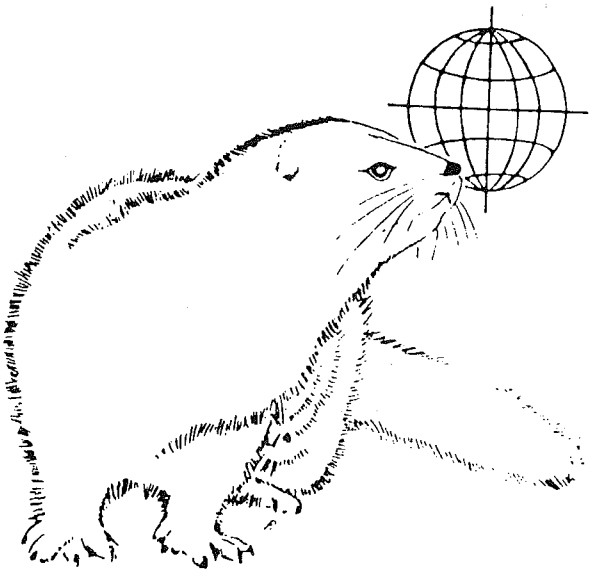

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NJF's Fur Animal Division

Titles of other publications - not abstracted.

The use of estrogen in obstetrics of fur animals. *A. Yu Vasil'ev. Veterinariya, USSR, 9, 13-14, 1987. In RUSS. Code 3-5-M-F.*

Studies on the temperature regulation of the Nutria. *Marie-Luise Siegle, K. Rübsamen. Deutsche Pelztierzuchter, 60, 2, 30-31, 1986. In GERM. Code 3-O.*

The territory behaviour of farm fur animals. *Hannu Korhonen, Mikko Harri. Turkistalous, Finland, 3, 112-117, 1988. In SWED. Code 11-10-M-F-O.*

Manure of fur animals as fertilizer. Aulis Jarvi. Turkistalous, Finland, 2, 74-75, 1988. In SWED. Code 12-10-14-M-F-O.

Fur and fur traits of the chinchilla. *Anonymous. Deutsche Pelztierzuchter, 60, 5, 81-84, 1986. In GERM. Code 2-O.*

The slaughtering of nutria with reference of meat inspection. *Jukka Arstila. Myocastor, Finland, 1, 24-28, 1987. In FINN. Code 2-12-O.*

Observations on the behaviour of chinchilla. *Anonymous. Deutsche Pelztierzuchter, 60, 8, 130-132, 1986. In GERM. Code 11-O.*

Game theory and the North American Fur Trade: A comment. *John Vincent Nye. Journ. of economic history, 48, 3, 677-680, 1988. Code 14-O.*

Game theory and the North American Fur Trade: A reply. *Ann M. Carlos, Elizabeth Hoffman. Journ. of economic history, 48, 3, 681, 1988. Code 14-O.*

New regulations for trapping and tests on traps. *Torsten Mörner, Christer Pettersson, Jörgen Wehre. Svensk Veterinartidning, 40, 7, 357-364, 1988. In SWED. Code 14-O.*

4. Genetics.

Titles of other publications - not abstracted.

Inheritance of hair coat color, length and density in rabbits. *V.V. Miros, V.I. Nikhno, N.I. Sklyarova. Krolikovodstvo i zverovodstvo, USSR, 3, 13-14, 1987. In RUSS. Code 4-2-O.*

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5. Reproduction.

6. Nutrition & Food Technology.

Titles of other publications - not abstracted.

Prevention of wetting in sables. (The use of E-vitamin, selenium and choline in sable rations on the Pushkin state farm of the Moscoe region). *D.N. Perel'dik, B.A. Kulichkov, V.V. Gubskij, N.E. Kulikov. Krolikovodstvo i zverovodstvo, USSR, 3, 28-29, 1987. In RUSS. Code 9-6-O.*

Polecats requirement for metabolic energy. (Rationed feeding of young animals). *G.S. Taranov, T.Z. Komissarchik. Krolikovodstvo i zverovodstvo, USSR, 3, 9-10, 1987. In RUSS. Code 6-O.*

Declined level of energy nutrition in replacement nutria females at the early age and in the pregnancy period. *V.F. Kladovshchikov. Krolikovodstvo i zverovodstvo, USSR, 3, 8, 1987. In RUSS. Code 6-5-O.*

7. Veterinary Science.

Titles of other publications - not abstracted.

Infectious diseases of fur animals. Development - diagnosis - prevention - combating, 1. *H. Ch. Löliger. Deutsche Pelztierzuchter, 61, 3, 33-34, 1987. In GERM. Code 9-M-F-O.*

Infectious diseases of fur animals. Development - diagnosis - prevention - combating, 2. *H. Ch. Löliger. Deutsche Pelztierzuchter, 61, 4, 52-53, 1987. In GERM. Code 9-M-F-O.*

Diseases of nutrias and possibilities of therapy. 2. *Eckart Körner. Deutsche Pelztierzuchter, 61, 3, 36-37, 1987. In GERM. Code 9-O.*

Prevension of intestinal diseases in fur animals (Virus etiology). *V.S. Slugin. In RUSS. Code 9-M-F-O.*

Aerosol methods for administering medicinal preparations and vaccines to mink. *V.M. Karpov, K.N. Gruzdev, I. Ya Bannov, K.P. Bobryshev. Veterinariya, Moscow, USSR, 7, 9-10, 1988. In RUSS. Code 9-12-M-F.*

Failure to detect gastric campylobacter-like organisms in a group of ferrets in New Zealand. *C. Tasman-Jones. New Zealand Medical Journal, 101, 846, 275, 1988. Code 9-O.*

8. Communications.

NORDISKE
JORDBRUGSFORSKERES
FORENING

Scandinavian Association of Agricultural Scientists

Fur Animal Division

INVITATION TO THE NJF SUBSECTION FOR FUR ANIMALS
Seminar No. 170 in fur animal production, Grand Hotel Stockholm
1989-09.29 to 1989-10-01.

The fall seminar of the NJF division of fur animals will take place at Grand Hotel in Stockholm from Friday September 29th to Sunday October 1st, 1989. The meeting will start at 1 p.m. on Friday and conclude before lunch on Sunday which means that the participants will take care of these meals themselves. We recommend some of the many restaurants situated close to Grand Hotel, as the lunch at Grand Hotel is expensive. Saturday afternoon an excursion with lunch is included in the arrangement. Furthermore, the conference fee includes two nights in single rooms/double rooms, two dinners, two lunches, coffee as well as various conference material.

Enrollment must take place at the latest on September 1st, 1989 on the enclosed form to

Jill Eriksson
Sveriges Pälsdjursuppfödares Riksförbund
Box 8124
S-163 08 Spånga - Sverige
Tel. 46-8362770.

Participation fee to be paid with the enrollment on postal account 30404-8 or by banker's cheque issued to Sveriges Pälsdjursuppfödares Riksförbund (SPR).

Congress fee:	Member of NJF	Not member
Single room	2500 SEK	2750 SEK
Double room	2000 SEK	2250 SEK

For those who arrive by plane, buses depart frequently from Arlanda to the centre of Stockholm, and from there it is only a few minutes by taxi to Grand Hotel.

PROGRAMME

FRIDAY September 29, 1989

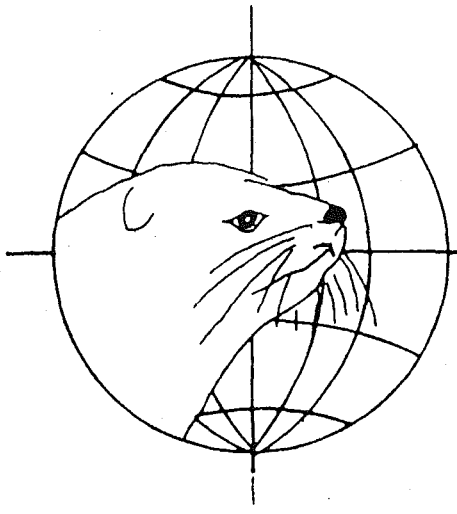
1.00 p.m.	Welcome
1.10 p.m.	Halgeir Sterten & Åshild Longva Eldegard: Development of the feed optimalization technique in Norwegian fur animal production.
1.30 p.m.	Juoko Työppönen: Diagnosis of iron deficiency in mink.
1.50 p.m.	Søren Michaelsen & Hilmer Sørensen: Biochemical examinations in relation to skin quality in mink and fox.
2.10 p.m.	K. Rouvinen & E. Mäntysalo: Aging and preparation qualities in mink and blue fox pelts.
2.30 p.m.	Jaakko Mononen, M. Harri, K. Haapanen & H. Korhonen: Neses as thermic environment for fox and raccoon dog kits.
2.50 p.m.	Tuula Dahlman, Ilpo Pölönen & Jaakko Mäkelä: The use of carbohydrates during the breeding period of mink.
3.10 p.m.	Coffee break
3.30 p.m.	Kimmo Haapanen, M. Harri, J. Mononen & H. Korhonen: Nests as thermic environment for fully grown foxes and raccoon dogs.
3.50 p.m.	Vivi Pedersen: The effect of early handling on later behaviour and stress susceptibility in silver fox.
4.10 p.m.	Fjalar Fors & Kjell Nydahl: Housing principles of fur animals - current situation.

SATURDAY, September 30, 1989

9.00 a.m.	The perinatal project, Finland Anne Näveri & Juoko Työppönen: Clinical-chemical and haematological changes in pregnant blue fox females and newborn kits.
9.20 a.m.	The perinatal project, Sweden Anne-Telene Tauson & Lena Englund: Status report.
9.40 a.m.	The perinatal project, Norway Astrid Indrebø: Experiment parvoviral infection in pregnant blue fox females, Clinic, blood parameters and loss of kits.
10.00 a.m.	Coffee break
10.20 a.m.	Vivi Pedersen: Improvement of cage and nest box systems for foxes. Latest results of the project.
10.40 a.m.	E. Smeds & Taina Loikala: Salmonella in fur animals.
11.00 a.m.	Henrik Falkenberg: Humoral immune response in mink.
11.20 a.m.	Christian Munch: Examination of AD reaction in mink after vaccination with three types of mink vaccines.
11.40 a.m.	Niels Enggaard Hansen: The killing of mink by using CO, CO_2 and N_2.
12.00 a.m.	Gabrielle Lagerkvist, Einar J. Einarsson & Mats Fors-berg: Progesterone and estradiol 17ß in mated and unmated minks, respectively.
12.20 p.m.	Posters
1-5 p.m.	Excursion

SUNDAY, October 1, 1989

9.00 a.m.	Jan A. Fougner & Wenche Farstad: The use of deep frozen semen in fox breeding.
9.20 a.m.	Liisa Jalkanen: Bacteriological status in fox semen and its influence on pregnancy.
9.40 a.m.	K.R. Johannesen: Fox circle mating system/Experiences and results from progeny testing of males.
10.00 a.m.	Hilkka Kenttämies: Blue frost inter specific hybrids in progeny test of silver fox males.
10.20 a.m.	Coffee break + check out
11.10 a.m.	Outi Lohi: Heritability of body length and weight at different times.
11.30 a.m.	Kári Saarenmaa: Heritability of breeding for litter size in blue fox.
11.50 a.m.	Jesper Clausen: Progeny testing of AI males in fox breeding.
12.10 p.m.	Raija Ingo, Leena Blomstedt, Juoko Työppönen, Kari Saarenmaa, Jouni Kangas & Maija Valtonen: Curly hair in silver fox. Presentation: Leena Blomstedt: Morphology of fur and skin. Maija Valtonen: Clinical images. Kari Saarenmaa: Heritability.
12.40 p.m.	End



IFASA & Scientifur

NOTES
SCIENTIFUR, Vol. 13, No. 3, 1989.

Let us start with the good news. It has now been confirmed that SCIENTIFUR will continue after 1989.

At the first board meeting of International Fur Animals Scientific Association (IFASA) it was concluded that SCIENTIFUR shall continue and - depending of the economical resources - slowly be changed in the direction stated for the IFASA-journal - previously described in SCIENTIFUR as "International Fur Animal Production - journal for scientific and technical information".

From January 1st, 1990 it is our intention that SCIENTIFUR shall be moved from the Division of Fur Animals of the Scandinavian Association of Agricultural Scientists (NJF) to IFASA and shall - under the direction of IFASA serve as a communication link to the members.

It is also decided that scientific reports printed in SCIENTIFUR shall be approved by referees. However, the possibilities of sending technical original reports for publication will still exist.

Have you, as the interested reader, noticed that SCIENTIFUR during 1989 has changed to be the journal bringing the largest number of original reports regarding fur animal production of scientific and technical nature?

This tells you that today SCIENTIFUR is to an even higher degree by far the best international source of scientific and technical information about fur animal production. As mentioned already, this position will be stimulated in the future.

The board of IFASA has also confirmed the draft of the CONSTITUTIONS of IFASA, and it is our intention, as far as possible, to invite scientists, related persons, organizations and institutions to become members of this international association.

In the next issue of SCIENTIFUR - and by direct letters - information regarding membership etc will be given.

DON'T FORGET THAT THE TIME OF CRISIS IS ABSOLUTELY THE LAST MINUTE TO LOOK AHEAD AND ACT - THE FUTURE IS FOR THOSE WHO ACT!

One of the simplest and cheapest ways of ensuring the future is to take advantage of the information available, locally and internationally. Therefore, in IFASA and SCIENTIFUR we hope that the short term crisis will not be used to reduce the support of the future, whicht is what a subscription to SCIENTIFUR and a membership of IFASA really is.

The bad news is that many subscriptions to SCIENTIFUR Volume 13 are still unpaid, and that more than 40 of the books "Beautiful Fur Animals - and their colour genetics" sent in October 1988 according to orders also are unpaid.

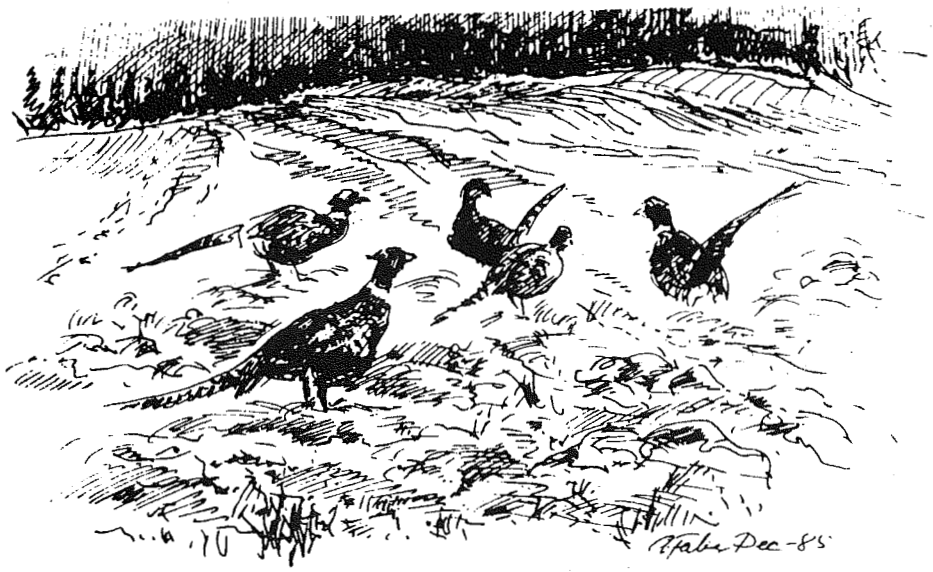
This is a serious problem for a publisher in a serious economic crisis.

Therefore, dear readers, think about this when you have the possibility to discuss the future with colleagues, and think again how highly you feel you can recommend the service of SCIENTIFUR to your colleagues. Your support in all directions is our only chance to overcome the economic deficit of more than 100,000 US$ for the first 13 years of service for the fur animal production.

Have a good summer - and act for the future.

Best regards

Gunnar Jørgensen
Your editor.



Original Report.

Description of skin- and hair morphology by using microscopic image analysis and computer technique.

Palle Vistisen Rasmussen
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Abstract.

Objective measures and descriptions in connection with quantitative and qualitative examinations of fur and skin are important to the fur trade, where product evaluation is mainly based on subjective measures. Relevant parameters are for instance cross section shape and sectional area (thickness) of guard hair, number of hair follicles per area as well as types of follicle groups per area. After adaptation of the histological staining methods, it has - by means of microscopic image analysis and computer technique - become possible to establish reproducible, objective, relatively fast and exact routine procedures.

Introduction.

Microscopic image analysis controlled by computer technique has become an important tool or measuring and counting device in connection with morphological (morphometric) examinations of histological preparations from fur animals. Manual and slow procedures have been replaced by "mouse"-activated, quick, menu controlled procedures. The equipment can make simple statistical calculations, and, coupled with a personal computer, the information can be stored directly on a hard disk or a floppy disk for further processing.

The morphological analyses are used as documentation and control of the effect on fur development and fur type in relation to hair growth (priming), skin defects, selection experiments, feeding experiments, cage and nest conditions as well as skin technology.

Equipment, material and methods.

The equipment used for the actual image processing consists of the following elements: a light microscope, a Scan Beam stand alone image processing module box, an object monitor, a keyboard, a video camera, an optomechanical "mouse" plus software (Scan Beam).

Tissue preparation: In this case the histological material consists of skin biopsies (Ø = 2-6 mm) which are bored out (trepaned) skin

samples, and dissected guard hair from mink pelts.

Skin biopsies are fixed in a buffered (pH = 7) formalin solution, dehydrated in upgraded ethanol solutions, cleared in oil of turpentine, impregnated and embedded in paraffin. In a microtome horizontal sections, 5-6 μm thick, are produced. The staining method is a modification of the so-called SACPIC-procedure, which is a combination staining making it possible to distinguish growing hairs (anagen) from hairs at rest (telogen).

Morphometric examinations of guard hair are mainly performed on material from pelts. The hairs will typically represent a circular skin sample of approx. 20 mm^2. All hairs from the sample are cut off by a scalpel and the guard hairs are dissected and sorted out subjectively into two types, i.e. long primary (lp) and shorter intermediary (ip). The guard hairs are mounted on a slide, lying next to each other with the thickest part of the lancet part on level. By means of two-sided tape, the hairs are fixed (control under a stereo microscope). Then they are washed carefully in a detergent, absolute ethanol, transferred to xylen/abs. ethanol and at last to xylen. The hairs are then embedded into DPX (mounting medium). After hardening, the incision plane is marked, and a DPX-plate containing the lancet parts of the guard hairs is cut out. This is embedded vertically in paraffin. In a microtome a cross section of the thickest part of the lancet parts is produced (typically a section contains 50-80 hairs). The section is de-paraffined and stained with amido black. The hair cuticles hereby appear blue.

Counting and measuring in practice.
Figure 1 shows a typical area of analysis from a horizontally cut skin biopsy from the tail of a mink. The various follicles and follicle groups have different names. As guard hair and underfur hair are created in primary and secondary follicles, respectively, the nomenclature of the groups is as follows:

GrTypSLP: Type of group with underfur hair in telogen and a long (thick) guard hair.

Fig.1. An outline of a typical area (a. 0.8 mm^2) for microscopic follicle analysis from a horizontally cut skin biopsy (mink tail). The counting area has been defined. The morphological data (a printout) is shown in figur 3.

UGrTypSLP: Type of group with one or more underfur hairs in anagen (the rest in telogen) and a long (thick) guard hair.

GrTypSIP: Type of group with underfur hairs in telogen and an intermediary (rather thin) guard hair.

UGrTypSIP: Type of group with one or more underfur hairs in anagen (the rest in telogen) and an intermediary (rather thin) guard hair.

GrTypS: Type of group exclusively with underfur hairs in telogen.

UGrTypS: Type of group exclusively with underfur hairs where one or more of these are in anagen.

A menu for "follicle analysis" is shown on the object monitor next to the image transmitted from the microscope. After microscopy and identification, the underfur follicles are marked (with symbols), counted and categorized semi-automatically in groups by means of the "mouse". Each image analyzed is described as a set, of which there may be several.

Figure 2 illustrates a cross section of a number of lancet parts of mink guard hairs as they will appear on the object monitor.

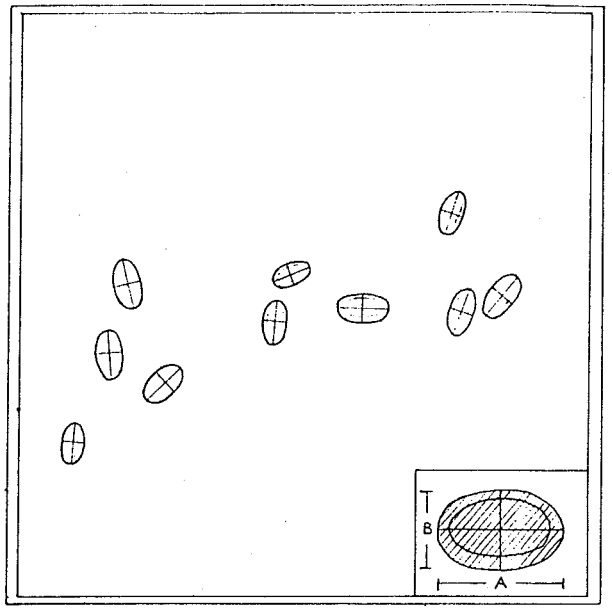

Fig. 2. An illustration of a microscopic cross section of a number of lancet parts of mink guard hairs. The morphometric data (a printout) is shown in figur 4.

A(μm) : the large diameter of the hair cross section.
B(μm) : the small diameter of the hair cross section.
B/A(%): cross section shape of the hair.

Area of cross section (μm2).

When measuring these parameters, a menu called "hair analysis" is shown on the object monitor next to the image transmitted from the microscope. After microscopy, a system set-up is made (by means of an object micrometer), identification is done, the level of analysis is defined (pseudo staining of grey tone level), and by activating the "mouse", the procedure "hair analysis" is performed. This is repeated until all hairs of the section have been measured (up to 100 hairs per set).

Examples of result printouts.
Figures 3 and 4 give examples of printouts of "follicle analysis" and "hair analysis", respectively.

Simple statistical calculations, i.e. medium values of guard hair thickness and shape have been made.

Discussion of methods.
The image section of the object monitor contains 512 x 512 pixels.

