution of biotechnology to the diagnosis of animal diseases no longer needs emphasising. In fact, the numerous tests currently applied to veterinary diagnosis are the direct consequence of this progress, and over half of them were unknown before 1980.

This illustrates the rapidity with which these methods were discovered and then developed in laboratories, and brought into use by Veterinary Services. This success is certainly due to the high quality of the methods developed (specificity and sensitivity), and also to the rapidity and precision of their results, often at less cost.

These advantages, in comparison with conventional procedures, have considerably facilitated the surveillance of animal diseases. In some cases, they have led to changes in control strategies. Veterinary Services now have access to rapid and precise identification of a disease, and, if vaccination against the disease is indicated, it is now easier to apply in an infected population.

It is understandable that the Office International des Epizooties, which published in 1990 a special issue of the *Scientific and Technical Review* on biotechnology in general (Vol. **9**, No. 3), should wish to be associated with the *VIth Symposium of the World Association of Veterinary Laboratory Diagnosticians*, held in Lyons (France) from 9 to 12 June 1992. This collaboration helped to bring together highly specialised scientists for a meeting devoted entirely to biotechnological methods applied to veterinary diagnosis, and their contributions constitute this special issue.

The first part of the issue, entitled '**Generalities**', contains seven articles which present a practically exhaustive review of modern diagnostic techniques: monoclonal antibodies, nucleic probes, immuno-enzyme techniques, protein sequencing, genomic amplification, etc. applied to animal diseases of all origins.

The three other parts, entitled '**Virology**', '**Bacteriology**' and '**Parasitology**', provide precise details on the possibilities offered by biotechnology in the surveillance and control of diseases relevant to these three disciplines. Taking into account the number of presentations on this subject, a selection of the most valuable papers was made by the presidents of the sessions at the VIth Symposium in Lyons. This selection has made it possible to include those most useful to authorities responsible for animal disease surveillance, by providing new information on current problems, such as: diagnosis of the porcine reproductive and respiratory syndrome, mycoplasmas, mycobacteriosis, trypanosomosis, latency of Aujeszky's disease virus, simultaneous detection of antibodies and antigens, distinction between antibodies arising from vaccination and infection, etc.

The 24 communications cover 376 pages of information of exceptional density. This volume is therefore an exhaustive and practical publication for all specialists in veterinary diagnosis and those responsible for surveillance and control of diseases of animals.

ISSN 0253-1933
Vol. **12** (2): ISBN 92-9044-323-5 376 pp
(Airmail postage included for all countries)
Vol. **12** (2): Price FRF200 or US$40

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Recently published

Health and management of free-ranging mammals

Office International
des Epizooties

Two issues of the OIE *Scientific and Technical Review* have been devoted to the vast topic of the "health and management of free-ranging mammals", namely: Volume **11** (4), December 1992 and Volume **12** (1), March 1993. An introduction in the first of the two issues explains that these papers were compiled following presentations made at an International Symposium organised by the Laboratory for the Study of Rabies and Diseases of Wild Animals ("LERPAS" in French) and held in Nancy (France), from 14 to 18 October 1991, under the triple patronage of the World Health Organisation, the International Union for the Conservation of Nature and the Office International des Epizooties.

To achieve effective management of wildlife populations, man now acknowledges the need to analyse and understand the nature of relationships between mammals, parasites and their environment. The aim of these two issues is to provide the information presented in Nancy to all those who are involved in managing wildlife populations. Research and the exchange of information on a world-wide level is all the more important since the regression of species subjected to changes in habitat (destruction of traditional habitats, intensification of farm production and the wide use of pesticides, abandonment of farming in some areas, etc.) has often been followed by boosts in populations, as hunters and conservationists introduce animals from other areas and even other continents (e.g. *Sylvilagus* hares) or reintroduce certain species (e.g. lynx). In this type of intervention, not only is the potential introduction of accompanying parasites or pathogens often a threat, but also – despite some disastrous experiences, as with myxomatosis – a lack of understanding prevails, in that a dramatic disease situation may arise when healthy carriers mix with non-immunised animals.

The proceedings of this Symposium are arranged in three parts. The first is concerned with the present state of **knowledge on various species and individual diseases**. The second considers the **epidemiology of diseases**, with reference to transmission, impact and models, and the third describes current capacities in the **surveillance, control and prevention** of wildlife diseases and, the **management** of species of wild animals.

In 390 pages devoted to this theme, the reader will find a wide variety of papers which discuss how diseases are detected, monitored and avoided in a multitude of different species and environments. Papers vary from a study of crassicaudosis in large baleen whales to a serological survey in captive Arabian oryx. A total of 45 contributions by 116 specialists are presented.

ISSN 0253-1933
Vol. **11** (4): ISBN 92-9044-321-9 248 pp
Vol. **12** (1): ISBN 92-9044-322-7 312 pp

Vol. **11** (4): Price FRF185 or US$34
Vol. **12** (1): Price FRF200 or US$40
(Airmail postage included for all countries)

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6 August 1993

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