During the procedure "follicle analysis", which is the operator controlled, semi-automatic counting programme, the analysis area can be defined as a certain number of pixels by means of the demoprogram (the pointing submenu) of the image processing system. This area may be transformed into mm^2, considering the magnification that is used. (A preliminary, unbiased counting frame and

Fig. 4. An example of a hair analysis printout.

Hair analysis.

No.	A (μm) large diameter	B (μm) small diameter	Cross section area μm^2	B/A %
0	123	67	6904	54
1	123	61	6560	50
2	109	59	5437	54
3	134	73	8128	54
4	98	50	4322	51
5	112	56	5562	50
6	120	64	6771	53
7	123	73	7005	59
8	126	67	7067	53
9	112	53	5172	47

n	m	SD	n	m	SD	n	m	SD	n	m	SD
10	117	10	10	61	8	10	6295	1131	10	53	3

Fig. 3. An example of a follicle analysis printout.

Follicle analysis.

No	GrTypSLP n m SD	UGrTypSLP n m SD	GrTypSIP n m SD	UGrtypSIP n m SD	GrTypS n mSD	UGrTypS n m SD
0	74 15 2.4	0 0 0.0	71 18 1.0	0 0 0.0	15 15 0.0	0 0 0.0

counting rule for analysing the restricted field of vision will be tested and later reported.

It should be remembered that during preparation the specimen will shrink in relation to the original fresh skin biopsy. Through development of methods it is, however, possible to reduce the shrinkage. The alternative is to use plastic instead of paraffin as embedding medium.

Besides, the equipment requires that the histological preparation is shown with a sharp contrast (small aperture). It is an advantage to bring the microscopic image a little out of focus, as the cross section of hairs in the follicles will thus be seen more clearly on the object monitor. Please also note that only underfur follicles are counted. Because of the system design, the number of various follicle groups is registered at the same time. If further information regarding number of guard hair follicles in anagen phase is required, the observations must - in the existing version of the system - be noted down and registered into a data set.

The division of guard hair into long and intermediary is subjective. You can decide that guard hair with a basic hair diameter of up to 2 x the diameter of the underfur hairs in the group in question is an intermediary guard hair. In this connection a supplementary examination to illustrate the correlation between the number of intermediary hairs determined in a skin biopsy and the number of intermediary hairs determined in the corresponding hair sample has to been done.

During the procedure "hair analysis", which is the operator controlled, automatic program for measuring cross section axes and sectional areas, special requirements are made to the histological preparation used. One condition for an analysis without problems is that the difference in grey tone value between the objects and the "background" is big. In other words, this "background" should be transparent. Furthermore, it is important that the objects are separated, so that the object shape described in the "system set-up" can be recognized by the system. In this connection, a "split function" is often a great help.

To determine the "level of analysis", a certain "procedure" must be introduced. When this "procedure" is followed for each analysis, the results of a series of measurements can be reproduced.

Acknowledgements.

The author wishes to express his gratitude to laboratory technician Dragoljub Dragic for his constructive contribution in terms of methods and ideas and to Outi Lohi, M.Sc.Agric. for her assistance with the data processing. Furthermore, it should be mentioned that Asbjørn Brandt, M.Sc.Vet.Med., gave his great support at the start of the project.
In conclusion, the author thanks the Danish Fur Breeders' Association for financing the equipment.

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Original Report.

Effect of cage size and nest box on the haematological/enzymological status and physiological stress levels in mink kits.

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Abstract

The effects of cage size and nest box on experienced stress in mink kits were studied using changes in circulating eosinophil levels, differential leucocyte count, plasma cortisol concentration and some haematological and enzymological indicies as stress indicators. The cage sizes varying from 0.10 square metres to 1.05 square metres did not influence the stress physiological parameters, but mink in the largest cages had a higher haemoglobin concentration compared to mink in the smaller cage types. The eosinophil levels of all the females and the males with no nest box decreased from August to November, while the eosinophil level of the other males was constant and at the same initial level. The lack of nest box stress the mink more than the size of the cages.
In the adrenocortical function test the H/L-ratio and cortisol level decreased in mink after repeated acute stress (immobilization) and increased in mink after constant long-term stress (cage without nest box).

Key words

Introduction

Housing condition and cage sizes for domestic animals are considered important when debating animal welfare. In an earlier paper the behavioural and production consequence of keeping mink in extremely small or extremely large cages has been reported, *Hansen* (1988). In a recent series of studies on ranch mink, *Jeppesen & Heller* have found that experimental stress (repeated immobilization in mink traps) or social stress increased the level of circulating eosinophil leucocytes. These measurements were found to be better for assessing long-term stress in ranch mink than the cortisol concentration which shows transient and unstable elevation after a single or several days of 1 h immobility stress sessions.
The purpose of this investigation was to evaluate the effect of different sizes of cages and lack of opportunity to use nestbox on haematological and stress physiological indicies in mink.

Mink - Stress - Cage Size - Eosinophil Leucocyte - Differential leucocyte count - Haematology - Cortisol.

Materials and methods

The study includes 114 male and 114 female pastel mink, born in May 1987 and raised with their mothers under conventional farm conditions. At the age of 7-8 weeks, all the animals were caged male and female in pairs. Each litter was represented in each of the five cage types and every cage type was represented with 20 to 24 cages.

Cage	Bottom area (m^2) (1xw)	Volume (m^3) (1xwxh)	Nest box
1	(110 x 96) cm = 1.056	(110 x 96 x 76) cm = 0.802	yes
2	(90 x 30) cm = 0.270	(90 x 30 x 45) cm = 0.121	yes
3	(35 x 30) cm = 0.105	(35 x 30 x 45) cm = 0.047	yes
4	(70 x 15) cm = 0.105	(70 x 15 x 45) cm = 0.047	yes
5	(90 x 30) cm = 0.270	(90 x 30 x 45) cm = 0.121	no

Blood samples were collected in 50 x 10^{-6} l capillary tubes by nail cutting at approximately four weeks (2nd August), eleven weeks (8th October) and fifteen weeks (6th November) after weaning. Individual eosinophil leucocyte counts were determinded according to the method described by *Zarrow et al. (1964)*.

In the last two sampling periods, differential leucocyte counts were done manually on May-Grünwald stained smears.

At pelting, the animals were anaesthetized with pentobarbitol (45 mg/kg b.wt; i.p.) and 20 ml blood samples were taken by heart puncture. EDTA stabilized samples of blood were analysed for haemoglobin (cyanomethaemoglobin method), haematocrit (haematocrit capillary tubes centrifuged 10000 r-p.m. for 3 min.). The number of erythrocytes and leucocytes was determined by electronic counting (Linson counter 431a - using control blood L-nonm. Labex as reference). Mean corpuscular volume and mean haemoglobin concentration were calculated. Activities of plasma creatine kinase were determinded kinetically (*J.T. Baker Chemicals B.V., DeVenter, Holland*). The plasma and the adrenal ascorbic acid concentration was analyzed as described earlier (*Lund, 1979; Brandt, 1987*). Plasma total protein was determined using the Biuret method.

Adrenocortical function test was performed on 8 females randomly sampled from each of the five cage types. To make it possible to relate the cortisol response of these animals to animals which were stressed, a control group of 8 female mink, at the same age and kept under conventionally farm conditions, was stressed by one hour immobilization per day for a period of 8 days.

The females of the control group were tested for adrenocortical function one day after finishing the immobilization treatment. Eight females from the five different cages were given the same treatment. The animals were anaesthetized with pentobarbitol (35 mg/kg b.wt.; i.p.) after which they were injected with 0.05 ml dexametason (0.08 mg/kg b.wt.; s.c.). Blood samples were taken three hours later for quantification of cortisol (plasma), after which the animals were injected with 0.2 I.U. ACTH/kg b.wt; i.m. The final blood samples were taken 30 min. later and analyzed for content of cortisol by competitive protein binding technique after extraction with hexane and ethanol using the Cortisol 125 I Radioimmunoassay Kit.

Statistics

Conventional statistical methods were used for calculations of means and S.E.M. of measured variables. Significance of differences between mean values of the main treatments were tested using the Duncan multiple range test.

Results and discussion

The effects of variable cage sizes on mean circulating eosinophil leucocyte levels for each of the three blood samplings are shown in fig. 1. For males in the four type of cages of different sizes the eosinophil levels were constant from the first blood sampling in August to that in November. For the females

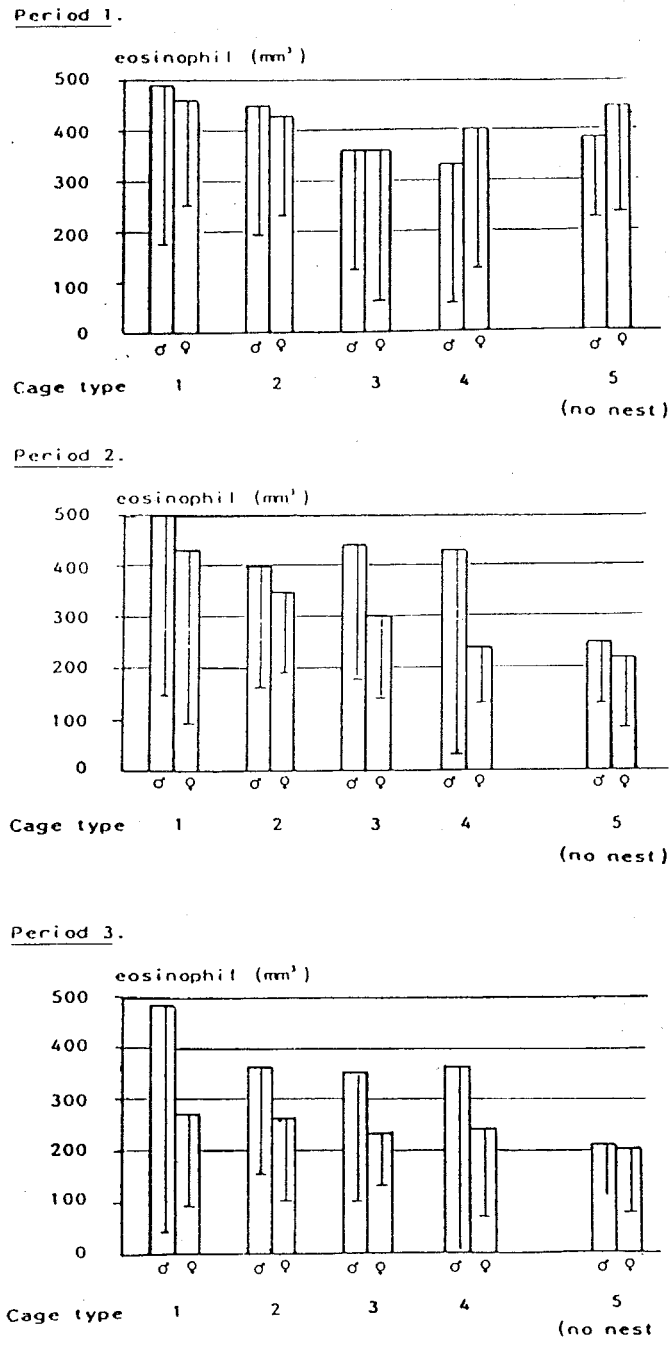

Fig. 1: The effect of different cage sizes and nest box on the number of eosinophil leucocytes in mink. The three charts represent different periods of sampling: 1)= August 2-24; 2)= October 8-13; 3)= November 6-10.

in the same cages the eosinophil levels decreased significantly in the same period. At the first blood sampling there was no effect of the sex and cage types on the eosinophil levels. At the second blood sampling the females in cage type 1 had a significantly higher level than the females in cage types 3 and 4 ($P<0.004$). At the third blood sampling the levels of eosinophil leucocytes of all the females were alike and at a lower level compared to the males. These results indicate that the investigated cage sizes did not influence the physiological stress level in mink. The decreased eosinophil levels in female mink cohabiting with males indicate that females cope better with the situation than the males (lower stress level). The results are not in agreement with earlier experiments in which the females had shown to be more stressed than the cohabited males *(Jeppesen & Heller, 1985)*. A greater stress level for females is supported by numerous studies on common laboratory animals, in which females ordinarily appear subordinant to males under restricted housing conditions *(Browerman et al., 1974)*. Further investigations must be carried out before a final proof can be given for the observed sex difference.

A large increase of the eosinophil level has been shown for both sexes in October (most pronounced for the female) followed by a return to normal level in November-December *(Jeppesen, 1988)*. The present results have shown that the highest level was reached in August and then decreased for the females.

All the results from the haematological investigations (table 1) are within the 95% confidence bourdaries of reference values for mink at that particular age. The haemoglobin concentration was significantly higher for mink in cage type 1 compared to mink in the other cage types. The erythrocyte count and haematocrit were in general highest in cage type 1 and lowest in cage type 4, but there was no difference in haematocrit between mink in cage types 1, 2 and 3.

The conclusion must be that the cage sizes have some effect on the physical condition in mink; thus the higher oxygen carrying capacity for mink in cage type 1 indicate that these animals have had a greater activity and subsequent higher metabolism. There were no differences in heart weight, total plasma protein, plasma ascorbic acid and adrenal

Table 1: The effect of cage sizes and nest box on haematological indicies in mink.
(1=1.056 m² ; 2=0.270 m² ; 3= 0.105 m² ; 4=0.105 m² ; 5=0.270 m² - nest box).

Haematology:

Cage type	1			2			3			4			5			Signif. P-value	
	Mean	Std.	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Type	Sex
ERYTHROCYTES (10^{12}/l)																	
Male	7.91	1.28	20	8.06	1.52	24	7.64	1.08	23	6.87	1.11	19	7.81	1.06	19	0.0017	ns
females	8.60	1.11		7.66	1.37		7.45	1.73		7.41	1.18		6.98	1.14			
LEUCOCYTES (10^9/l)																	
males	5.36	1.89	20	5.40	2.21	24	5.17	1.94	23	5.26	2.30	20	4.62	1.70	21	ns	0.0002
famales	4.73	2.01		4.45	1.71		3.73	1.42		3.89	1.94		4.11	1.80			
HAEMOGLOBIN mmol/l)																	
males	10.25	0.76	20	9.84	0.95	24	9.98	0.77	23	9.84	0.90	20	10.26	1.52	21	0.0173	ns
females	11.18	1.05		10.37	1.29		9.82	1.70		10.17	1.70		9.43	1.56			
HAEMATOCRIT (%)																	
males	49.60	7.82	20	52.23	10.15	24	49.22	7.23	23	43.69	8.12	19	49.32	6.74	21	0.0065	ns
females	53.98	7.59		47.86	8.72		47.50	11.52		46.80	7.56		44.37	7.80			
MEAN CORPUSCULAR VOLUME (FL)																	
males	62.20	2.59	20	63.50	2.45	24	64.13	2.47	23	63.00	3.04	19	63.19	3.19	21	ns	ns
females	62.40	2.62		62.08	3.16		63.36	3.02		62.74	2.66		63.00	2.79			
MEAN CORPUSCULAR HAEMOGLOBIN (fmol)																	
males	1.32	0.20	20	1.25	0.20	24	1.32	0.15	23	1.45	0.19	19	1.32	0.12	21	(0.0606)	ns

Statistical test: GLM-procedure (SAS). SD = standard deviation.

Table 2. The effect of different cage sizes and nest box on heart weight (g), total plasma protein (g/l), plasma ascorbic acid (mg/l), adrenal ascorbic acid (mg/g) and creatine kinase (u/l).

Organs.

Cage type	1			2			3			4			5			Signif. P-value	
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Type	Sex
HEART																	
males	11.13	0.59	16	10.99	1.21	24	10.94	0.91	24	11.12	1.22	21	10.64	1.18	22	ns	0.0001
females	6.24	0.80	15	6.60	1.22	23	6.45	1.00	20	6.33	0.72	13	6.39	0.53	17		
TOTAL PROTEIN																	
males	62.03	3.64	20	61.36	4.86	24	59.89	4.84	24	62.61	5.96	21	62.56	3.76	23	ns	0.0001
females	65.32	5.44	20	62.82	5.73	24	64.46	5.91	22	66.53	8.22	20	64.84	5.29	21		
PLASMA ASCORBIC ACID																	
males	13.65	4.73	20	14.13	3.09	24	14.22	4.40	24	13.24	4.31	21	16.45	5.03	22	ns	0.0061
females	19.81	6.21	19	15.36	5.34	22	13.77	5.04	21	16.86	6.13	20	15.30	5.14	21		
ADRENAL ASCORBIC ACID																	
males	0.38	0.10	18	0.40	0.08	21	0.41	0.14	21	0.39	0.13	20	0.41	0.08	21	ns	0.0006
females	0.31	0.13	17	0.30	0.13	24	0.34	0.15	23	0.34	0.12	19	0.39	0.13	22		
CREATINE KINASE																	
males	295.10	90.32	20	399.21	251	24	321.9	157.8	23	368.7	135	19	519.38	714	21	ns	0.0003
females	622.00	568.18	19	1101.12	1429	24	483.2	310.7	21	736.7	766	19	586.43	454	21		

Statistical test: GIM-procedure (SAS). SD = standard deviation.

ascorbic acid and creatine kinase between mink in the four types of cages, but a significant sex difference was seen (table 2).

The results of the differential leucocyte count (table 3) showed no difference between mink in the four sizes of cages.

Table 3. The effect of different cage sizes and nest box on the mean values of differential leucocyte count of mink. (1 = 1.056 m^2, 2 = 0. 270 m^2, 3 = 0.105 m^2, 4 = 0.105 m^2, 5 = 0.270m^2 - nest box).

Cage type	1	2	3	4	5	P-value	
Rod-shaped	n=40	n=47	n=48	n=44	n=48	type	sex
8-13/10	0.011	0.013	0.009	0.008	0.011	ns	ns
7-10/11	0.007	0.007	0.007	0.007	0.006	ns	0.0469
Segmented							
8-13/10	0.357	0.437	0.399	0.416	0.470	0.0001	ns
6-10/11	0.425	0.440	0.392	0.433	0.511	0.0001	ns
Eosinophil							
8-13/10	0.066	0.063	0.054	0.067	0.041	0.0030	ns
6-10/11	0.060	0.054	0.059	0.057	0.040	0.0226	0.0059
Lymphocytes							
8-13/10	0.535	0.458	0.507	0.474	0.447	0.0003	ns
6-10/11	0.478	0.468	0.506	0.469	0.410	0.0001	ns
Monocytes							
8-13/10	0.031	0.028	0.031	0.035	0.031	ns	0.0329
6-10/11	0.030	0.030	0.035	0.034	0.031	ns	ns
Heterophil/lymphocytes (H/L- ratio)							
8-13/10	0.879	1.231	0.989	1.138	1.308	0.0004	ns
6-10/11	1.100	1.158	0.972	1.173	1.479	0.0001	ns

Statistical test: GLM-procedure (SAS). SD = standard deviation.

Gross & Siegel (1983) found that a rise in the ratio of heterophils (segmented, rodshaped and eosinophil) to lymphocytes was the most reliable indicator of stress in chicken. *Kristensen & Jeppesen (1988)* confirmed these results in foxes. In this present experiment, cage size and sex have no effect on ratio of heterophils to lymphocytes (H/L-ratio), indicating that there are no major differences in stress level between minks in the four sizes of cages (table 3).

At the same time as we investigated the effects of different sizes of cages on ranch minks stress physiology, we deprived some mink of using the nest box.

The effects of lack of admission to nest box on mean circulating eosinophil leucocyte levels for each of the three blood samplings are shown in fig. 1 (cage type 5).

For males in cage type 5 the eosinophil levels decreased significantly ($P<0.0001$) from the first blood sampling in August to that in November, in the same way as the cohabiting female as well as the females in cage types 1 - 4. This is in contrast to the males in cage types 1-4 which remain at a high level.

Investigation of the agonistic behaviour in the same project (*Hansen, 1988*) shows no difference between minks with and without admission to a nest box and agonistic behaviour could not be the cause of changes in circulating eosinophil level for males in cage type 5. If the eosinophil level reflects the stress level, then the decrease in eosinophil leucocytes must indicate a low stress level

for males without nest box. This result could be explained as a consequence of the lack of refuges in the nest box. Thus the male mink being habituated to the daily activities on the farm developed a lower stress level. Investigations on Gerbils (*Clark & Galif, 1977*) show that if the animals are deprived of a hiding place (refuges), many of the behavioural and physiological characteristics of the domestic animals will develop. This situation should be the same for the females in cage type 5, but nevertheless all females showed a decrease in the eosinophil leucocyte level partly related to the level in August and partly to the level of the males in cage types 1-4.

Another explanation could be that the lack of admission to nest box in cage type 5 may have stressed the males in such a way that they could not maintain the eosinophil level for months. The decline of the eosinophil level of the females could instead be caused by the presence of the males in the same cage (social stress).

The results of differential leucocyte count (table 3) showed that mink without a nest box had more segmented leucocyte and less eosinophil leucocytes and lymphocytes than mink in the other cage types. The H/L-ratio was significantly higher ($P<0.0001$) for mink without than for mink with a nest box. This indicates that the lack of nest box was a much more stressing factor than the cage size.

As *Heller & Jeppesen (1985)* have shown that ranch mink can be stressed by repeated immobilization, we stressed a control group of 8 female mink before the adrenocortical function test which could be compared to mink with and without nest box.

The differential leucocyte count after ACTH treatment (acute stress, table 4) showed, in relation to the differential leucocyte count after constant stress (table 3), an increase of the number of segmented leucocytes and a significant decrease in eosinophil leucocytes, which caused a significant increase in the H/L-ratio (table 4). The ACTH treatment resulted in mink with no nest box having a higher H/L-ratio than the control group ($P<0.0898$). This difference reflected the cortisol level (table 5), where mink with no nest box had the highest cortisol level and the control group the lowest level ($P<0.0187$). *Meunier-Salaun et al. (1987)* found that pigs confined to a small area displayed enhanced resistance of their pituitary-adrenal axis to the dexamethasone suppression test and enhanced reactivity to ACTH injection, and interpreted this results as an indication of chronic stress. The observed difference in plasma cortisol concentration and the H/L-ratio between mink females with no nest box and the control group could be caused by the fact that the control group had been acutely stressed repeatedly by immobilization and the ACTH treatment acted as a continuation of this treatment.

Table 4. The effect of different cage sizes, nest box and immobilization on differential leucocyte count of mink in the adrenocortical function test. Period 30/11-4/12 (n = 8 females per group).

Cage type	1	2	3	4	5	Control
Rod shaped	0.007	0.008	0.010	0.006	0.013	0.016
Segmented	0.843	0.816	0.843	0.820	0.855	0.717
Eosinophil	0.003	0.000	0.001	0.003	0.001	0.007
Lymphocytes	0.123	0.158	0.129	0.151	0.104	0.216
Monocytes	0.024	0.019	0.018	0.020	0.028	0.036
H/L-ratio	6.93	5.21	6.62	5.49	8.35	3.47 ($P<0.898$)

These results give an extra dimension to the findings of *Jeppesen & Heller (1986)*, who have shown that repeated acute stress of

Table 5. The effect of cage sizes (1-4), nest box (5) and immobilization (control) on mean cortisol level (nmol/l) of mink after dexametasone suppression (1) and ACTH stimulation (2) respectively.

Cage type	N	Cortisol (1) Mean	SD	Cortisol (2) Mean	SD
1	7	18	3	343	83
2	7	21	11	364	74
3	8	14	5	367	126
4	8	15	4	368	88
5	8	18	14	417*	77
Control	8	11	5	313*	88

Statistical test: GLM-procedure (SAS). SD = Standard deviation.
* $P<0.0187$.

mink cannot be monitored by the plasma cortisol concentration, because the direct response on each stress occasion gets progressively weaker. The mink with no nest box could have been constantly long-term stressed with a degree of adrenocortical hypertrophia and reacted to the following acute stress treatmen (ACTH) with an increase in the cortisol concentration.

The hypothesis of eosinopenia combined with an increase in cortisol concentration and high H/L-ratio after constant long-term stress for mink fits well with the results of Denison & Zarrow (1954), who found a decrease in eosinophil leucocytes as a consequence of chronic administration of more than 10^{-4} gram cortisone acetate.

Our findings clearly indicate that the knowledge about the dynamics of the physiological stress measurements after acute stress, repeated acute stress and constant long-term stress is insufficient.

Conclusion

The cage sizes investigated in this experiment did not influence the stress physiological parameters, but the haematological values are most optimal in cage type 1, indicating a better physical condition. At the time from August to November, females in all the cage types show a significant decrease in the eosinophil leucocyte levels. The lack of admission to nest box affects the mink much more than the sizes of the cages.

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Original Report.

The measurement of electrical conductivity of the skin at the acupuncture points affecting the immunity in polar foxes.

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Summary.

The aim of the investigation was the determination of electric potentials at the chosen immunity points in young and mature polar foxes, the comparison of mean electric potentials at these points in young and mature animals, finding the dependencies between the values of electric potentials at particular points, the determination of the values of electric potentials at particular points and the determination of the values of potentials in polar foxes which do not show any clinical signs of a disease. The experimental material comprised 22 young and 21 mature polar foxes. The investigations were carried out with the help of Racomp II apparatus. The measurements were taken at the acupuncture points: Hegu (LI 4), Zusanli (ST 36), Quichi (LI 11) and Dazhui (SI 14). Highly significant differences were observed in the values of electric potentials at the acupuncture points between groups of young and mature foxes. The coefficients of variability of electric potentials in young foxes were nearly twice lower than in the group of adult foxes. The correlations between the values of potentials at particular points are quite high, especially in the group of mature foxes.

Introduction.

In 1950, *Y. Nakatani* proved that there existed certain dependencies between the state of internal organs and the values of electric resistence measured at the points of proper meridians. He localized these points on the human skin by their higher electrical conductivity as compared to the neighbouring regions and called them REPP (Reactive Electric Permeable Points). He noted that REPP form lines corresponding to acupuncture meridians. Those lines were also described by *M. Hyodo (1975, 1979)* as lines of good conductivity. *Nakatami* explained the appearance of REPP by viscero-dermatic reflexes transmitted via nerves of the sympathetic system according to the pattern: disorder of an internal organ - sending the information impulses through the afferent nerves - the processing of the information in the spinal cord or brain areas - directing the information to the reflex zones on the skin - the appearance of the pathologic REPP.

Through the stimulation of REPP, the differentiation is made of the local stimulation of the sympathetic nerves in correlation between the body surface and the internal organs. Thus, by the stimulation of the proper

points one can affect the proper organs *(Nahatani, Hyodo, 1975; Nahatani, Yamashita, 1977)*.

The aim of the present investigation was:

1. The measurement of the electric potentials at the chosen immune points in young and mature polar foxes.
2. The comparison of mean electric potentials at those points in young and mature animals.
3. Finding the dependence between the values of electric potentials at particular points.
4. The determination of electric potentials in polar foxes which do not show any clinical signs of at disease.

On the basis of the measurements of electrical conductivity at the chosen points responsible for immunity, a method will be worked out allowing the determination of immunity state of the animal organism.

Material and methods.

The experimental material comprised blue polar foxes *(Alopex lagopus, L.)*, 22 animals aged 7 weeks and 21 mature foxes. Young animals, born in the first decade of June, 1987, originated from 3 litters of the females marked with farm numbers as Z 2040, Z 954 and Z 686. Mature foxes were not homogenous as to their age, 6 were 1 year old, 2 - two years, 3 - three years, 6 - four years, 2 - five years and 1 - six and 1 - eight years old. All the animals did not show any clinical signs of a disease.

The investigations were carried out at Duchnice near Ozarow. The foxes were fed and kept in accordance with traditional system commonly accepted on farms in Poland.

The investigations were conducted with the help of Racomp II apparatus which works according to a computer program. The program prepared by Soft Electronic from Szcecin allowed conversational method of work with the system. The system comprises, apart from the interface Racomp II, also a microcomputer ZX Spectrum and a monitor.

The direct measurements were taken using passive and active electrods. The passive one was fixed to the tail of the animal previously wetted with physiological salt solution and the acupuncture point was localized with the help of a sharp end of the active electrode. After locating the point the electrical conductivity of the skin was measured and the result was read on the monitor in 1-2 sec. since the beginning of the measurement.

The electrode was supplied with electric current of the constant tension of 12 V and the measurements were taken within the limit of 200 μA. The measurements were taken at the acupuncture points (according to Essentials of Chinese Acupuncture, 1980) and our own observations *(Sciesinski et al., 1988)*.

1. Hegu (LI 4) which is located in the depression over the first finger of the forelegs.
2. Zusanli (ST 36) is located laterally from the frontal crest of the tibial bone in the depression between the tibial bone and the fibula below the tubercle of the tibia.
3. Quichi (LI 11) is located caudally from the humeral joint along the caudal margin of the deltoidal muscle in the, so called, depression between the head of the triceps.
4. Dazhui (SI 14) is located between the spinous process of the last (seventh) cervical vertebra and the first thoracic vertebra, more or less at the level of the shoulder.

The group of data comprised all the measurements done at a given point. The data, previously tested by the X^2 (Chi^2) test at $p = 0.05$ for the normal distribution, were evaluated statistically using C-Chachran test at the level of significance of $p = 0.05$ and $p = 0.01$ in the face of non-homogeneity of variance evaluated by the F-Fischer test at $p = 0.01$. The significance of correlations between points in each group was evaluated statistically by t-Student test at $p = 0.01$ and $p = 0.05$.

Results and discussion.

The mean electric potentials were compared for every point in the group of young and mature polar foxes. All the differences proved to be highly significant (Table 1).

There was also observed the presence of dependencies between the values of potentials at different points in animals of the same group. If in the group of young foxes those dependencies showed varied values, then in the group of mature foxes the values were close to 0.6 (Table 2).

Table 1. The values of electric potentials of the skin at particular REPP (Reactive Electric Permeable Points).

Point	Group of animals						
	Young			Mature			
	x	S	V	x	S	V	.
Hegu	9.6	2.3	23.9%	51.4	21.2	41.2%	9.00**
Zusanli	14.4	3.6	25.0%	58.5	24.5	41.8%	8.16**
Quichi	14.6	3.2	21.9%	50.9	27.5	54.0%	6.51**
Dazhui	11.5	2.5	21.7%	51.8	25.5	49.2%	7.20**

** differences highly significant statistically.

Table 2. The coefficients of correlation between particular REPP.

Points between which the dependencies were investigated	Group of animals	
	Young	Mature
Hegu and Zusanli	0.50*	0.65**
Hegu and Quichi	0.84**	0.62**
Hegu and Dazhui	0.06	0.64*
Zusanli and Quichi	0.54**	0.67**
Zusanli and Dazhui	0.42*	0.56**
Quichi and Dazhui	0.09	0.64**

* correlation coefficient statistically significant.
** correlation coefficient statistically highly significant.

In the face of the fact that the investigations were carried out on animals which did not show any clinical signs of a disease, it is worth noticing that the coefficients of variability for the group of mature foxes are more or less twice higher than in the group of young foxes. No tendency for the change of the values of electric potentials with age was observed in the group of mature foxes. Possibly it results from the fact that after full development of the immune system, the age is not a factor differentiating the values of the potentials. Of course, such an assumption needs to be verified on a bigger number of animals. On the basis of the obtained results, one can assume that in the future prophylactic stimulation of the immune system during the critical period (7-12 weeks of age) an individual dosage of stimulation will not be necessary.

Further investigations in this field should aim at building a standard formula of the stimulation dose which would be common for the whole herd or even the whole species. If there exist significant dependencies between the values of electric potentials at different points, then it should reflect on a dose of

stimulation. Thus it seems possible to find a constant proportion between the stimulation dose at different points. Working out such a standard would decrease labour consumption of acupuncture as a method of immunity stimulation in animals.

However, if further investigations show the uselessness or impossibility of working out a standard for stimulation, the correlation from Table 2 could be of importance for diagnostic purposes. It means, that if these dependencies were confirmed, then in order to determine the functional state of the immune system it would be enough to measure the electric potentials only in some points chosen from all responsible for immunity.

Conclusions.

1. Highly significant differences were observed in the values of electric potentials at the points Hegu (LI 4), Zusanli (ST 36), Quichi (LI 11), and Dazhui (SI 24) between the groups of young and mature foxes.
2. Coefficients of variability of electric potentials in young foxes were nearly twice lower than in the group of mature foxes.
3. Correlations between the values of electric potentials at particular points are quite high in the group of mature foxes.
4. It would be useful, in case of veryfying the results of the present investigations, to aim the future ones at working out a model of the prophylactic dose of acupuncture stimulation of the immune system in young polar foxes aged 7 to 12 weeks.
5. The present investigations could be a base for future research aiming at finding the dependency between the functional state of the immune system of healthy and ill animals and the values of electric potentials at REPP and also finding representative points which characterize this state in the best way.

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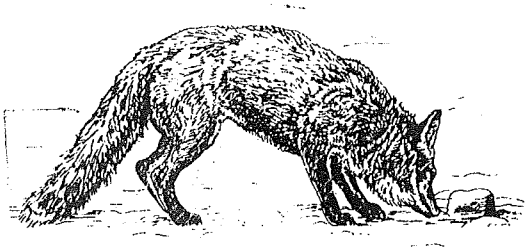

Original Report.

Changes in the white picture of blood after the electropuncture stimulation of Dazhui, Hegu, and Zusanli points in young polar foxes.

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Summary.

Electroacupuncture stimulation of the points responsible for immunity, namely Hegu, Zusanli and Quichi was applied for the purpose of the investigation. The experimental material comprised 32 fox cubs aged 7 weeks. The acupuncture points were stimulated with the help of Racomp II apparatus. An increased level of leucocytes was observed after applying the stimulation at the points Hegu, Zusanli and Quichi up to 39th day. After the procedure, the changes in the per cent composition of leucocytes were observed. First, an increase of the number of neutrophils and a decrease of the number of lymphocytes were observed while later there was an increase of the lymphocyte number.

Introduction.

The present experiment is a trial of increasing the immunity of young foxes after their weaning. An attempt at using the method of electroacupuncture in order to increase immunity was undertaken. Acupuncture electrostimulation was applied at the points responsible for immunity, namely Hegu, Zusanli and Quichi (1, 2, 3, 4, 5).

Material and methods.

The experimental part was carried out at the polar and silver fox farm at Duchnice near Ozarow from June to September 1988.
The experimental material comprised 32 polar fox cubs aged 7 weeks and originating from 4 litters of the dams marked as W.516, W.1804, Z.724 and A.678. For the purpose of the experiment 4 males and 4 females were chosen from each litter.

The control and experimental groups comprised 8 animals each. The control group included 8 cubs, 2 from each litter (one male and one female). The foxes were fed in accordance to traditional system accepted on farms in Poland.

The cubs were kept in the pavillon type cages.

The acupuncture points were found with the help of Acupuncture Expert System produced by Soft Electronic, Szczecin - Racomp II. It is a device worked out on the basis of ZX Spectrum computer together with the interface with a program based on the Ryodoraku method (1, 2, 3, 4).

In the experiment carried out in the control group, the electroacupuncture stimulation was applied at points nonspecific for immunological reaction (placebo) situated in the region of gluteal muscles (5, 6).

In the experimental group electroacupuncture was applied at the specific points (5): Dazhui (SI 14), Hegu (LI4) and Zusanli (ST 36).

Racomp II electrodes were connected to the interface producing the current of 12V and 20mA and 10 HZ frequency.

The time of stimulation of a point in the control and experimental group amounted to 10 min.

Blood was collected after cutting off a claw of a digit in a limb prior to and after 3, 7, 14, 25, 39 and 53 days since the stimulation.

The number of white blood cells was determined and the qualitative picture of those cells was evaluated (according to *Arneth Schilling*).

The results were evaluated statistically using the t-Student test at the level of significance $p = 0.05$ and $p = 0.01$.

Results and discussion.

Table 1 shows the leucocyte level; from the 3rd days after the electrostimulation of the Dazhui (SI 14) point an increase of the leucocyte level can be observed. The increase of the leucocyte level is observed up to 39th day after the procedure (Table 1). In 53 days after the procedure of electrostimulation of the Dazhui point the results become insignificant.

Table 1. The level of leucocytes (in thousands) in young polar foxes after the electroacupuncture of the Dazhui (SI 14) point.

Date of reading	Control group X	Control group V (%)	Experimental group X	Experimental group V (%)
Prior to the stimulation	7.925	9.6	7.962**	7.7
3 days after the stimulation	8.837	14.8	15.931**	12.0
7 days after the stimulation	8.781	7.5	15.581**	4.3
14 days after the stimulation	8.581	19.3	14.781**	2.6
25 days after the stimulation	9.000	13.5	13.512**	3.4
39 days after the stimulation	10.756	5.03	13.969**	4.6
53 days after the stimulation	9.7063	12.7	9.069	11.0

x = the mean value of the leucocyte level in 1 mm^3 of blood.
V = the coefficient of variability.
** = the differences statistically highly significant p = 0.01.

Table 2 shows the leucocyte level after the electrostimulation of the Hegu (LI 4) point. From the 3rd day a significant increase of the leucocyte level is observed which persists

Table 2. The level of leucocytes (in thousands) in young polar foxes after the electroacupuncture of the Hegu (LI 4) point.

Date of reading	Control group X	Control group V (%)	Experimental group X	Experimental group V (%)
Prior to the stimulation	7.925	9.6	8.162	22.4
3 days after the stimulation	8.837	14.8	15.325**	5.7
7 days after the stimulation	8.781	7.5	14.419**	5.2
14 days after the stimulation	8.581	19.3	16.194**	12.3
25 days after the stimulation	9.000	13.5	13.812**	13.5
39 days after the stimulation	10.756	5.03	12.100**	9.7
53 days after the stimulation	9.7063	12.70	9.450	10.04

x = the mean value of the leucocyte level in 1 mm^3 of blood.
V = the coefficient of variability.
** = the differences statistically highly significant p = 0.01.

Table 3. The level of leucocytes (in thousands) in young polar foxes after the electroacupuncture of the Zusanli (ST 36) point.

Date of reading	Control group X	Control group V	Experimental group X	Experimental group V
Prior to the stimulation	7.925	9.6	8.731	18.0
3 days after the stimulation	8.837	14.8	15.337**	4.4
7 days after the stimulation	8.781	7.5	14.694**	3.7
14 days after the stimulation	8.581	19.3	16.256*	14.0
25 days after the stimulation	9.000	13.5	13.537**	4.1
39 days after the stimulation	10.756	5.03	14.675**	8.9
53 days after the stimulation	9.7063	12.70	9.300	14.0

x = the mean value of the leucocyte level in 1 mm^3 of blood.
V = the coefficient of variability.
** = the differences statistically highly significant p = 0.01.

to 39th day after the stimulation. In 53 days the results are insignificant. The level of leucocytes after the electroacupuncture of the Zusanli (ST 36) point is presented in Table 3. In 3 days after the procedure a significant increase of leucocytes is observed which persists up to 39th day after the stimulation. In 53 days the results are insignificant (Table 3).

Table 4 presents the results of the per cent

Table 4. The per cent composition of leucocytes in 7 week old polar foxes after the electroacupuncture of the Dazhui (SI 14) point.

Date of reading	R C	R Ex	S C	S Ex	L C	L Ex	E C	E Ex	M C	M Ex
Prior to the stimulation	-	-	41.80	41.50	50.00	48.50	6.16	6.50	1.88	3.50
3 days after the stimulation	-	-	37.15	55.33	55.12	40.13	5.50	2.1	2.50	2.25
7 days after the 'stimulation	-	-	33.25	49.60	47.50	43.03	9.25	5.00	4.00	2.00
14 days after the stimulation	-	-	34.26	47.00	59.00	44.25	5.87	7.12	1.87	1.60
25 days after the stimulation	-	-	37.26	42.00	56.00	49.25	5.88	6.12	1.86	2.60
39 days after the stimulation	-	-	36.26	40.00	57.00	50.25	4.88	5.12	2.86	3.60
53 days after the stimulation	-	-	35.13	33.87	66.00	57.12	3.87	7.75	2.00	1.25

R = rod-shaped neutrophils, S = segmented neutrophils, L = lymphocytes,
E = eosinophils, M = monocytes, C = control group, Ex = experimental group.

composition of leucocytes after the electroacupuncture of the Dazhui (SI 14) point. In 3, 7 and 14 days after the procedure one could observe an increase of segmented neutrophils and a decrease of lymphocytes. In 25 days since the procedure the amount of lymphocytes increases and the amount of neutrophils decreases. Such a picture can be observed up to 53rd day since the stimulation (Table 4).

Table 5 presents a per cent composition of leucocytes after the simulation carried out at the point Hegu (LI 4). Firstly, 3 days after the procedure, the amount of segmented neutrophils increases. This increase persists up to the 7th day and in 14 days the amount of lymphocytes starts to increase and the number of neutrophils. The increase of lymphocytes is observed up to 53 days after the procedure (Table 5).

Table 5. The per cent composition of leucocytes in 7 week old polar foxes after the electroacupuncture of the Hegu (LI 4) point.

Date of reading	R C	Ex	S C	Ex	L C	Ex	E C	Ex	M C	EX
Prior to the stimulation	-	-	41.80	38.50	50.00	51.50	6.16	5.50	1.88	4.50
3 days after the stimulation	-	-	37.15	52.30	55.12	43.10	5.50	3.1	2.50	1.55
7 days after the stimulation	-	-	33.25	50.00	47.50	45.30	9.25	2.2	4.00	2.55
14 days after the stimulation	-	-	34.26	43.00	59.00	52.30	5.87	1.20	1.87	3.55
25 days after the stimulation	-	-	37.26	39.00	56.00	56.30	5.88	2.20	1.86	2.50
39 days after the stimulation	-	-	36.26	38.00	57.00	57.00	4.88	2.50	2.86	2.50
53 days after the stimulation	-	-	35.13	35.00	66.00	60.00	3.87	2.00	2.00	3.00

R = rod-shaped neutrophils, S = segmented neutrophils, L = lymphocytes, E = eosinophils, M = monocytes, C = control group, Ex = experimental group.

The per cent composition of leucocytes after the electroacupuncture of the Zusanli (ST 36) point is presented in Table 6.

In 3 and 7 days there is an increase of segmented neutrophils and a decrease of lymphocytes. In 14 days an increase of lymphocytes is observed. This increase persists through all the dates of reading up to 53rd day after the procedure (Table 6).

The obtained results of electroacupuncture stimulation of the skin at the points Dazhui, Hegu and Zusanli in 7 week old polar foxes are similar to those obtained after the procedure performed at the Quichi point by *Sciesinski and Frindt (1988)*.

Conclusions.

1. An increased level of leucocytes has been observed in young polar foxes after the electroacupuncture of Dazhui, Hegu and Zusanli points. The leucocytosis persists until 39th day after the procedure.

Table 6. The per cent composition of leucocytes in 7 week old polar foxes after the electroacupuncture of the Zusanli (ST 36) point.

Date of reading	R C	R Ex	S C	S Ex	L C	L Ex	E C	E Ex	M C	M Ex
Prior to the stimulation	-	-	41.80	40.50	50.00	47.50	6.16	5.50	1.88	5.50
3 days after the stimulation	-	-	37.15	48.50	55.12	39.50	5.50	5.50	2.50	6.50
7 days after the stimulation	-	-	33.25	45.50	47.50	42.50	9.25	9.25	4.00	4.50
14 days after the stimulation	-	-	34.26	43.50	59.00	45.50	5.87	5.87	1.87	6.50
25 days after the stimulation	-	-	37.26	40.50	56.00	47.50	5.88	4.50	1.86	7.50
39 days after the stimulation	-	-	36.26	36.50	57.00	51.50	4.88	3.50	2.86	7.50
53 days after the stimulation	-	-	35.13	33.50	66.00	54.50	3.87	4.40	2.00	7.80

R = rod-shaped neutrophils, S = segmented neutrophils, L = lymphocytes, E = eosinophils, M = monocytes, C = control group, Ex = experimental group.

2. After the procedure, some changes in the per cent composition of leucocytes were observed in young foxes. First, in 3 and 7 days after the stimulation of the Hegu point, there were observed an increase of neutrophils and a decrease of lymphocytes, while from 14th day one can observe an increase of lymphocytes which persists up to 53rd day after the procedure.

3. After the electrostimulation of the Dazhui point, the increase of neutrophils was observed in 3, 7 and 14 days after the procedure. In 25 days there is an increase of the amount of lymphocytes which persist upto 25th day after the procedure.

4. The increase of neutrophils was observed after the procedure at the Zusanli point in 3, 7, 14 and 25 days while after 39 and 53 days an increase of lymphocytes was observed.

5. The changes in the level and composition of leucocytes in young polar foxes after the electroacupuncture performed at the Dazhui, Hegu and Zusanli points present a possibility of using this procedure as a practical methods increasing the immunity of animals.

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The author would like to express their sincere gratitude to the management of the Agricultural Productive Cooperative Duchnice and in particular to Ms. Barbara Szczepkowska, the manager of the polar and silver fox farm for their cooperation in carrying out the research.

In-vitro secretion of prolactin and growth hormone in the presence of melatonin by pituitary gland from mink kept under long or short days.

M. Meunier, P. Brebion, N. Chêne, J.-L. Servely, L. Martinet.

Mink anterior pituitaries were incubated in Medium 199 for up to 9 or 13 days. Biological activity of prolactin and GH was determined. Daily concentrations of prolactin and GH in the incubation medium were also measured by radioimmunoassay and radioreceptor assay. When females were kept under short days for several weeks before the experiment, a significant decrease in prolactin secretion by the anterior pituitary was observed as compared with that in females maintained under long days. In contrast, secretion of GH was not modified by the photoperiodic history of the animals. Pineal gland denervation by ablation of the superior cervical ganglia a few months before the experiment, or addition of melatonin to the incubation medium of anterior pituitaries from intact or ganglieonectomized females, did not modify the secretion of prolactin and GH. The pituitary gland does not therefore seem to be a direct target site for melatonin in transducing the duration of daylength on the hypothalamo-pituitary axis.

J. Endocr., 119, 287-292, 1988. 1 table, 2 figs., 27 references. Authors abstract.

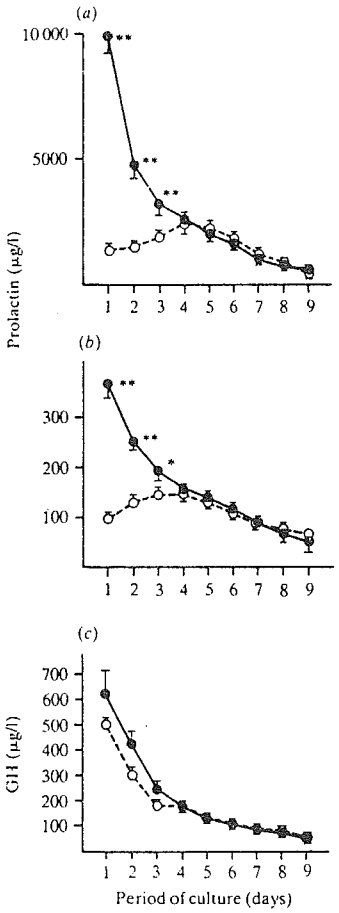


FIGURE 1. Secretion of (*a* and *b*) prolactin and (*c*) GH by pituitaries from female mink maintained under long (solid lines; $n = 7$) or short (broken lines; $n = 11$) days. Prolactin concentrations were measured by (*a*) radioimmunoassay and (*b*) radioreceptor assay. Values are means ± S.E.M. $*P < 0{\cdot}01$, $**P < 0{\cdot}005$ compared with animals kept under short days (*t*-test).

Metal and anionic macromolecular binding capacity and hair depigmentation in mink by Vantocil 1B, a biguanidine polymer.

Nelly Blumenkrantz, Georg Hillemann.

Minks receiving feed added a biguanidine polymer as antiviral-antibacterial agent and whose dam received the same feed during gestation and lactation period, showed depigmentation of the underfur. The biguanidine is shown to dissolve melanin and to be able to chelate copper, iron and zinc ions, the two former required for melanogenesis. Possible sites of interference with melanogenesis are discussed. The product added (a cationic compound), is shown to bind with anionic polymers, i.e. DNA, RNA and GAG. Possible "in vivo" influence of this binding on

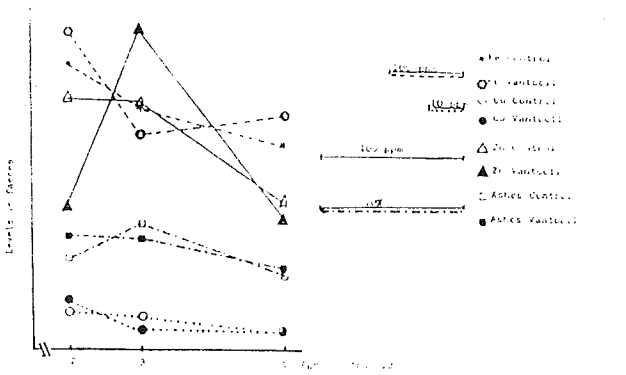


Fig. 1. Content of copper, iron and zinc in faeces of young kits that received control and Vantocil added diets and whose mothers received similar feed during gestation and lactation periods. Slightly increased excretion of iron, copper and zink at 3 months of age under the effect of Vantocil was observed.

biosynthesis of proteins and connective tissue components is discussed.

Acta Agric. Scand., 39, 217-227, 1989. 8 tables, 1 fig., 30 references. Author's summary.

Effect of an energy reduced feeding on quality and connective tissue components of mink skin.

Nelly Blumenkrantz, R. Sandø Lund.

Diets formulated to contain similar chemical components but different caloric level were administered from July to December to minks of the same age and strain divided into 2 groups. During the first 2 months the animals received exactly the same feeding. From September 1, with monthly changes in the caloric intake level, controls received 19%, 15%, 8% and 4% more calories than the experimental minks which were maintained at the same caloric feeding level from August to December. Results of the experiment indicated a feeding related clear biochemical topographical difference between tail and dorsal skin with decreased content of hexuronic ac. UA-GAG, Pro, Hyp, Hyl, water and fat (increased % DDS) in both locations under the restricted feeding. Reduction of fur quality was found in the reduced-feeding group. Results are discussed on the basis of importance of location and addition of new parameters for objective evaluation of skin quality, until today evaluated only subjectively.

Acta Agric. Scand., 39, 235-241, 1989. 4 tables, 17 references. Author's summary.

Effect of dietary addition of fish silage, rapeseed meal or Vantocil on mink dermal connective tissue components and fur quality.

Nelly Blumenkrantz, Georg Hillemann.

Connective tissue components of samples from skin of minks submitted to 4 different feedings, i.e. (1) control diet, (2,3, and 4) control diet added respectively filleting scrap as silage; rape-seed meal and Vantocil, a biguanidine product, were analyzed. Skin of animals receiving rape-seed oil (glycosinolates) showed increased content of water, GAG, Hyp, Hyl and decreased fat and Pro, those receiving Vantocil did not show increase of Hyl and those receiving fish silage showed decrease of water and increase of glycosaminoglycans GAG in relation to the control-fed group. Increased fur quality was exhibited by the Vantocil-fed group only. Different content of water was found in skins ready to be sold. Differences in GAG type content, specially hyaluronic acid, known to present high water binding capacity, is suggested. Some of the effects observed are discussed as the result of thyroidal deficiency induced by glycosinolate metabolism.

Acta Agric. Scand. 39, 229-234, 1989. 6 tables, 11 references. Author's summary.

Reactivity of eleven anti-human leucocytes monoclonal antibodies with lymphocytes from several domestic animals.

Bent Aasted, Merete Blixenkrone-Møller, Else Bang Larsen, Helle Bielefeldt Ohmann, Ruth Buemann Simesen, Åse Uttenthal.

Nine commercially available monoclonal antibodies and two monoclonal antibodies from The American Type Culture Collection, raised agains various human leucocyte surface antigens, were tested on lymphocytes from cow, sheep, goat, swine, horse, cat, dog, mink, and rabbit as well as man.

Four antibodies bound to lymphocytes from some of the animals. These were the antibodies against CD8 and CD4 antigen, the antibody to C3b-receptor, and the antibody to the HLA-DR antigen. The CD8 antigen-reactive antibody reacted with lymphocytes from mink, cat, dog, and sheep, while the CD4 antigen-reactive antibody reacted with lymphocytes from mink. The anti C3b-R antibody reacted with lymphocytes from horse, swine, dog, and cat, and the anti-HLA-DR reacted with lymphocytes from

cow, goat, sheep, horse, dog, cat, and mink.

Veterinary Immunology and Immunopathology, 19, 31-38, 1988. 1 table, 2 figs., 4 references. Authors abstract.

Emesis, radiation exposure, and local cerebral blood flow in the ferret.

U.I. Tuor, M.H. Kondysar, R.K. Harding.

We examined the sensitivity of the ferret to emetic stimuli and the effect of radiation exposure near the time of emesis on local cerebral blood flow. Ferrets vomited following the administration of either apomorphine (approx. 45% of the ferrets tested) or peptide YY (approx. 36% of those tested). Exposure to radiation was a very potent emetic stimulus, but vomiting could be prevented by restraint of the hindquarters of the ferret. Local cerebral blood flow was measured using a quantitative autoradiographic technique and with the exception of several regions in the telencephalon and cerebellum, local cerebral blood flow in the ferret was similar to that in the rat. In animals with whole-body exposure to moderate levels of radiation (4 Gy of ^{137}Cs), mean arterial blood pressure was similar to that in the control group. However, 15-25 min following irradiation there was a general reduction of local cerebral blood flow ranging from 7 to 33% of that in control animals. These cerebral blood flow changes likely correspond to a reduced activation of the central nervous system.

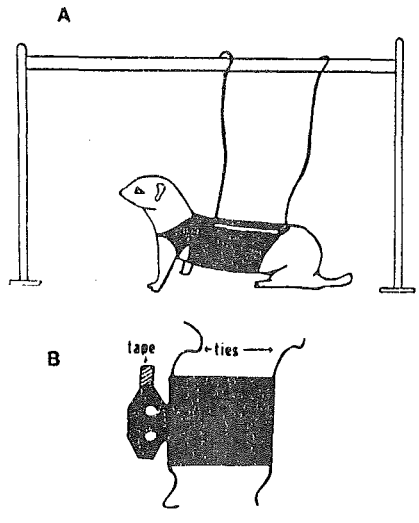


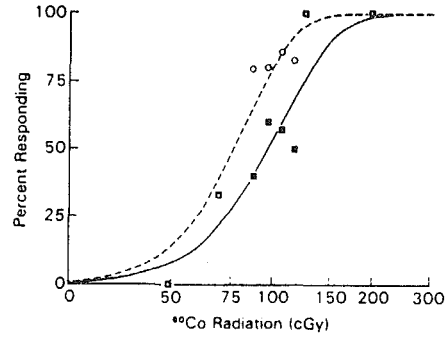
FIG. 1. (A) Restraint of the ferret by a sling tethered to a stand. The front and hind legs are allowed to move freely. (B) Design of the sling. The forelegs of the ferret are inserted through holes at the front end of the sling which is then wrapped around the ferret and secured with a piece of surgical tape and ties. The ties are secured to the cross bar of the stand.

Radiation Research, 114, 537-549, 1988. 6 figs., 4 tables, 23 references. Authors' summary.

Characterization of Radiation-induced Emesis in the Ferret.

Gregory L. King.

Forty-eight ferrets (*Mustela putorius furo*) were individually head-shielded and radiated with bilateral ^{60}Co τ radiation at 100 cGy min^{-1} at doses ranging between 49 and 601 cGy. The emetic threshold was observed at 69 cGy, the ED_{50} was calculated as 77 cGy, and 100% incidence of emesis occurred at 201 cGy. With increasing doses of radiation, the latency to first emesis after radiation decreased dramatically, whereas the duration of the prodromal period increased. Two other sets of experiments suggest that dopaminergic mechanisms play a minor role in radiation-induced emesis in the ferret. Twenty-two animals were injected either intravenously or subcutaneously with 30 to 300 μg/kg of apomorphine. Fewer than 50% of



Dose (Gy)	0.49	0.69	0.88	0.98	1.08	1.17	1.27	2.01
Emesis	0/2	1/3	2/5	4/5	4/7	3/6	2/2	6/6
Emesis and/or Retching	0/2	1/3	4/5	4/5	6/7	5/6	2/2	6/6

FIG. 2. Weibull distribution of ferret emetic response to ^{60}Co radiation. Population dose response is calculated by the Weibull model) of the percentage of animals responding to distinct radiation doses with episodes of either emesis only (■) or emesis and retching (nonproductive emesis (○)). Overlapping data are indicated by the (◧). Dashed and solid lines are fit by computer program. Lower table: Number of animals in each group responding to distinct radiation doses (upper ribbon of panel).

the animals vomited to 300 μg/kg apomorphine; central dopaminergic receptor activation was apparent at all doses. Another eight animals received 1 mg/kg domperidone prior to either 201 (n = 4) or 401 (n = 4) cGy radiation and their emetic responses were compared with NaCl-injected-irradiated controls (n=8). At 201 cGy, domperidone significantly reduced only the total time in emetic behavior. At 401 cGy, domperidone had no salutary effect on radiation-induced emesis. The emetic responses of the ferret to radiation and apomorphine are compared with these responses in other vomiting species.

Radiation Research, 114, 599-612, 1988. 4 figs., 4 tables, 47 references. Author's summary.

The brain stem localization of vagal preganglionic neurones in the ferret, Mustela putorius furo.

D.J. Withington-Wray, K.M. Spyer.

Horseradish peroxidase-wheatgerm agglutinin was injected into the cervical vagus nerve of adult ferrets. Efferent fibres coursing in the vagus nerve were shown to originate in the dorsal vagal motor nucleus (DmnX), the nucleus ambiguus (nA), a region ventral to the nucleus ambiguus (VnA) and the reticular formation between DmnX and nA. The distribution of Vagal preganglionic neurones in the ferrets is compared with data already obtained in similar studies conducted in other mammals.

Quarterly Journ. Expt. Physiology, 73, 439-441, 1988. 1 fig., 8 references. Authors' summary.

Cyclic modulation of Sertoli Cell junctional complexes in a seasonal breeder: The mink (Mustela vison).

R.-Marc Pelletier.

The development and modulation of Sertoli cell junctions was studied in newborn and adult mink during the active and inactive spermatogenic phases. The techniques used were electron microscopy of freeze-fractured replicas and thin sections of tissues infused with horseradish peroxidase as a junction permeability tracer. In the newborn, freeze-fractured developing junctions had either spherical or fibrillar particles. In addition, junctional domains where particles were associated preferentially with the E-face, and others where particles were associated preferentially with the P-face, were found developing either singly or conjointly within a given membrane segment, thus yielding a heterogeneous junctional segment. Coincidently with the development of a tubular lumen and the establishment of a competent blood-testis barrier, junctional strands were composed primarily of particulate elements associated preferentially with the E-face. In adult mink during active spermatogenesis, cell junctions were found on the entire lateral Sertoli cell plasma membrane from the basal to the luminal pole of the cell. In the basal third of the Sertoli cell, membranous segments that faced a spermatogonium or a migrating spermatocyte displayed forming tight, gap, and adherens junctions. In the middle third, abutting membrane segments localized above germ cells were involved in continuous zonules and in adherens junctions. In the apical or luminal third, the zonules were discontinuous, and the association of junctional particles with the E-face furrow was lost. Gap junctions increased in both size and numbers. Junctional vesicles that appeared as annular gap and tight-junction profiles in thin sections or as hemispheres in freeze-fracture replicas were present. Reflexive tight and gap junctions were formed through the interaction of plasma membrane segments of the same Sertoli cell. Internalized junctional vesicles were also present in mature spermatids. During the inactive spermatogenic phase, cell junctions were localized principally in the basal third of the Sertoli cell; junctional strands resembled those of the newborn mink. During the active spermatogenic phase, continuous zonules were competent in blocking passage of the protein tracer. During the inactive phase the blood-testis barrier was incompetent in

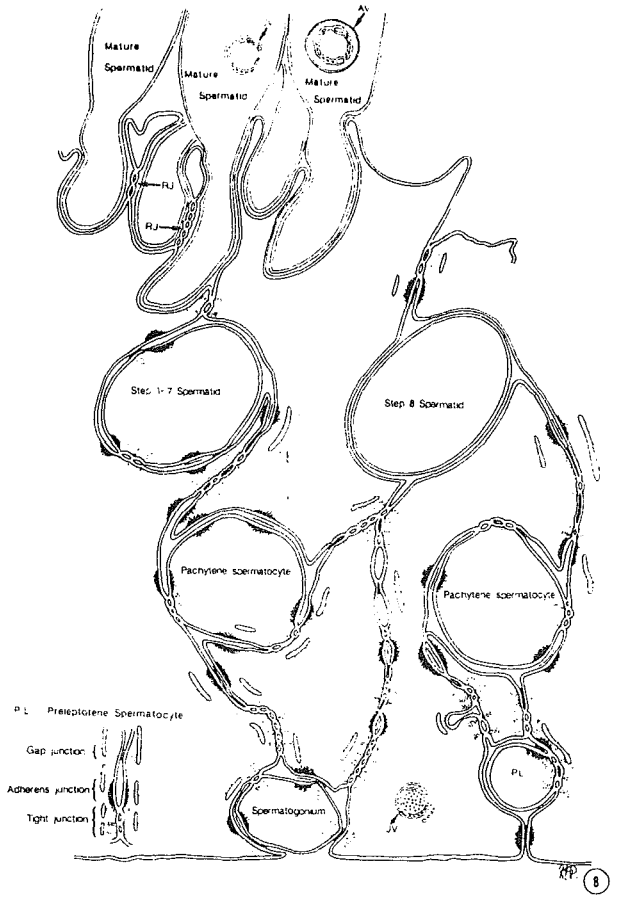


Fig. 8. Diagrammatic representation of stage VII of the cycle of the seminiferous epithelium from an adult mink as viewed in thin section during the active spermatogenic phase. Sertoli cell gap, tight, and adherens junctions are illustrated on the entire lateral plasma membrane of a Sertoli cell from the base to the apex. Some of the cell junctions involve adjoining Sertoli cell membranous segments; others involve germinal and Sertoli cell membranous segments. Only the plasma membrane of the germ cells is represented. Three internalized junction vesicles (JV) are represented at the apex and at the base of the seminiferous epithelium. At the apex, junction vesicles are present within the spermatid cytoplasm. One vesicle is free; the other is included in an autophagic vacuole (AV). At the base, a junction vesicle is represented within the Sertoli cell cytoplasm and in association with lysosomelike structures. RJ, reflexive junction.

blocking entry of the tracer into the seminiferous epithelium. It is proposed that modulation of the Sertoli cell zonules being formed at the base and dismantled at the apex of the seminiferous epithelium follows the direction of germ cell migration and opposes the apicobasal direction of junction formation reported for most epithelia. The arrest of spermatogenesis coincides with dramatic changes in the dynamic modifications of Sertoli cell zonules.

Am. Journ. of Anatomy, 183, 68-102, 1988. 48 figs., 134 references. Author's abstract.

Peptidergic neurohormonal systems in the basal hypothalamus of the ferret and the mink: Immunocytochemical study of variations during the annual reproductive cycle.

L. Boissin-Agasse, G. Alonso, G. Roch, J. Boissin.

The hypothalamic systems secreting corticotropin-releasing hormone (CRF), somatostatin, oxytocin, vasopressin and luteinizing hormone-releasing hormone (LHRH) were characterized using immunochemistry, and variations were studied in relation to the recrudescence of testicular activity in the ferret and the mink, two species with opposite photoregulation of their annual reproductive cycles. Under the present conditions of study, the immunoreactivity of the CRF, somatostatin, and oxytocin systems showed no significant variation in either species.

In contrast, in these two species, the immunoreactivity of the LHRH system varied considerably depending on the date of observation. The increase in the number and immunoractivity of the LHRH-secreting neurons that occurred in November in the mink and in January in the ferret, is in agreement with previous results showing that the photoperiod plays an essential role in regulating the annual activity of the testis and that the photoperiodic environmental conditions required for the activation of the LHRH system differ between the species.

Similarly, correlations could be found between an increase in immunoreactivity of the vasopressinergic axons projecting to the external median eminence and the recrudescence of testicular activity.

Cell and Tissue Research, 251, 153-159, 1988. 3 figs., 48 references. Authors' summary.

The arteries of the base of the brain in coypu, Myocastor coypus (Molina).

Tadeusz Roskosz, Cezariusz Wiland, Jerzy Malinski.

The investigations were carried out on 25

brains of animals of both sexes and different age. The arteries were filled with latex through the thoracic aorta. After fixing the material in 5% formalin, the bones of the skull were decalcified in 5% hydrochloric acid. Then the meninges were prepared uncovering the arteries of the brain base. It has been observed that the main source of vascularization of the brain in coypu is the basilar artery being the continuation of the vertebral arteries, the terminal branches of which form the cerebral arterial circle. The endings of the underdeveloped internal carotid arteries divide in the arms of this circle into segments corresponding to the caudal communicating artery and the cranial cerebral artery.

Ann. Warsaw Agric. Univ. - SGGW-AR, Vet. Med., 13, 11-16, 1986. 8 figs., 15 references. In ENGL. Su. POLH. Authors' abstract.

The olivary nuclei in blue fox (Alopex lagopus L.).

Marek Jastrzebski, Zbigniew Milart, Anna Bujak.

The cellular structure and topography of the olivary nuclei in blue fox have been described on the basis of histological examination of paraffin sections of medulla oblongata. The sections were stained with Klüver-Barrer's method. The structure of the olivary nuclei in blue fox most strongly resembles such nuclei in dog. As compared to other species, their localization is more forward within the medulla oblongata and the nuclei are characterized by a strong development of the accessory dorsal olivary nuclei.

Ann. Warsaw Agric. Univ. - SGGW-AR, Vet. Med., 13, 35-40, 1986. 9 figs., 6 references. In ENGL. Su. POLH. Authors' abstract.

A tethered-restraint system for blood collection from ferrets.

Robert K. Jackson, Victor A. Kieffer, Jerome J. Sauber, Gregory L. King.

The laboratory ferret, *Mustela putorius furo*, recently has come into prominence as a laboratory animal for use in biomedical research.

Previously described methods for blood collection in this species (toenail clip, retro-orbital or cardiac puncture, caudal tail or jugular venipuncture and bleeding from the ventral tail artery) all require chemical or physical restraint. These restraint methods are not well suited for studies in which an active response is to be observed during blood withdrawal or drug administration.

This report describes a method of tethered-restraint for the ferret in which an in-dwelling venous jugular catheter is implanted for withdrawing blood samples.

Each animal was caged individually and fitted with a modified guinea pig harness and tether produced by Alice King Chatham Medical Arts. The harness fit around the animal's upper torso and was attached to a stainless-steel flexible-spring tether through which the catheter was threaded. The distal end of the tether was connected to a miniature fluid swivel which was attached to the catheter and was clamped to the cage top. The only rotation occurred between the swivel shaft and the housing of the swivel. This arrangement prevented twisting or kiking of the catheter. The system restricted

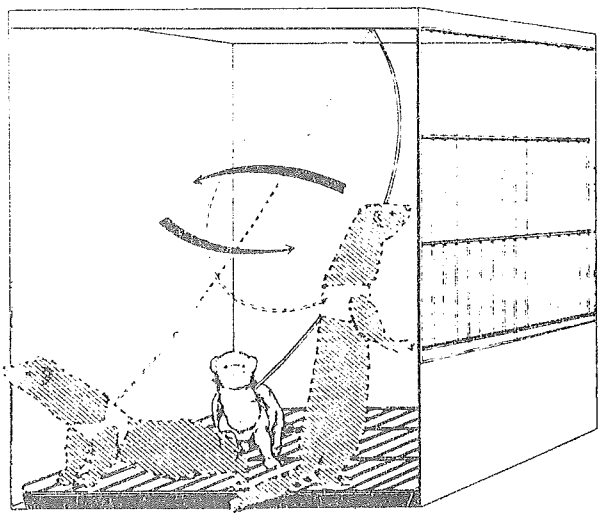


Figure 1 The length of the tether is sufficient to allow the ferret access to all areas of the cage. The system restricts movement somewhat, but does not interfere with normal activity once the ferret has become accustomed to tethered-restraint.

movement somewhat, but did not interfere with normal activity once the animals became accustomed to tethered-restraint.

In conclusion, we find that ferrets easily adapt to the tethered-restraint system, and that the behavior of tethered ferrets is not discernibly different from non-tethered ferrets. Additionally, tethered-restraint allows blood samples to be drawn by one person, reduces the stress normally associated with other means of physical restraint, and avoids the need for tranquilization or sedation during sampling.

Lab. Animal Science, 38, 5, 625-628. 1 fig., 14 references. Abstracted by G. Jørgensen.

Selecting biochemical blood plasma parameters of male nutrias during postnatal ontogenesis.

P. Jelinek, J. Illek.

Selected biochemical parameters of blood plasma (total protein, fraction of albumins, alpha globulin, beta and gamma globulins, urea content, activity of alkaline phosphatase, AST and ALT, concentrations of glucose, calcium, magnesium, inorganic phosphorus, copper and manganese) of male nutrias of standard breed are presented. The animals were allocated to 10 age groups from 1 to 300 days of age. The results obtained in individual age categories were mathematico-statistically evaluated.

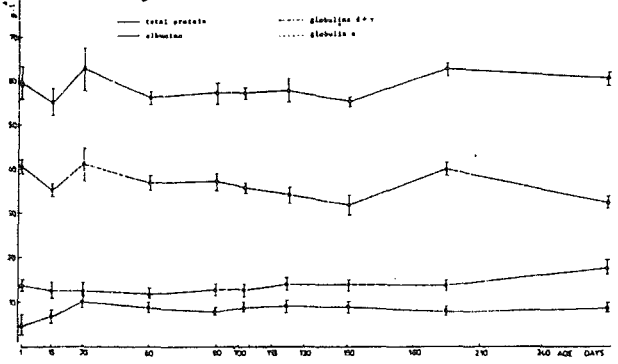


Fig. 1. Total protein, albumins, alpha globulins and beta + gamma globulins in the blood plasma of nutrias aged 1 to 300 d.

Acta Vet. Brno, 56, 41-52, 1987. 8 figs., 26 references. In ENGL. Su.: CZEC, RUSS. Authors' abstract.

Cholinesterase activities in uterus of normal and fenchlorphos treated blue foxes (Alopex lagopus) during various reproductive states.

Gunnar N. Berge, Sigrun H. Sterri, Nils E. Søli.

The uterine acetylcholinesterase and total cholinesterase (acetylcholinesterase plus butyrylcholinesterase) activities in normal and fenchlorphos treated blue fox vixens were determined during various reproductive states.

AChE and Total-ChE of non-medicated vixens in oestrus were about one half of those in anoestrus. In pregnant uteri (luteal phase) the activities were 25% and 30% compared to anoestrus.

In vixens given 100 mg/kg fenchlorphos for 3 weeks during anoestrus, the remaining activity of AChE in uterus were in average 37%. Pregnant and non-pregnant vixens in the luteal phase medicated prior to mating and during time of implantation, displayed AChE activities which were only moderately reduced (remaining activities 83% and 72% compared to medicated animals in anoestrus: remaining activity 37%).

Plasma ChE-activity increased during pregnancy in the controls while enzyme activity was strongly reduced in animals given 100 mg/kg fenchlorphos daily through the whole pregnancy.

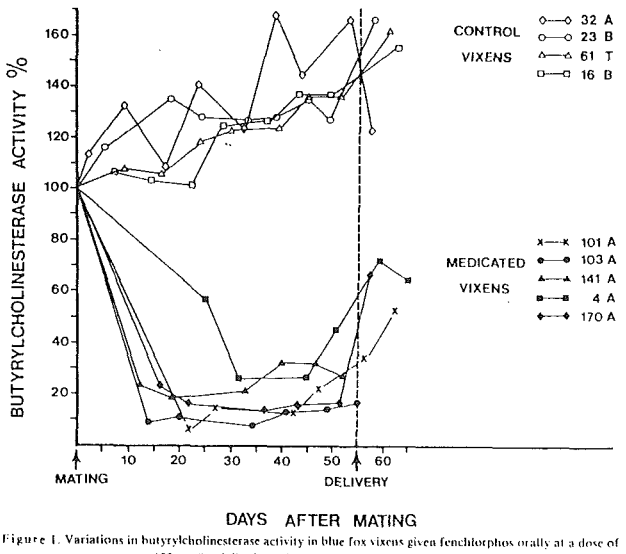


Figure 1. Variations in butyrylcholinesterase activity in blue fox vixens given fenchlorphos orally at a dose of 100 mg/kg daily throughout pregnancy. Experiment IV

It was concluded that the previous reported embryotoxic effect of fenchlorphos in the blue fox did not seem to be directed towards the moderate inhibition of the uterine cholinesterases.

Acta Vet. Scand., 29, 117-123, 1988. 3 tables, 1 fig., 19 references. In ENGL. Su: NORW. Authors' summary.

The effect of adrenocorticotropin on the progesterone plasma level and the progesterone production in the female silver foxes adrenal glands in vitro.

L.V. Osadchuk.

The plasma progesterone increased following a single injection of ACTH (3 ME/kg). The progesterone production was also increased by ACTH after incubation of adrenals in vitro. The data suggest that the adrenal glands of female silver foxes are capable not only for secreting progesterone, but also of responding to ACTH with a further increase in the progesterone secretion.

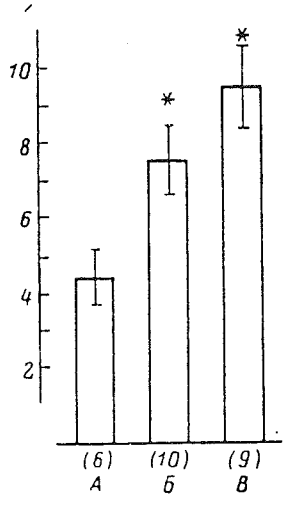


Рис. 2. Влияние АКТГ на продукцию прогестерона надпочечниками в условиях in vitro.

По вертикали — продукция прогестерона, нг/100 мг ткани/ч. *А* — контроль; *Б*, *В* — добавка соответственно 0.5 и 1.0 ед АКТГ на 100 мг ткани. Остальные обозначения те же, что и на рис. 1.

Fiziologicheskij Zhurnal SSSR, 74, 7, 1015-1019, 1988. 2 figs., 17 references. In RUSS. Su. ENGL. Author's summary.

Thermoregulatory significance of basking behaviour in the raccoon dog (Nyctereutes procyonoides).

Mikko Harri, Hannu Korhonen.

1. The raccoon dogs frequently basked in spring while keeping their dark chest area towards the sun. The importance of this behaviour for the thermal balance was examined by using a cylinder model, and the results were compared with that of the blue fox which has pale chest and no basking behaviour.

2. With no external radiation source, cooling rates of blue fox and raccoon dog models were almost equal, while in the sunshine with the chest area towards the sun, raccoon dog gained and blue fox lost heat.

3. In the same sunshine, the raccoon dog lost heat if its back area was towards the sun in comparison with the situation when the chest area was towards the sun.

4. Temperatures at the skin level were much higher for sun-exposed raccoon dogs than blue foxes especially on the chest area.

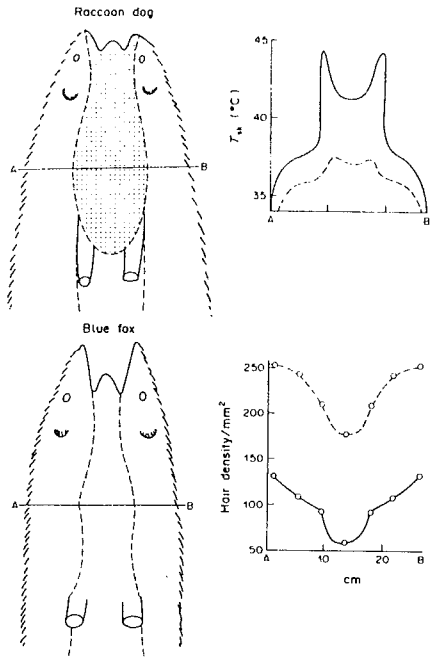


Fig. 2. Schematic illustration of the raccoon dog and blue fox pelts opened along their mid-dorsal line and stretched out. Dotted line shows the border of the thinfurred chest and the thickfurred, side-back coat. The shaded part shows the dark area of the chest of the raccoon dog. Temperatures at the skin level along line A–B are illustrated on the right upper corner and the hair density on the right lower corner. The hair density values are taken from Korhonen and Harri (1986). Values for the raccoon dog and the fox are marked by solid and dashed line, respectively.

5. It is concluded that the hair coat structure of the raccon dog is especially favourable for trapping heat from the sun, and with postural adjustments the animal takes maximal advantage of this free heat.

J. therm. Biol., 13, 4, 169-174, 1988. 2 tables, 2 figs., 19 references. Authors' abstract.

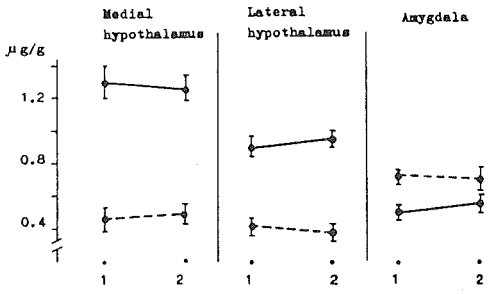


Fig. 3. 5-HT (solid line) and 5-HIAA (broken line) levels in brain regions of mink after ingestion of a single meal—1) overnight-fasted mink; 2) satiated mink.

Light intensity and maturation of the coat in mink.

V.M. Il'inskii, E.A. Tal'yanova.

For pastel and standard mink (54-180 per group) housed in sheds with darkened windows transmitting 10 lux light from Aug. onwards, or in control sheds with light intensity of approx. 40 lux, body weight of males at cropping averaged 2150 and 1889 g resp. in the 1st year and 2260 and 2082 g in the 2nd vs. 1274 and 1076 for females in the 2nd year, the differences due to light intensity being significant. Moult was completed 4-13 days earlier, and the percentage of Class-1 pelts was 5.9 points higher, in the experimental animals than in the controls.

Krolikovodstvo i Zverovodstvo, 3, 67, 1988. 2 tables. In RUSS. CAB-abstract.

Predatory aggression in the mink (Mustela vison): Roles of serotonin and Food satiation.

Ella M. Nikulina, Nina K. Popova.

5-Hydroxytryptophan at a dose of 50 mg/kg intraperitoneally (i.p.) sharply increased neural serotonin (5-HT) levels in mink and considerably inhibited that animal's predatory attack on rats. Intraperitoneal injection of 5-HT (10 and 20 mg/kg) did not influence such rat-killing. Neural levels of 5-HT or 5-hydroxyindoleacetic acid (5-HIAA) and subsequent aggression by the predator did not change to any great degree after ingestion of a single meal. Abundance of natural mink food for 3 days was associated with an increased level of 5-HIAA in the lateral hypothalamus and the amygdala as well as with an increased latency to attack and to kill rats. 5-HT seems to represent an endogenous factor that inhibits predatory attack by the mink; this effect appears to function through increased metabolism of 5-HT in some brain regions, which is evident after abundant intake of tryptophan with the natural diet.

Aggressive Behaviour, 14, 77-84, 1988. 4 figs., 28 references. Authors' summary.

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

Andrzej Zon, Dorota Kubanek, Maciej Meller.

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

Licence results were similar in groups II, III and IV. The foxes of group I were a lower

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

Rosz. Nauk. Zoot., 14, 1, 287-293, 1987.
3 tables, 8 references. In POLH. Su. GERM, ENGL, RUSS. Authors' summary.

Investigations on the use of melatonin.

Leena Blomstedt, Maija Valtonen, Ilpo Pölönen, Liisa Jalkanen.

20 adult mink females, 45 adult blue fox females, 20 young Blue Frost male and female foxes, 120 young blue fox males and females, 18 adult polecat females, and 10 young male polecats, treated with melatonin, were ready for pelting from 27 Oct. to 10 Nov., on 5 Nov., on 10 Nov., on 5 Nov., on 5 Nov. and from 27 Oct. to 30 Dec. resp. vs. on 7 Dec., on 30 Nov., from 10 to 20 Nov., on 17. Nov., on 28 Dec. and on 30 Dec. for untreated controls. Treatment of an unspecified number of raccoon dogs advanced the date of pelting by 10-18 days. Pelt quality was adversely affected in all treated animals except the polecats. It is suggested that for best results mink, polecats and adult blue foxes should be treated in mid-July, adult raccoon dogs at the end of June or beginning of July, young raccoon dogs in mid-July and young blue foxes at 7-10 wk of age.

Finsk Pälstidskrift, 22, 4, 158-162, 1988.
6 tables, 4 ill. In SWED. CAB-abstract.

Cages with a tunnel may improve reproductive performance in silver foxes.

Bjarne O. Braastad.

Silver fox females (99-100 per group), of which 46.5% were aged 2 yr, were housed (1) in standard wooden cages measuring 44.5 x 44.5 cm (controls), (2) in wooden cages as above, with a 18 x 20 cm tunnel or (3) in wooden cages measuring 35 x 50cm, with 2 exits to an L-shaped tunnel. In the 3 groups resp., litter size at whelping per mated female averaged 3.28 plus or minus 1.99, 3.50 plus or minus 1.96 and 3.86 plus or minus 1.82 for young females vs. 3.90 plus or minus 2.18, 4.19 plus or minus 1.67 and 3.93 plus or minus 2.16 for adult females, and litter size 3 wk after whelping averaged 2.64 plus or minus 2.08, 3.04 plus or minus 1.95 and 3.52 plus or minus 2.09 vs. 3.33 plus or minus 2.32, 3.96 plus or minus 1.83 and 3.44 plus or minus 2.25.

Finsk Pälstidskrift, 23, 1, 4-6, 1989.
2 tables, 4 ill. In SWED. CAB-abstract.

Studies on mink cages and nests at Swedish fur farms in 1969-71.

Eva Aldén.

Some experiments investigating the effects of cage type and size, housing density, and day length on mink growth, reproductive performance and pelt size and quality are summarized .

Våra Pälsdjur, 59, 10, 378-379, 1988.
3 ref., In SWED. CAB-abstract.

Results of some experiments and current research.

Eva Aldén.

Young mink females (29 per group) were housed in adjacent cages (5 cages per section measuring 1 m) with wooden nest boxes, or were housed leaving 1 cage empty between females. In the groups resp., kit mortality to weaning was 13.2 and 15.9%, litter size at weaning averaged 5.3 and 5.2 and kit weight at 3 wk of age 130 and 128 g for males and 118 and 118 g for females. None of the differences between the housing groups was significant.

Våra Pälsdjur, 60, 1, 20-22, 1989
In SWED. CAB-abstract.

Influence of aircraft noise on reproduction, mortality and behaviour of the mink mutants Black Cross and Saphir.

Leopold Weindrich.

48 female mink aged two years of the breeds "Black Cross" and "Saphire" were exposed for ten days to 117 overhead flights by the aircraft types BO 105, Alouette II and Phantom F4F during three phases (pre-, peri- and postnatal phase) of their reproductive cycles.

The following acoustic data were recorded:
- noise pressure level,
- distribution of frequency,
- slope of the signal,
- duration of the signal.

The study investigated whether overhead aircraft noise influences the reproductive mortality among mink. Reproductive data were compared between experimental and control groups of mink up to their weaning of the 43rd day after birth.

Also a video analysis was done of the behaviour shown by the experimental animals prior to, during and succeeding the overhead flights.

The results were as follows:

1. The commarison of the reproductive data between experimental and control groups showed no signs of causal relation to the overhead flights as to:
- number of empty females,
- the average kit production per female,
- litter size at birth,
- the perinatal mortality quota,
- the postnatal mortality quota,
- the weight of the whelps recorded on the 35th day after birth,
- causes of death of the whelps had died (results of patho-morphological, microbiological and virological diagnosis).

2. The ethological result as to the occurrence, type and intensity of the reaction towards the stimulus elicited by the overhead flights differed only minimally from those registered at the outset of the experiment.

- The strongest reaction in type and intensity was elicited by the 'hovering' of the helicopters followed by the reaction to the overhead flights of the helicopters.

- The reactions to the overflights of the jets were considered minimally.

- The brood care behaviour was not negatively influenced.

- Lossed due to cannibalism or cronism as a result of fright or panic reactions were not registered.

- Flight behavior as a reaction to overhead flights was not observed.

Inagurnal-Dissertation, Tierarztliche Hochschule, Hannover, GFR, 165 pp, 21 tables, 35 figs., 157 references. In GERM. Su. ENGL. Author's summary.

Blood values of the chinchilla.

Monika Spannl.

Among others, examinations about the possibilities of taking blood samples of the chinchilla have been taken. The withdrawal of blood from a individual patient is only justifiable by taking it from the aurecular vein or by scratching the rim of the ear. By this means one only gets a small quantity of blood (up to 1 ml), which is just sufficient for specific individual examinations (for example haematocrit).

For examinations of the live stock or for experimental purposes blood can be drawn in anaesthesia by cardiopuncture or can be taken from the retrobulbar venousplexus. By doing so one receives 3-5 ml, which are sufficient for a complete laboratory status.

81 blood samples of 79 chinchillas being kept monogam as well as polygam have been examined. The parameters are blood picture, clinical-chemical counts (bilirubin, urea, creatine, blood sugar, total serum protein), electrolytes (sodium, potassium, calcium, phosphorus), enzyme activities (GOT, GPT, AP, GLDH, GGT) and from 15 animals a bloodgas-analysis, mainly from arterial blood, was carried out.

Basic counts for the chinchilla have been ascertained from 77 blood samples.

x, s_x-, s and s^2 were statistically analysed. As a result it was noticed that in particular counts there are only insignificant discrepancies, which are already known from those of other kinds of rodents. The largest dispersion, as expected has been found for the number of the total leucocytes.

According to the test results, the chinchilla also has, as many other kinds of rodents, a lymphocytic blood picture. Finally statistical comparisms, which seemed efficient, (analysis of variance, t-test, oneway-method) were made with regard to different criterions (- "kind of blood", sex, age); a significance could only be stated for haemoglobin, haematocrit, monocytes, creatines, glucose, total serum proteine and phosphorus

A group of chinchillas has clinical symptoms of various kind and showed the change of the laboratory value as was to be expected.

Another group presented clinical changes (primarily trichophytic - infestation), without having different blood counts. A last group did not show any obvious clinical symptoms, but particular or several laboratory values had changed, which could not be classified in every case to a certain clinical syndrome.

Inaugural-Dissertation, Tierarztliche Fakultat, Ludwig-Maxmillans-Universität, München, GFR. 1987. 92 pp, 11 tables, 23 references. In GERM. Su. ENGL. Author's summary.

Physiological studies on the gastrointestinal tract in the nutria (Myocastor coypus Molina, 1782).

Walther Stahl.

In the gastrointestinal tract of adult nutrias the profiles of electrical potential differences and of diverse digesta parameters (dry matter, electrolytes, volatile fatty acids, osmolality, pH) were established. In addition specific activities of three disaccharidases (maltase, sucrase, lactase) and of pancreatic amylase have been determined during ontogenesis. Furthermore the lengths of stomach and intestine, the weights of gastrointestinal contents and the weights and lengths of the amimals' bodies have been ascertained.

The electrical potential difference mucose to blood was studied along the digestive tract in 8 narcotized animals in situ. The values were highest in stomach with about 30 my, they decreased in small intestine to 14 my and remained at about 20 my in caecum and colonic furrow ("Colonrinne"). Potential differences at the antimesenterial mucosa of proximal colon were significantly higher than that of the mesenterial side. Along the distal colon the values became again slightly higher.

The analysis of the gastrointestinal contents of 8 adult animals provided profiles along the portions of digestive tract, which were generally similar to that of other rodents. The dry matter content rose from the relatively low values in the stomach (10%) to about 21% in large intestine. Within the region of colonic loop ("Colonschleife") the formation of fecal pellets resulted in a distinct increase from 22% in the proximal to 29% in the distal part of the loop. Concerning the eletrolytes the concentration of sodium rose from 45 mmol/l in stomach to about the threefold in small intestine, and continously declined along large intestine to about 71 mmol/l. The profile of potassium was inverse; it increased steadily from the stomach (25 mmol/l) to the rectum (85 mmol/l). Calcium had a similar behaviour: After 22 mmol/l in the stomach it reached

63 mmol/l in the distal colon; the lowest calcium concentrations were in the bulbus duodeni (5 mmol/l). The anion chloride fell from the maximum in the stomach (137 mmol/l) to 17 mmol/l in the caecum and then remained almost constant throughout the colon. Significant differences for potassium, calcium and chloride existed between the furrow and the lumen of colon. Volatile fatty acids were only studied in caecum contents. The total concentration (87 mmol/l) was made up by acetic (59%), propionic (21%) and butyric acid (17%), while the rest consisted of varianic acid as well as the isomeres of butyric and valerianic acid. Osmolatity was found to be maximal in small intestine; from there the values diminished towards the stomach and the colonic loop to about 280 mosm/kg; relative high osmolatities also were in the rectum. The pH of the very acid stomach's contents was already in the bulbus duodeni increased tonearly neutral values; in small intestine the pH was around 7.7 and it finally went down slightly from caecum (pH 6.2) to distal colon (pH 5.5).

Enzymic activities were investigated in four groups of 3 animals each, two, four and eight weeks of age and in adults. The pH-Optima for maltase, sucrase, lactase and pancreatic amylase were 6.7, 7.2, 5.0 and 7.2 respectively. Depending on age the specific activities of maltase, sucrase and pancreatic amylase generally increased; lactase was varable, but declined in the adults. Depending on localization peak activities of disaccaridases were measured in jejunum, while those of bulbus duodeni, duodenum and ileum were normally distinctively lower.

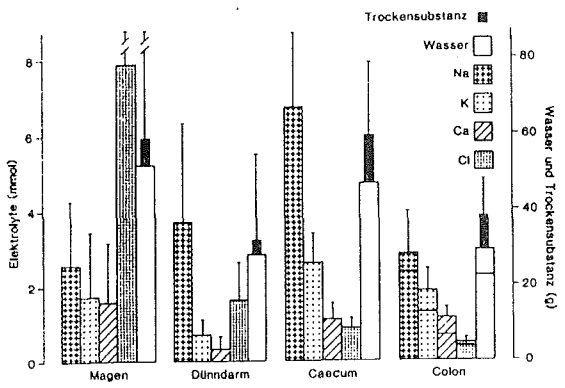


Abb. 15: Gehalte des Magen-Darm-Inhaltes an Wasser und Trockensubstanz sowie an einzelnen Elektrolyten in den verschiedenen Abschnitten des Verdauungstraktes (Wasser plus Trockensubstanz ergibt den Gesamtinhalt). Beim Colon gibt der untere Teil der Säule den Anteil des Cp, der obere den des Cd am Gesamtcolon an.

Inaugural-Dissertation, Tierarztliche Fakultat, Ludwig-Maxmilians-Universität, München, GFR. 1987. 111 pp, 203 reference, 12 tables, 28 figs. In GERM. Su. ENGL. Author's summary.

Anaesthesia in the European otter (Lutra lutra).

T. Kuiken.

A 1-year-old male European otter weighing 5 kg was anaesthetized for blood sampling with an intramuscular injection of ketamine hydrochloride (18 mg/kg) and diazepam (0.5 mg/kg). Both the induction phase (6 minutes) and the recovery (completed one hour after injection) went smoothly, and during immobilization the otter was completely relaxed. The heart rate was about 240/minute, 20 minutes after injection, and the rectal temperature which was 40.7 degC, 12 minutes after injection (possibly due to excitement during catching and restraint) fell to 39.5 degC at 37 minutes after injection.

Veterinary Record, 123, 59, 1988.
5 references. CAB-abstract.

A method of catching otters Lutra lutra (L.) for breeding purposes.

Stefan Sikora.

On the basis of studies of the etology of otters settling in Poznan province, and particularly in the rivers Konczak, Welna and Warta, an effective and simple method has been elaborated for catching live otters in self-closing traps. These traps can be installed at rivers in the vicinity of dams. It was found the developed trap model is a safe device, it does not injure the animals, it is easy to operate, and due to its size it cannot

be used by awners. The studies indicated that male animals settle considerably vaster territories than the females. This fact is in complete agreement with the quoted literature. The males are characterized by a high mobility and tendency to frequent changes of hunting grounds. That is why the males are much more frequently caught into the traps installed at rivers than the females.

The catches by this method should be done resonably since the cath of a significant number of males can lead to an unfavourable sex rate. It was found that beavers can be caught into the stationary traps as well.

The experiments indicated that the use of the described traps and then transportation cages adequately shelted and filled with dry grass, make the application of sedatives unnecessary when the transportation distance does not exceed 100 km. Since already after a short stay in the traps, the otters become thirsty and they like to drink, they can be given sedatives dissolved in water.

Panstwowe Wydawnictwo Naukowe, Poland, 61, 207-219, 1987. 3 figs., 17 references. In POLH. Su. ENGL. Authors' summary.

Influence of the environment of prey selection by the otter (Lutra lutra) in North-West Spain.

Antonio Callejo.

The feeding habits of the otter have been studied by analysing its droppings in the river Pereiro (Galicia, N.W. Spain). Its diet consists of six major categories or prey which, in order of importance, are fishes, amphibians, mammals, birds, insects, and reptiles. Seasonal variations can be seen in its diet. In the rainy seasons (spring and winter) fish lose their hegemony to amphibians. However in the summer there is a great increase in the consumption of mammals.

The prey selection values are positive for trout (*S. trutta fario*) and negative for rouch (*Rutiius arcasii*) in all seasons. Otter have a preference for medium sized trout (10-20 cms) and large rouch (+ 8 cms). As far as amphibians are concerned, otters prefer batrachians (mainly the larger ones) to newts.

The consumption of fish is influenced by the maximum atmospheric temperatures, that of amphibians by the level of the river and by the minimum atmospheric temperatures, and that of mammals by the temperatures of the water and the minimum atmospheric temperatures.

Mammalia, 52, 1, 11-20, 1988. 7 tables, 1 fig., 29 references. In FREN. Su. ENGL. Author's summary.

Historical and present status of the black-footed ferret.

Dean E. Biggins, Max H. Schroeder.

The black-footed ferret *(Mustela nigripes)* was once widely distributed in the Great Plains and intermountain valleys of North America, its range overlapping the combined ranges of several species of prairie dogs *(Cynomys spp.)*. Most life history information has been obtained from studies of ferrets in soutwestern South Dakota (1964-1974) and studies near Meeteetse, Wyoming (1981-present). The ferret's nearly complete dependence on prarie dogs was documented in both study areas. The recent collapse of the Meeteetse poulation of ferrets due to an outbreak of canine distemper underscores the threat posed by this disease, but reductions of prairie dogs by man and other diseases are also potentially harmful. Eighteen animals are being held for captive breeding, no free-ranging ferrets have been located, and species recovery seems dependent on captive propagation and releases.

Paper presented at the Eighth Great Plains Wildlife Damage Control Workshop, Rapid City, South Dakota, April 28-30, 1987. 1 fig. 23 references. Authors' abstract.

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

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

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

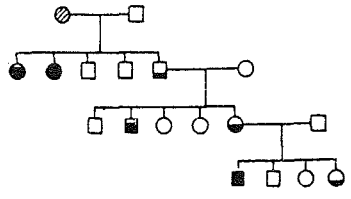


Fig. 1. Genealogy of family with anomalous expression of H3 allotype. Black symbols indicate the presence of H3 in blood serum (different degrees of its manifestation estimated semiquantitatively according to DID); cross-hatched symbol) incomplete antigenic identity to control H3; open symbols) absence of H3 according to DID.

Genetika, 23, 8, 1491-1498, 1987. Translated by Plenum Publ. corp, USA, 0038-5409/87/-2308-1047, 1988. 4 tables, 1 fig., 23 refs. Authors' summary.

Genetics and evolution of the mink Lpm system.
VIII. The peculiarities of variability of antigenic structure of the Lpm protein and α_2-macroglobulin in mustelidae family.

V.I. Yermolaev, T.V. Shumny, S.M. Miroshnichenko, O.K. Baranov.

Interspecific variability of the isotypic structure of two macroglobulins (Lpm and α_2M) in Mustelidae family was investigated using monospecific rabbit antisera against Lpm and α_2M Mustela vison. It was established that all the species studied may be divided into four groups, according to the degree of their homology with Lpm: 1) M. vison; 2) M. altaica, M. erminea, Kolonocus sibirica, Putorius eversmany, P. putorius, Lutreola lutreola; 3) Vormela peregusna; 4) Martes martes, M. foina, M. zibellina. The greatest divergence of Martes gene species from M. vison and other species studied is determined by two different immunogenetic approaches, the first based on the whole isotype of Lpm and the other using allotypic markers of individual Lpm genes. The variability of the isotypic structure of α_2M was lower than that revealed in Lpm. V. peregusna is the only species which significantly differs from all above-mentioned species, including M. vison. The differences established for degree of variability between Lpm and α_2M in Mustelidae family may be connected with the evolutionary peculiarities of these two genetic system of serum α-macroglobulins, which being phylogenetically related, are still structurally divergent.

Genetika, 24, 9, 1658-1664, 1988.
2 figs., 1 table, 17 references. In RUSS. Su. ENGL. Authors' summary.

The mapping of four genes (α-GAL, PGK-1, HPRT and G6PD) on the X-chromosome of the American mink (Mustela vison).

N.S. Zhdanova, S.D. Pack, T.B. Nesterova, N.A. Mazurok, A.A. Gradov, O.L. Serov.

The segregation of X-linked markers (αGAL, PGK-1, HPRT and G6PD) was analysed in hybrids between gamma-ray irradiated mink fibroblasts and Chinese hamster cells, or between mink cells and mouse hepatoma cells. Based on the segregation data and the data of cytogenetics analysis of a few hybrids, the order of the mink genes was deduced as αGAL-PGK-1-HPRT-G6PD-qter. This order differs from that reported for human and murine genes, in spite of the very obvious

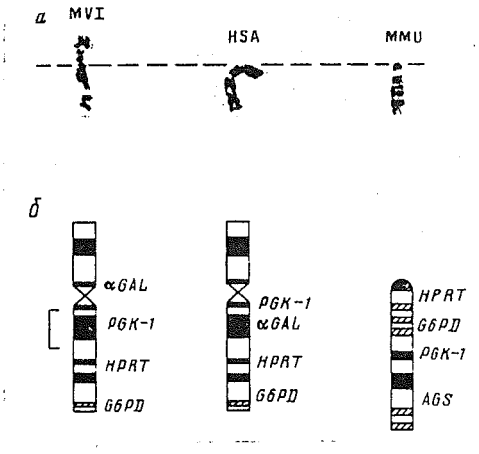


Рис. 2. Микрофотографии Х-хромосом норки (MVI, Mustela vison), человека (HSA, Homo sapiens) и мыши (MMU, Mus musculus): *а* – G-окраска, *б* – диаграммы Х-хромосом, окрашенных по Гимза

similarity between G-banding of the mink and human X-chromosomes. Therefore, at least one reversion is responsible for the differences observed for the human and mink X-chromosomes.

Genetika, 24, 8, 1448-1455, 1988. 4 tables, 2 figs., 18 references. In RUSS, Su. ENGL. Authors' summary.

Chromosomal localization of the gene coding for the ß-subunit of NA$^+$K++-ATPase in the American mink (Mustela vison).

T.M. Khlebodarova, G.I. Karasik, S.E. Lapteva, N.M. Matveeva, O.L. Serov, E.D. Sverdlov, N.E. Broude, N.N. Modyanov, G.S. Monastyrskaya.

The BATP gene coding for the ß-subunit of Na^+,K^+-ATPase has been localized on chromosome 13 of the American mink *(Mustela vison)* using mink-Chinese hamster somatic cell hybrids and pig cDNA clones as probes. The AATP gene for the α-subunit of Na^+K^+-ATPase is on mink chromosome 2 (1987) FEBS Lett. 217, 42-44). Consequently, the AATP and BATP genes for the Na^+K^+ATPase occupy separate mink chromosomes.

FEBS Letters, 236, 1, 240-242, 1988. 1 fig., 1 table, 17 references. Authors' abstract.

Genetic polymorphism of plasma α1B-glycoprotein and transferrin in arctic and silver foxes.

R.K. Juneja, T. Niini, O. Lohi, B. Larsen, B. Gahne.

Plasma samples of 235 foxes from 38 complete families (14 of arctic foxes, 21 of silver foxes and 3 with arctic x silver fox hybrid offspring) were analysed by one-dimensional horizontal polyacrylamide gel electrophoresis (PAGE) pH 9.0 followed by general-protein staining of gels. A major postalbumin for fox plasma was identified af α1B) by using immunoblotting with antiserum specific to human or pig plasma α1B. Four codominant, autosomal alleles of α1B were found in arctic foxes. Two transferrin (TF) alleles (Tf^F, Tf^S) were observed in arctic foxes and two (Tf^D, Tf^f) in silver foxes; the TF F type of both of the fox species showed identical electrophoretic mobilities. The arctic foxes showed a high degree of polymorphism for both TF and α_1B. The silver fox showed a scarce polymorphism of TF and were monomorphic for α^1B. The arctic fox, silver fox and their hybrids could be clearly differentiated from one another by their plasma protein patterns obtained by the PAGE method.

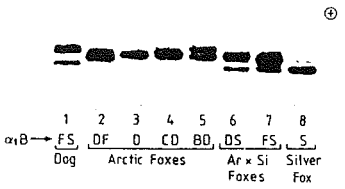


Figure 2. One-dimensional horizontal polyacrylamide gel electrophoresis (pH 9.0) of eight different plasma samples, followed by immunoblotting using antiserum to pig or human plasma α_1B-glycoprotein (α_1B). Lane 1, dog; lanes 2–5, arctic foxes; lanes 6–7, hybrids between arctic and silver foxes; lane 8, silver fox. The dog α_1B variants F and S have different mobilities than those of fox α_1B variants F and S.

Animal Genetics 19, 237-244, 1988. 2 tables, 2 figs., 15 references. Authors' summary.

Original Report.

Effects of Gonadoplex R Leo Vet. on fertility and plasma progesterone in mink.

Henrik Falkenberg
Forsøgsfarmen Syd, Lindknudvej 35, Lindknud, DK 6650 Brørup, Denmark.

Summary.

Injection of Gonadoplex R Leo Vet. to pastel mink females before and after the first mating didn't increase the fertility or the number of follicles/Yellow bodies in the ovaries.

It did influence the plasma progesterone level, shown by the fact, that the control group had a significant lower concentration compared to the three hormone groups on the 5 of April.

Introduction.

In mink production, hormones have been used to increase the fertility, and to treat unmated females in late March.

With the exception of a few experiments *(Murphy, B., 1976)*, the use of hormones (releasing factors, gonadotropins, estrogen and progesterone) have not been reported to increase the fertility in mink.

The aim of this study was to investigate the effects on fertility and plasma progesterone by using a well known hormone product, Gonadoplex R Leo Vet.

Gonadoplex is a mixture of pregnant mare serum gonadotropin (PMSG) and humane choriongonadotropin (HCG) in a 2:1 proportion. PMSG contains primarily FSH-active substances, and HCG LH-active substances.

The idea with this study was to increase fertility by promoting the development of follicles through FSH and promoting ovulation through LH. To test whether the animals responded to the hormone treatment, the plasma progesterone was measured weekly during the gestation period.

Materials and methods.

The investigations were carried out on a Danish fur breeding research farm in March 1988. The animal materiel consisted of 100 pastel females and 18 pearl males.

The females were divided into 4 separate groups of 25 each. The average family index for fertility was the same in each group.

Group 1 was injected with 100 I.U. gonadoplex I.M. in the hind leg 7 days before the first mating. Group 2 was injected with 100 I.U. 3 days before the first mating, and group 3: 5 days after the first mating. Group 4

(control group) was untreated.

Each male got the opportunity to mate females in all 4 groups, and the matings were done according to the 1:9 mating system. The daily number of matings, starting the 5 of March, were attempted to be the same in each group.

Blood samples were collected each week from 29 February to 9 May from 3 females belonging to each group. The samples were collected I.V. from the hind leg (cephalic vein) and stabilized with heparine.

The above mentioned females were attempted to be mated the 7 March and again the 16 March.

The plasma was analyzed for progesterone, using Enzygnost serum progesterone test-kit vet. from Hoechst. In order to fit the calibration curve, some of the samples were diluted with mare serum, found free of progesterone. The readings were done spectrophotometrically by an Inter Med Eliza reader at 492 nm. Progesterone was measured in ng/ml.

Two females from each group mated the 12 March were killed the 21 March before the second mating took place. The ovaries were surgically removed, and the number of follicles were counted using a Nikon stereo microscope. The ovaries were later fixated in a 4% formalin dissolution, mounted and cutted in 5 slices with an interval of 500 my. The slices were dyed with eosin/hematoxylin, and the number of mature follicles and yellow bodies were counted.

Results.

The breeding results divided by group are shown in table 1. The number of kits per mated female is greatest in group 2 which also surpass groups 1 and 3 in relation to the number of kits per litter. There were no statistical significant difference between groups in relation to living kits, dead kits and kits totally at birth per mated female, table 4. In groups 1 to 3 females mated twice, resulted in a higher number of kits per litter, compared with females mated once. In the control group there was no difference between females mated once or twice.

The number of follicles counted before fixation is shown in table 2. The number of follicles in groups 1 and 2 is higher compared to groups 3 and 4. The number of follicles and yellow bodies counted in the dyed micro slides is shown in table 3. The number of follicles in group 1 is significant from the control group, table 4.

Table 1. Breeding results at birth for each group.

	Group 1 7 days before 1.mat.		Group 2 3 days before 1.mat.		Group 3 5 days after 1. mating		Group 4 control	
The whole group	N	X	N	X	N	X	N	
Number of living kits per female	23	4,65	24	5,13	21	5,14	22	5,73
Number of living kits/mated female	20	5,35	20	6,15	20	5,40	22	5,73
Number of living kits per litter	17	6,29	19	6,47	18	6,00	18	7,00
Females mated once	N = 14		N= 6		N = 10		N = 4	
Number of living kits per litter	6,07		6,16		5,90		7,00	
Females mated twice	N = 3		N = 13		N = 8		N = 14	
Number of living kits per litter	7,33		6.62		6,13		7,00	

N = Number of females, x = average number of kits.
The average number of living kits/mated female for the research farm = 4,9.

Table 2. Number of follicles before fixation.

	Group 1 7 days before 1.mat.		Group 2 3 days before 1. mat.		Group 3 5 days after 1.mating		Group 4 control	
Identification number	3026	2617	2714	3100	3058	3025	2669	3139
Number of follicles in the right ovary	21	5	11	14	16	4	13	9
Number of follicles in the left ovary	12	10	10	10	8	4	5	10
Number of follicles per ovary per female	12		11,3		8,0		9,3	

Table 3. Number of follicles and yellow bodies in dyed microslides.

	Group 1 7 days before 1.mat.		Group 2 3 days before 1. mat.		Group 3 5 days before 1. mat.		Group 4 control	
Identification number	3026	2617	2714	3100	3058	3025	2669	3139
Number of follicles in the right ovary	0	0.5	2	2	2	2.5	1	2.5
Number of follicles in the leftovary	0	0.5	1.5	2.5	2	3	2.5	3
Number of yellow bodies in the right ovary	5.5	1.5	2.5	4.5	4	2.5	3	2.5
Number of yellow bodies in theleft ovary	3.5	2	1.5	3	4.5	2	3.5	1
Number of follicles per ovary per female	0.25		2.0		2.38		2.25	
Number of yellow bodies per ovary per female	3.13		2.88		3.25		2.25	

Table 4. P-values for a two sample t-test between each experimental group and the control group Ho: No difference between groups.

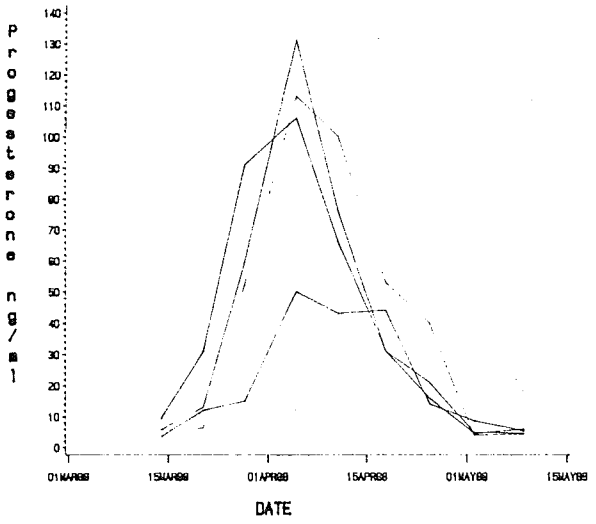
	Group 1 7 days before 1.mat.	Group 2 3 days before 1.mat.	Group 3 5 days after 1.mating
Number of living kits at birth/mated female	0.6952	0.6389	0.7171
Number of dead kits at birth/mated female	0.3739	0.7197	0.9026
Total number of kits at birth/mated female	0.5589	0.6956	0.7300
Number of follicles per female	0.001***	0.0407*	0.6045
Number of yellow bodies per female	0.8452	0.7059	0.3696

* = significance at the 0.05 level

** = significance at the 0.01 level

*** = significance at the 0.001 level.

Fig 1. Plasmaprogesterone as a function of date.
The bottom curve indicates control group.



The results from the progesterone analysis are shown in fig. 1. Every point on each curve is calculated on data from 3 animals. The variation (std.dev.* 100/mean) between progesterone recordings from three animals range from 1% to 89% with a mean value of 32% and a standard deviation at the mean of 27.

The 4 curves show an identical course, with an early increase in middle March and a peak in the first week of April and a decline towards the first of May.

The curves belonging to the three hormone groups (groups 1-3), are very much alike, and have an earlier increase in progesterone and a higher peak level compared with the control group. The curve from the control group have a course and a peak value comparable with findings made by *Clausen, Tove, (1986).* The difference in progesterone between the hormone- and the control group is shown by an analysis of variance to be statistical significant at the 0.05 level only on the 5 of April. These findings indicate that the ovaries have responded to the injections of gonadotropins.

Discussion.

Looking at the breeding results there are no statistical evidence which indicates that the present applied hormone treatment increases the fertility. It is not possible to draw conclusions based on the uncertain statistical results of the counting of follicles and yellow bodies. Furthermore, there is no obvious relationship between the number of follicles/yellow bodies and the breeding result.

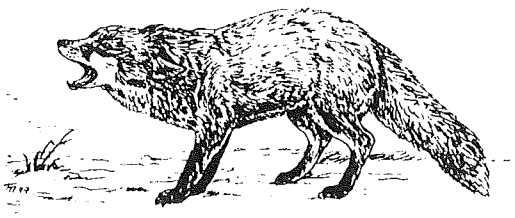
The result from the progesterone analysis do indicate that the ovaries respond to the hormone treatment by increasing the production of progesterone. Progesterone has been reported to influence the gestation length which further can influence the litter size.

A new experimental design could be to separate the ingredients in gonadoplex, and to inject the PMSG before the first mating and the HCG along with the second mating.

References.

Murphy, B., 1976. Effects of syntetic GnRH on litter size in ranch mink bred once or twice. Theriogenology, 6, 4, 463-466.

Clausen, Tove. 1986. Undersøgelse af progesteronindholdet i blodet hos tæver i månederne marts, april og maj. Faglig Årsberetning, Dansk Pelsdyravlerforening, 137-144.



Determination of Plasma Progesterone in the Blue Fox (Alopex lagopus) at Pro-oestrus and Oestrus by use of a commercial kit.

Rene Høier.

A commercially available method for determination of progesterone in blood from blue fox vixens is compared to a laboratory method, and the correlation is expressed as (X, Y)= (concentration by the standard method, concentration by the commercial method, in nmol/l): Y=0.5130X + 27.70; n=238; r=-0.8839 for comparison of all values, and Y=1.0024X + 11.05; n=177; r=0.9293 for concentrations of progesterone <127 nmol/l. The latter range of progesterone concentrations is relevant for prediction of time for artificial insemination (AI). Distribution of results with respect to intervals for timing of AI depicts that 162 out of 238 (68%) are grouped in the same way by both methods. Discrepancies are recognized since the commercial method provides higher levels in the low concentration area, and lower levels in the range of high concentrations as compared to the standard method. Proposals for explanations of the diverging results are given.

Acta Agric. Scand. 39, 181-186, 1989.
2 tables, 6 references. Author's abstract.

Basis of reproduction and reproductive techniques in mink.

Pedro Diaz Jiménez, Luis Fernando Gosálvez Lara.

An illustrated account is given of the reproductive anatomy of male and female mink and of sexual maturity, mating season, oestrus, mating, implantation, gestation, parturition, lactation, hormonal control of oestrus, mating systems and AI. Data are presented in 15 graphs and 2 tables.

Hojas Divulgadoras, 9, 32 pp, 1988.
2 tables, 14 figs. In SPAN. CAB-abstract.

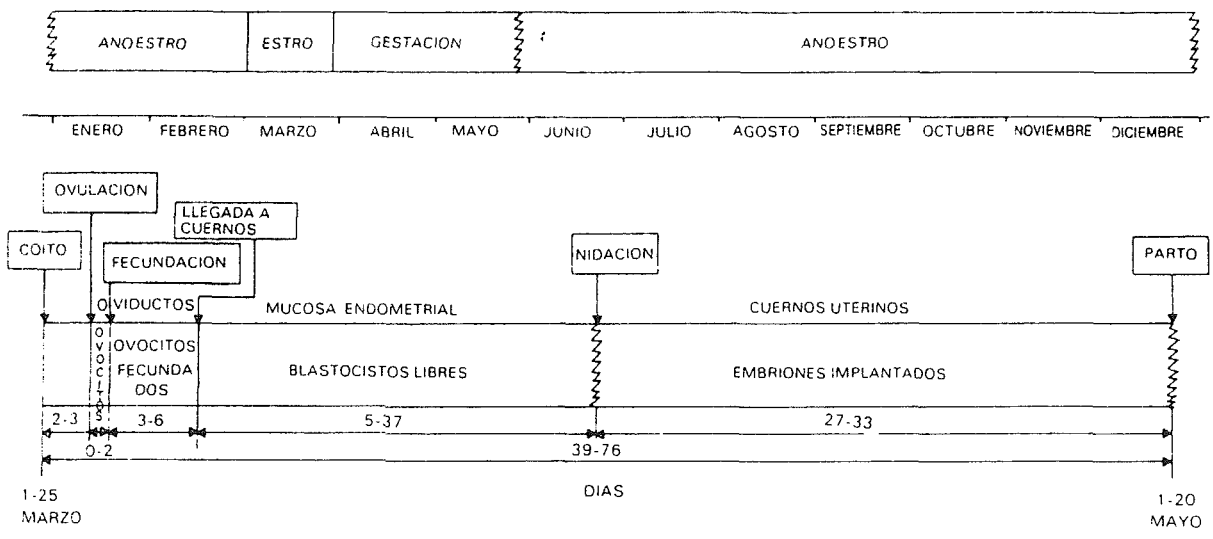


Fig. 12.—Actividad sexual anual y cronología de la gestación del visón en el hemisferio Norte.

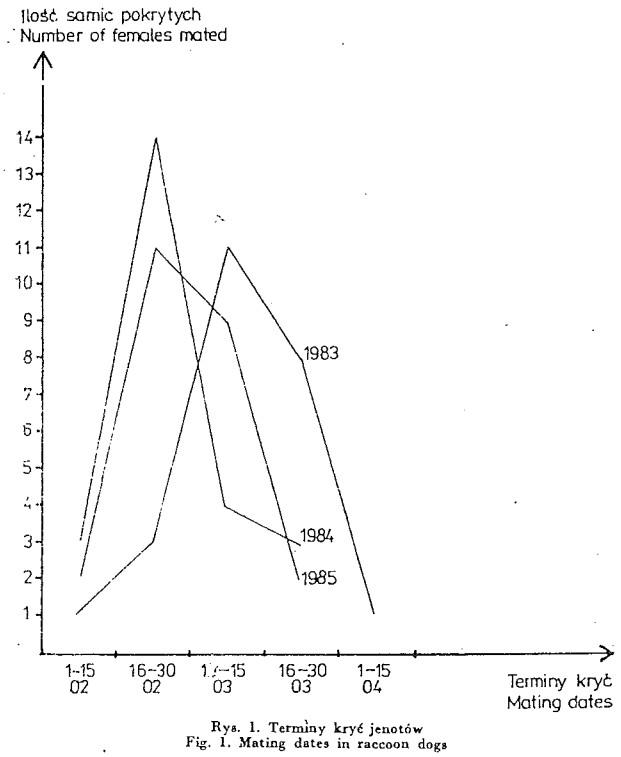
Studies of mating systems and determination of optimum date of slaughter for skins in raccoon dogs.

Andrzej Zon, Dorota Kubanek, Stanislaw Niedzwiadek.

Female raccoon dogs (24 in 2 groups) were mated three times on three following days (group I) or twice on two following days (group II). The percentage of fertile and delivered females was 93.4 in group I and 68.9 in group II. Litter size was, respectively, 8.6 and 7.6 pups.

Three-times done mating resulted in the better fertility and fecundity, and had a great influence on profitability of raccoon dog breeding.

To determine an optimum date of slaughter, 5 groups of 12-17 dogs each with equal parts of both sexes were allotted: group A slaughtered on October 22-23, group B - on November 2-3, group C - on November 12-13, group D - on November 22-23, group E - on December 2-3. The skins obtained were evaluated by experts. The results indicated that in our condition the optimum time of slaughter was in the period before November 15. The skins obtained after that date were of lower value due to losses and higher brittleness of cover hair.



Rys. 1. Terminy kryć jenotów
Fig. 1. Mating dates in raccoon dogs

Roczniki Naukowe Zootechniki (Poland), 14, 1, 121-130, 1987. 3 tables, 1 fig.
In POLH. Su. GERM, ENGL, RUSS.
Authors' summary.

Effect of birth date on reproductive performance of polar fox females.

Andrzej Zon, Zbigniew Sieron, Maciej Meller.

Females of polar fox (40) were evaluated considering their birth date: group I - born before May 10, group II - born after May 15. The first rutting symptoms appeared in both groups at the end of February. Mating season in group II lasted 33 days and was 3 days longer than that in group I. The percentage of females delivered was differentiated: I - 83.5, II - 73.8. Barrenness rate was 8% higher in group II. Gestation lasted 53 days in both groups. Average litter size was 7.8 and 8.5 pups in groups I and II, respectively. The body weight of foxes at weaning was 1755.3-1688.7 g for males and 1672.5-1622.8 g for females, at slaughter, respectively, 6009.9-5949.3 g and 5594.7-5614.1 g. The results of licence estimation of young foxes were not differentiated between the groups. Average classification of the skins in groups I and II was 3.6 and 3.7, respectively.

The birth date of females was shown to influence the date of appearing rutting symptoms, and the length of reproduction period. The higher barenness of females born after May 15 in the first year of their productivity was also found. Litter size was similar in females born on normal and delayed dates. The young foxes showed a high growth rate and their skins were of a high fur value. The results indicate that late dates of birth should not decisively affect the purpose of females utilization, particularly that of a high breeding value.

Roczniki Naukowe Zootechniki (Poland)., 14, 1, 113-119, 1987. 4 tables, 12 references.
In POLH. Su. GERM, ENGL, RUSS.
Authors' summary.

Oestrus in silver foxes.

L. Jalkanen, Maija Valtonen, Altti Lukola.

Prior to and during oestrus, until 2 days after the last insemination, (51-59 days before parturition), electrical resistance tests were carried out on vaginal mucus and blood samples were collected daily from 5 silver fox females. All females were inseminated twice, with an interval of 24 h between inseminations, on the day after the 2nd peak resistance value (approx. 750 ohm, 54 days prior to parturition). Blood oestradiol concentration peaked twice, reaching 0.34 plus or minus 0.16 and 0.32 plus or minus 0.11 nmol/litre resp. 58 and 56 days before parturition. All females conceived, and litter size averaged 3.6. It was concluded that electrical resistance tests give the best results in determining the peak time for insemination in silver foxes.

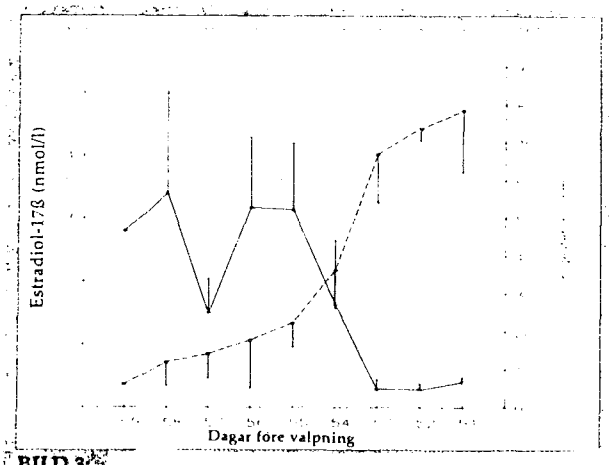


BILD 3. Serumets östradiol-17ß ▲—▲ och progesteronhalter ●--● hos fem silverrävshonor under förbrunsten och brunsten. (Medelvärden ± SE)

Finsk Pälstidskrift, 23, 1, 8-9, 1989.
3 figs., 5 references. In SWED.
CAB-abstract.

Whelping results at the experimental farms in 1988.

Jaakko Mäkelä, Fjalar Fors.

At Maxmo Experimental Farm in Finland, in 1988, the percentages of infertile mink, polecat, blue fox and silver fox females were 17.9, 7.6, 30.0 and 37.8 resp., and the number of young born per mated female averaged 3.9, 7.4, 6.2 and 2.4. At Kyrkslatt Experimental Farm, the percentages of infertile mink, polecat and blue fox females were 25.0, 16.8 and 27.8 resp, and the number of young born per mated female averaged 3.9, 6.5 and 7.4.

Finsk Pälstidskrift, 22, 9, 377, 1988.
In SWED. CAB-abstract.

Approaching the whelping season.

Lars Elofson.

Of 79, 79 and 64 young Standard, Hedlund White and Sapphire mink females, mated twice from 6 Mar., with an interval of 9 days between matings, 6.3, 7.6 and 7.8% resp. failed to produce a litter, and the number of liveborn kits per female whelping averaged 6.7, 6.0 and 6.2. Of 65, 38 and 24 adult females of the 3 types, mated on 2 subsequent days from 20 Mar., 0, 10.5 and 4.2% resp. failed to produce a litter, and the number of liveborn kits per female whelping averaged 7.1, 5.8 and 5.6. Of Standard young and adult females, 67 and 76% resp. whelped within 2 days of 1 May and 8 May, and of White + Sapphire young and adult females, 67 and 88% resp. whelped within 2 days of 6 May and 12 May. For 74 litters from young Standard females, preweaning kit mortality was 7.4% vs. 4.8 for 65 adult females.

Våra Pälsdjur, 59, 4, 138-141, 1988.
2 tables, 2 figs. In SWED. CAB-abstract.

Approaching the mating season.

Gabrielle Lagerkvist.

The results of some recent mink mating trials, carried out in Sweden and the Netherlands, investigating the effects of the date of mating, the number of matings, and flushing on CR and litter size, are summarised. The bibliography is not printed in the journal, but may be obtained from the author.

Våra Pälsdjur, 60, 2, 37-39, 1989. In SWED.
CAB-abstract.

Evaluation of the quality of silver fox semen at different stages during cryopreservation, and the fertilizing capacity of frozen/thawed silver fox spermatozoa.

Peer Ola Hofmo.

This thesis, which is written in English, consist of Acknowledgments, Introduction, References, 4 reports and Summary.

Each of the reports are summarized in the following.

Thesis: Dept. of Reproductive Physiology and Pathology, Norwegian College of Vet. Med., Norway. 1988. 6 pp, 13 references.
In ENGL.

Electromicroscopical studies of membrane injuries in blue fox spermatozoa subjected to the process of freezing and thawing.

Peer Ola Hofmo, Kjell Andersen Berg.

Disintegration of blue fox sperm membranes was studied by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). In unfrozen spermatozoa studied by SEM, the plasmalemma and the acrosome appeared to be intact, except for a few cases of disruption of the former structure at the anterior part of the head.

In semen frozen in 0.5 ml plastic straws by use of N_2 vapor after dilution with Tris-fructose-citric acid with 8 vol. % glycerol and 20 vol. % egg yolk and thawed at 70°C for 8 sec. the spermatozoa displayed different degrees of membrane damage. These alterations could be classified into three main categories of which the first included only minor changes in the plasmalemma, but vesiculation and disintegration of the outer part of the acrosomal membrane. In the second category (also the most frequent one) the outer part of the acrosomal membrane was extensively vesiculated, and the plasmalemma was discharged proximal to the equatorial segment. Extensive loss of plasmalemma and complete absence of the outer part of the acrosomal membrane characterized the last category of membrane damage.

The functional implications of the three categories of membrane alterations are discussed.

Part of thesis: Dept. of Reproductive Physiology and Pathology, Norwegian Coll. of Vet. Med., Norway. 1988. 14 pp, 34 references.
In ENGL. Authors' summary.

Effect of different freezing af thawing rates and post-thaw storage on survival and acrosome integrity of frozen/thawed silver fox spermatozoa.

Peer Ola Hofmo.

Two trials with freezing of silver fox semen were performed. In trial I, silver fox semen was frozen by two different freezing procedures. Semen frozen according to procedure 1 (-50°C/min from -7°C to -100°C) was thawed in a water bath at + 70°C for 8 seconds, while that frozen according to procedure 2 (-5°C/min from -7°C to -100°C) was thawed either in a water bath at + 35°C for 20 seconds, or in ice-water for 5 minutes. No significant difference in the percentage of motile spermatozoa was found between the three methods of cryopreservation. The percentage of spermatozoa with an intact acrosome frozen according to procedure 1, procedure 2/thawed at +35°C and procedure 2/thawed in ice water was 63.3%, 49.5% and 39.9%, respectively ($P<0.05$), while motility scores were 3.73, 3.22 ($P<0.05$) and 3.03 ($P>0.10$), respectively.

In trial II, semen frozen according to procedure I and thawed in a water bath at +70°C for 8 seconds was examined for the percentage motile spermatozoa, motility score and acrosome integrity immediately after thawing, and following post-thaw storage for 30 minutes at +20°C (not examined for acrosome integrity), after further storage for 90 minutes at +4°C and additionally after 18 hours at +4°C. Motility was 48.3%, 43.8%, 37.9% and 12.5%, respectively. Only the

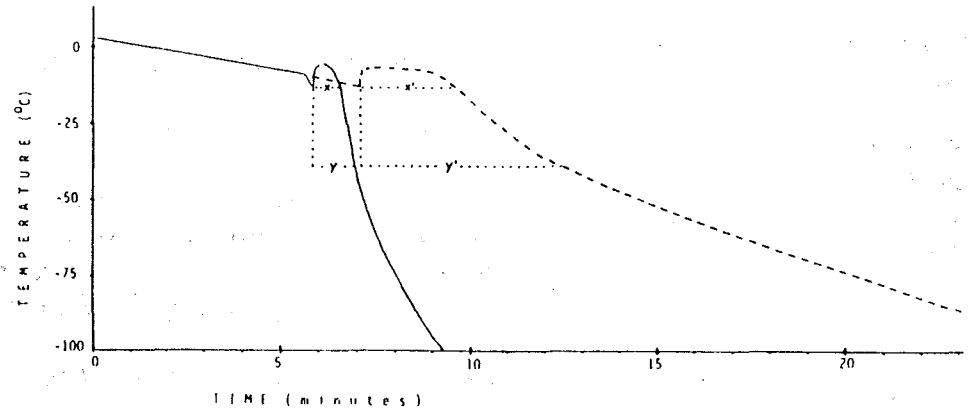


Figure 1: Measurements of the actual semen temperature using a thermocouple placed within the straw.
— Procedure 1 (fast freezing)
- - Procedure 2 (slow freezing)
x & x' = Duration of the eutectic part x=40 sec. x'=180 sec.
y & y' = Time from crystallization until semen temperature reached -40°C
y=75 sec y'=51 min.

latter value was significantly diferent (P<-0.05). Motility scores were 4.0, 3.9 (P>0.05), 3.5 (P<0.05) and 2.1 (P<0.05), respectively, while the percentage of spermatozoa with intact acrosome was 73.7, 47.5 (P<0.05) and 28.5 (P<0.05), respectively.

Part of thesis: Dept. of Reproductive Physiology and Pathology, Norwegian Coll. of Vet. Med., Norway. 1988. 17 pp., 2 tables, 1 fig., 28 references. In ENGL. Author's summary.

Studies of cryopreservation of fox spermatozoa and evaluation of the fertilizing capacity of frozen/thawed silver fox spermatozoa.

Peer Ola Hofmo.

Semen from 26 silver foxes was frozen by a standard procedure in a programmable biological freezer and used for insemination of 56 blue fox vixens. Sperm motility was studied at different stages during the semen processing.

Mean motility decreased from 90.1% in fresh semen to 82.0% after cooling and equilibration, and to 61.0% after thawing (P<0.01). Mean motility score decreased from 4.8 in fresh semen to 4.1 following cooling and equilibration (P<0.01). The latter value was not significantly different from the observed post-thaw motility score of 4.0 (P>0.05). A positive correlation was found between motility of fresh semen and motility after equilibration (r=0.62; P<0.01), as well as between the latter and post-thaw motility (r=-0.37; P<0.05) However, there was no correlation between the motility of fresh semen and that of frozen/thawed semen. A difference in freezability of semen was found not only among different males, but also among different ejaculates from the same male.

Pregnancy rate was 69.7% and average litter size was 6.71. Pregnancy rate, but not litter size, decreased significantly as post-thaw motility decreased.

Part of Thesis: Dept. of Reproductive Physiology and Pathology, Norwegian Coll. of Vet. Med., Norway. 1988. 16 pp, 3 tables, 29 references. In ENGL. Author's summary.

Intrauterine insemination in foxes using frozen silver fox semen, including a preliminary trial with reduced sperm number and insemination volume.

Peer Ola Hofmo, Jan A. Fougner.

A total of 277 ejaculates from 70 male silver foxes aged 1-7 years were processed for freezing using a programmable biological

freezer. The frozen semen was to be used in two fertility trials.

A significant difference was seen between pubertal males (n=45) and older males (n=25) in the ability of their semen to withstand the process of freezing and thawing. After thawing, 28.9% of the ejaculates from the pubertal males were discarded due to the presence of less than 50% motile spermatozoa, while the corresponding proportion from the older males was only 9.1% (P<-0.01). No significant difference was found in the percentage of discarded ejaculates after cooling and equilibration.

In trial I, three technicians inseminated 207 blue fox vixens using 1.0 ml semen containing a total of 150 million spermatozoa. The vixens were inseminated twice during the heat. The pregnancy rate was 87.0%, and litter size averaged 7.72. Of 15 silver foxes inseminated, 10 became pregnant, with an average litter size of 4.83. In trial II, 51 blue fox vixens were inseminated with 0.5 ml semen containing a total of 75 million spermatozoa, and 53 blue fox vixens were inseminated with 1.0 ml semen containing a total of 150 million spermatozoa. The pregnancy rates for the two groups were 88.2 and 88.7 (P>0.10), respectively, and litter sizes 7.54 and 7.73 (P>0.10), respectively.

Part of Thesis: Dept. of Reproductive Physiology and Pathology, Norwegian Coll. of Vet. Med., 1988. 13 pp, 2 tables, 22 references. In ENGL. Authors' summary.

Further trials with frozen semen.

Kai-Rune Johannessen

Of 200 blue fox females in Norway, inseminated in 1989 with frozen silver fox semen, 87% conceived, and litter size at birth per female whelping averaged 7.7 cubs.

Norsk Pelsdyrblad, 63, 1, 8, 1989.
In NORW. CAB-abstract.

Improving whelping performance in foxes.

H.Å. Kulbotten, Kai-Rune Johannessen, Jan Fougner.

Possibilities of improving the reproductive performance of silver and blue foxes in Norway by means of culling, selection, oestrus detection, mating methods, nutrition and improving cub viability are discussed.

Norsk Pelsdyrblad, 63, 1, 15-17, 1989. 1 figs., In NORW. CAB-abstract.

Original Report.

Effect of copper addition to mink feed during the growth and moulting period on growth, skin production, and copper retention.

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Research in Fur Animals
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Summary.

An experiment with 3 groups of pastel mink kits was performed during the growth and moulting period. The animals were fed either a conventional mink feed (group 1) or the same feed with the addition of copper (group 2 and 3). The copper concentration in the feed (wet weight basis) was 5.1 mg/kg, 39 mg/kg, and 116 mg/kg for the three groups respectively.

Growth and fur production were not affected by the dietary treatment in either males or females.

A balance trial with 5 males per group showed that the copper excretion in feces increased with increasing copper intake, and 75 - 90 % of the intake was excreted in feces. The urinary copper excretion was also elevated with increased copper intake. However, it only constituted 0.3 - 1.5 % of the copper intake. With increasing copper intake the copper balance in mg increased - but in percent of intake decreased.

In contrast to the result of the balance experiment no difference was found between groups in the copper level in plasma and tissues (heart, kidneys, spleen, liver, and femur) from the males at pelting time.
In general there was no indication that addition of extra copper in normal Danish mink feed would improve the production.

Introduction.

It is well established that copper is an essential mineral for human and animals. Conventional Danish mink feed normally contains about 25-35 mg copper/kg dry matter corresponding to 5-10 mg/kg wet feed, which under normal circumstances should exceed the animals' need.

From other animals - especially pigs - it is known that addition of copper to the feed up to about 250 mg/kg feed can have a positiv effect on growth rate. This has never been shown in mink.

Copper deficiency often leeds to anemia, probably because some copper containing enzymes are involved in iron mobilization. As a result of this anemia - and also because copper containing enzymes are directly involved in the melanine formation - one of the symptoms of copper deficiency is lack of hair pigmentation. Besides, copper enzymes are important for the keratinization of hair. It therefore is obvious that copper is a very important mineral for mink.

Even if the normal copper content of the feed is expected to be sufficient, it would be interesting to know, if an extra copper supply would improve the production. The purpose of the present study was to examine the effect of additional copper in conventional mink feed on growth rate, fur production and copper retention in growing mink kits.

Materials and Methods.

The experiment consisted of 3 groups of 18 male and 18 female mink kits of the pastel type.

The experimental period was from July 12th to pelting time (last days of November). The growth rate of the animals during the experimental period was followed by monthly weighings.

The animals were fed a conventional farm feed (*Stårup Fodercentral A/S, DK-4573 Højby*) (group 1) or farm feed supplemented with extra copper (group 2 and 3). A small feed sample was taken from each group about every second day during the experimental period. A compound sample for each month was formed of these daily samples. The compound samples were analysed for nutrient and mineral content (copper, zinc, iron). All analyses were made at the Central Laboratory of the National Institute of Animal Science. The methods are described by *Jakobsen and Weidner (1973)*. Based on actual analyses the feed provided 16.3 gram crude protein and 7.8 gram crude fat per kg wet feed. The copper content was (mean) 5.1 mg/kg wet feed (group 1), 39 mg/kg wet feed (group 2) and 116 mg/kg wet feed (group 3). The average zinc content was 48 mg/kg wet feed, and the iron content 173 mg/kg wet feed for all groups.

In the beginning of August 5 males per group entered a 4 day balance period for determination of copper-, zinc-, and iron- excretion and -retention. During that period the animals were maintained individually in stainless steel metabolism cages.

The feed composition at the time of the balance period is shown in Table 1. The actual copper content was 4.7, 43 and 123 mg/kg wet feed for the three groups respectively. Dry matter concentration was 37.2 %.

Table 1. Composition of farm feed used during the balance period.

Ingredient	g/kg
Cod offal (fresh/frozen)	260
Herring (fresh/frozen)	170
Fish silage (herring)	95
Poultry silage (heat treated)	32
Poultry waste (heat treated/frozen)	55
Feather silage (heat treated/frozen)	55
Blood cells (fresh/frozen)	20
Blood meal (spray dryed)	8
Fish meal (low ash)	32
Meat and bone meal (low ash)	4
Barley (heat treated)	45
Wheat (heat treated)	45
Wheat bran	25
Wheat germ	8
Maize gluten	8
Potatoe pectin	8
Potatoe protein	12
Vitamin mixture	3
Lard	25
Soya bean oil	23
Water	67

When the moulting was completed, the males were pelted without preceding drumming (pelts marked individually). For mineral analyses the following tissues were taken from each animal seperately : heart, kidneys, liver, spleen, and femur. Blood samples were collected by cardiac puncture for determination of haemoglobin, haematocrit, and copper and iron content in plasma. The females were pelted the traditional way, and the pelts marked by group.

The size of the pelts was measured from the nose to the tail root (by o.5 cm). The pelts were graded for : quality (1-12, 12 best), fur density (1-6, 6 most full), clarity (1-6, 6 purest), grey underfur (0-3, 0 = no grey underfur, 3 = most greyish).

Data were analysed by analysis of variance (GLM) and means compared by use of Duncan Multible Range Test *(SAS, 1982)* when appropriate.

Results and Discussion.

The growth rate for both males and females is stated i Table 2. There was no significant difference between groups ($P > 0.05$).

Table 2. Weight of animals during the experimental period (grams).

Group	1		2		3	
	Mean	SD	Mean	SD	Mean	SD
Males						
Start of experiment	944	115	939	91	951	81
17./8.	1459	168	1449	130	1490	156
16./9	1776	202	1797	201	1857	211
14./10.	2027	246	2060	241	2037	235
End of experiment	2012	265	2051	280	2041	272
Females						
Start of experiment	737	67	699	51	717	96
17./8.	947	100	927	84	933	89
16./9.	1079	173	1047	101	1107	148
14./10.	1201	131	1168	103	1185	147

The result of the pelt grading can be seen in Table 3. No difference between treatment groups was observed.

Table 3. Result of pelt grading.

Group	Mean 1	SD 1	Mean 2	SD 2	Mean 3	SD 3
Males						
Size	75.0	4.0	75.4	3.4	76.3	3.7
Quality	7.6	1.9	7.5	2.2	7.7	2.0
Density	3.4	1.4	3.8	1.5	3.8	1.1
Clarity	3.3	0.8	3.9	1.2	3.6	1.1
Grey underfur	0.7	1.2	1.1	1.2	1.1	1.1
Females						
Size	61.1	2.8	60.8	2.4	62.3	3.6
Quality	7.4	3.0	7.3	2.6	6.2	3.4
Density	3.3	1.8	3.4	1.5	2.4	1.1
Clarity	3.7	1.0	3.8	1.3	3.5	1.4
Grey underfur	1.7	1.0	1.6	1.1	1.0	1.0

Table 4 shows weight and mineral content of different tissues from the males at pelting time. For the weight of the tissues there was no difference between groups.

Table 4. Weight (grams) and mineral content (mg/kg dry matter) tissues from male mink at pelting time.

Group	1		2		3	
	Mean	SD	Mean	SD	Mean	SD
Heart weight	9.9	1.2	10.0	00.9	9.7	1.3
heart copper	55.0	7.7	62.5	9.8	58.1	10
Kidney weight	9.7	1.3	9.9	1.2	9.9	1.3
kidney copper	44.7	4.9	43.0	5.8	44.3	4.7
kidney zinc	279	35	291	33	281	26
Spleen weight	3.5	0.6	3.9	0.7	3.5	0.5
spleen copper	50.4	23	57.4	19	63.6	21
spleen iron	7560	2267	7444	2519	6964	2063
Liver weight	47.7	8.1	44.6	4.9	43.5	5.4
liver copper	82.6	66	81.0	54	124	81
liver iron	3015	1074	3053	718	3068	942
liver zinc	267	82	303	68	301	75
Femur weight	2.9	0.3	2.9	0.3	2.8	0.4
femur copper	6.0[a]	1.2	5.2[b]	0.7	4.1[c]	0.3
femur zinc	126	7.6	121	29	128	8.4

Means within a row not sharing a common superscript are signi cantly different ($P < 0.05$)

The copper content in the heart (in dry matter) tended to be higher for group 2, and if the content was expressed in percent of wet weight, group 1 and 2 differed significantly ($P < 0.05$). *Stuart and Johnson (1986)* found no effect of dietary copper level on the copper concentration of the heart in rats. The same result was found in pigs *(Castell and Bowland, 1968)*. In other experiments with rats, however, the copper concentration of the heart was found to increase with increasing dietary copper level *(Cohen et al., 1985a; Cohen et al., 1985b)*.

The dry matter concentration in kidneys was significantly lower ($P < 0.05$) in group 2 (25.5 %) compared to the other groups (26.5 %). The copper concentration in kidneys (wet weight basis) therefore became significantly lower in group 2, even though there was no difference, when the copper concentration was expressed in percent of dry matter. This is in contrast to results obtained with swine fed a wide range of dietary copper (Bradly et al., 1983), where the kidney copper concentration increased significantly, when the dietary copper level increased. The same was

observed in another trial with swine *(Castell and Bowland, 1968)* and in experiments with rats *(Cohen et al., 1985; Cohen et al, 1985b)*. The kidney zinc concentration was not affected by the experimental treatment.

In spleen it seems that the copper level increased with increasing copper intake but the difference was not significant ($P > 0.05$). The iron concentration decreased, when copper intake increased but this difference was not significant either ($P > 0.05$). These results are in agreement with those found in rats *(Cohen et al., 1985b)* but not in swine *(Castell and Bowland, 1968)*.

Liver copper concentration in group 3 was about 50 % higher than in the other groups but the difference was not significant ($P > 0.05$) because of high individual variations. As the liver is involved in copper storage and maintenance of copper homeostasis, an increase in copper content would be expected, when the copper intake increased. *Stuart and Johnson (1986)* found no effect of the dietary copper level on the copper content of liver in rats, while *Cohen et al. (1985a, 1985b)* reported an increase in liver copper concentration, when copper intake increased, which is in agreement with results from experiments with swine *(Castell and Bowland, 1968; Bradley et al., 1983)*.

The iron concentration in liver was not affected by the experimental treatment. An effect would have been expected, since high dietary copper levels could induce synthesis of the plasma-protein ceruloplasmin involved in mobilization of iron from the liver resulting in decreased iron level in liver.

The liver zinc concentration tended to be higher in group 2 and 3 compared with group 1 but the difference was not significant ($P > 0.05$).

The only significant difference in tissue mineral concentration was found in femur, where the copper concentration decreased, when the feed level increased. All groups differed significantly from each other ($P < 0.05$). No explanation for this result can be given, and it is in contrast to results obtained with rats *(Schwarz and Kirchgessner, 1979; Kirchgessner et al., 1984)*, where the copper concentration in femur increased as the dietary copper level increased.

High levels of dietary copper could cause iron deficiency by competetion for intestinal absorption binding sites. This could lead to iron deficiency anemia evidenced by a decrease in blood haemoglobin concentration as seen by *Kline et al. (1972)*. In the present mink trial haemoglobin and haematocrit values did not differ between groups (Table 5), which is in accordance with results from swine *(Castell and Bowland, 1968)* and rats *(Cohen et al., 1985a; 1985b)*.

Plasma copper level tended to increase, as copper intake increased, however not significantly (Table 5). In copper depleted rats the copper level in serum/plasma was much lower than in animals fed sufficient amount of copper *(Schwarz and Kirchgessner, 1979; Cohen et al., 1985b)*

Table 5. Result of blood analyses.

Group	1		2		3	
	Mean	SD	Mean	SD	Mean	SD
Haemoglobin, mmol/l	10.3	0.6	10.7	0.6	10.6	0.4
Haematocrit, %	45.3	2.2	45.6	2.3	46.0	1.5
Plasma copper, ppm	0.4	0.4	0.6	0.5	0.7	0.4
Plasma iron, ppm	1.0^a	0.4	1.6^b	0.6	2.2^c	1.0
Plasma iron[1], ppm	0.06^a	0.01	0.06^a	0.01	0.05^b	0.01

Means within a row not sharing a common superscript are signi cantly different ($P < 0.05$).

1) After protein precipitation.

The plasma iron level increased when copper intake increased, and group 3 differed significantly ($P < 0.05$) from the others (Table 5). This was also found in serum from rats *(Schwarz and Kirchgessner, 1979)* and to some degree in serum from swine *(Castell and Bowland, 1968)*. *Cohen et al. (1985a)* observed a low plasma copper level, when the dietary copper level was low and found that the plasma iron concentration was generally not affected.

If plasma proteins were precipitated before the iron determination, then plasma iron concentration in group 3 was significantly lower ($P<0.05$) than the others. This means that the high plasma iron content in group 3 (and 2) must have been associated with proteins, probably transferrin which is the main transport protein for iron in plasma.

In the balance trial the copper content in the feed had no significant effect on the zinc and iron balances and on the digestibility of dry matter and protein. The effect on the copper balance is stated in Table 6.

Table 6. Copper balances for 4 days in male mink in relatio varying dietary copper intake (5 animals per group).

Group	1		2		3	
Dietary copper content, mg Cu/kg wet feed	4.7		43		123	
	Mean	SD	Mean	SD	Mean	SD
Copper intake mg (I)	3.08[a]	0.22	28.1[b]	2.15	86.2[c]	4.85
Fecal copper excretion mg (F)	2.31[a]	0.17	24.6[b]	2.04	77.7[c]	3.35
Urinary copper excretion, mg (U)	0.05[a]	0.01	0.11[a]	0.03	0.28[b]	0.09
Copper retention mg (R)	0.72[a]	0.22	3.38[a]	0.51	8.22[b]	3.84
F/I, %	75.2		87.5		90.3	
U/I, %	1.5		0.4		0.3	
R/I, %	23.3		12.1		9.4	

Means within a row not sharing a common superscript are signi cantly different ($P < 0.05$).

As the feed intake was not affected by the feed copper concentration, the copper intake increased with increasing feed copper level. The copper excretion in feces (mg) increased as the copper intake increased, and it was shown that 75 - 90 % of the copper intake was excreted in feces. This result agrees well with results obtained with rats *(Owen, 1964; Stuart and Johnson, 1986)*.

The urinary copper excretion (mg) increased, when the copper intake increased but only group 3 differed significantly from the others. This increase could be a result of contamination of the urine with copper from the feces, as it is very difficult to avoid contamination of urine with feces in balance trials with mink. The urinary copper excretion only contributed 0.3 - 1.5 % of the copper intake.

The copper retention (mg) increased with increasing feed copper level, and was significantly higher in group 3. Group 1 and 2 did not differ significantly even though the retention in group 2 was about 5 times higher than in group 1. In percent of intake the retention decreased, when the copper intake increased, and group 1 differed significantly from the others.

The result of the balance trial is in contrast to the results concerning the tissue copper levels. From the balance trial it would be expected that the increased copper retention found in group 2 and 3 should be reflected in the copper content in tissues from these groups. This was, however, not found in this experiment.

Generally no evident effect of the feed copper level was observed, which indicates that the mink production would be improved by exceeding the level of copper normally used in Danish mink feed.

On the other hand the very high copper level in the feed for group 3 did not seem to have had harmful effects, which means that mink are not very sensitive to copper poisoning.

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Flushing of mink. Effects of level of preceding feed restriction and length of flushing period on reproductive performance.

Anne-Helene Tauson.

In an experiment with 200 standard mink females (five groups of 40 females) the effect of flushing (a period of restriction followed by refeeding preceding the mating season) on reproductive performance was evaluated. The results of a non-flushed control group were compared with flushing from 20 February or 4 March until mating. For each date for start of flushing, the flushing period was preceded by a 2-week period of either moderate or severe restriction.

Reproductive results confirm earlier data in that flushing from March 4, preceded by a 2-week period of moderate restriction, resulted in improved litter sizes (with 1.2 kits on average). Flushing from February 20 was less efficient. When comparing level of restriction, severely restricted females responded less to flushing than did moderately restricted females. The experimental treatment did not affect readiness to mate and the frequency of barren females was not conclusively affected. The rate of stillborn kits was not significantly affected but the highest rate was recorded in the group with superior litter size. In this investigation, both yearlings and adult females responded similarly to flushing.

Animal Reproduction Science, 17, 243-250, 1988. 3 tables, 20 references.
Author's abstract.

Digestibility of different grains in mink and blue fox.

Tuomo Kiiskinen, Jaakko Mäkelä, K. Rouvinen.

Digestibility of carbohydrates in raw and heat processed grain was studied in minks and blue foxes. Grain was included 13-20% (40-54% in dm) in mink diets and 17-22% (46-58% in dm) in blue fox diets. The same method described in the first part of this report was used for mink. The method used for fox was based on the use of an indicator (4 N HCl insoluble ash, AIA method).

Also these results showed that digestibility of carbohydrates in wheat will be improved remarkably as a result of processing. The improvement of digestibility was 30 percentage units in mink and 20 percentage units in fox ($P < 0.05$).

Increase of this size in digestibility has an notable effect on the metabolizable energy of the diet, too. In spite of the high dietary concentration of processed grain digestibility of carbohydrages seems to stay within the certain determined limits.

The results indicate that cooking of oats does not influence noticeably on digestibility of carbohydrates in fox and also processing of barley is economically questionable. The results suggest that the fox can digest better than the mink carbohydrates in raw grain and as regards processed grain differences are small.

Maatalouden Tutkimuskekus, Finland, 5, 14-23, 1988. 3 tables, 2 references.
In ENGL. Su. FINN, SWED. Authors' summary.

Digestibility of protein feedstuffs derived from plants in mink.

Tuomo Kiiskinen, Jaakko Mäkelä, K. Rouvinen.

Apparent digestibility of some protein feedstuffs of plant origin (soybean products, glutens, wheat protein concentrates, potato protein, dried distillery by-products) was studied in mink. Also the effect of grinding and special processing on extracted soybean meal (SBM) was investigated. In the experiments the conventional difference method of total excreta collection was used by mixing the test ingredients at 25-40% of the basic diet.
Digestibility of organic matter and crude

protein in the finely ground extracted SBM were on an average 55.5 and 78.0%, respectively. The corresponding values for the special processed fine SBM were 61 and 83%. The coarsely ground SBN had a 2-4 percentage units lower digestibility value for organic matter and 5-6 percentage units lower value for crude protein. The soyprotein concentrate (Soycomil) was highly digestible; organic matter 91 and crude protein 93% and the fermented SBM ("soy yeast") was digested as well as SBM. Digestibility of carbohydrates in SBM was on an average 20%.

Digestibility of organic matter and crude protein were for glutens (wheat and corn) 86 and 94%, for wheat protein concentrates (by-products of the Finnish starch industry) 76 and 87.5% and for potato protein (Protamyl) 81 and 81%.

Dried distillery by-products seem to be poorly digestible in mink. A product which originated from wheat and contained 41% crude protein in dry matter had the best values; 51% for organic matter and 75% for crude protein.

Using the digestibility values and the common energy coefficients for the digestible main nutrients the ME values of the investigated products were calculated.

Maatalouden Tutkimuskeskus, Finland, 5, 1-13, 1988. 3 tables, 11 references. In ENGL. Su. FINN, SWED. Authors' summary.

Organochlorine contaminants in arctic marine food chains: Accumulation of specific polychlorinated biphenyls and chlordane-related compounds.

Derek C.G. Muir, Ross J. Norstrom, Mary Simon.

Polychlorinated biphenyl congeners (S-PCB) and chlordane-related compounds (S-CHLOR) as well as DDT, hexachlorocyclohexane, toxaphene, and chlorobenzenes were determined in pooled arctic cod (*Boreogadus saida*) muscle and polar bear (*Ursus maritimus*) fat and in the blubber and liver of 59 ringed seals (*Phoca hispida*) from the east-central Canadian Arctic. S-PCB concentrations ranged from 0.0037 mg/kg (wet wt) in cod muscle to 0.68 mg/kg in male seal blubber and 4.50 mg/kg in bear fat. Tri- and tetrachloro PCB homologues were the dominant PCBs in fish, while pentachloro/hexachloro and hexachloro/heptachloro congeners predominated in ringed seal blubber and polar bear fat, respectively. Chlordane compounds detected in seal blubber were oxychlordane, *cis-* and *trans*-nonachlor, and *cis*-chlordane as well as nine minor components of technical chlordane, including nonachlor-III (a nonachlor isomer). Toxaphene and HCH isomers were the major organochlorines in cod muscle with mean concentrations of 0.018 and 0.010 mg/kg, respectively. S-CHLOR/S-PCB ratios ranged from 0.6 in fish muscle and bear fat to 0.7-0.9 in seal blubber, much higher than observed in more southerly marine environments, suggesting a proportionally greater input of chlordane into the Arctic.

Environ.Sci. Technol., 22, 9, 1071-1079, 1988. 5 figs., 5 tables. Authors' summary

Ameliorative effects of reduced food-borne fluoride on reproduction in silver foxes.

Richard H. Eckerlin, George A. Maylin, Lennart Krook, Daniel T. Carmichael.

Reduction of ingested fluoride in a skulk of silver foxes resulted in the reduction of fluoride burden, decreased neonatal mortality and increased kit production during a two breeding and whelping season period.

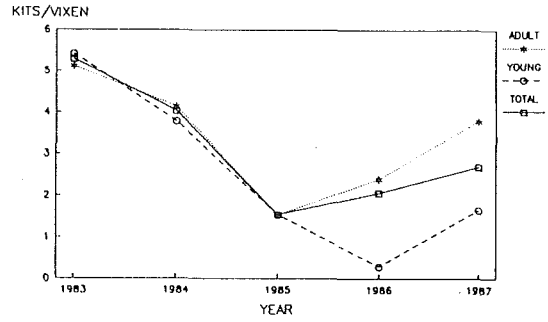


Fig. 2. Kits born to vixen on ordinate as function of years on abscissa

Cornell Veterinarian, 78, 4, 385-389, 1988. 3 tables, 2 figs., 10 references . Authors' abstract.

Hide wastes in diets for young arctic foxes.

A.D. Sobolev.

Male and female polar foxes were fed daily on a diet of cattle slaughter wastes, blood and a feed mixture containing extruded wheat meal, fish meal 2.6 or 0, and hide waste meal 0 or 3.6 g/100 kcal, together with a protein-and-vitamin concentrate and fat. The hide meal replaced 30% of the digestible protein. At the end of feeding body weight of males and females was 6.8 and 5.7 kg for group 1, and 7.0 and 5.8 for group 2; differences were not significant. Quality tests on the pelts indicated that the hide meal decreased quality by 1.8 percentage units. The use of hide wastes gave a financial saving of 0.68 r/pelt produced.

Sbornik Nauchnykh Trudov, Moskovskaya Vet. Akademiya, 98-101, 1986. 3 tables. In RUSS. CAB-abstract.

Effect of feeding mink on hide wastes on their pelt quality.

A.D. Sobolev.

Male and female mink were in 3 groups of 95 each and fed for 123 days on a daily ration containing digestible protein 7.5 g/100 kcal without or with hide waste meal added to replace 20 or 30% of the digestible protein. At slaughter area of pelt was 1120, 1140 and 1120 cm^2 for males, and 799, 799 and 783 cm^2 for females. Of the skins 61.3, 70.5 and 57.2% for males, and 73.4, 80.6 and 67.6% for females were of normal quality, while 2.0, 6.8 and 2.0, and 9.6, (-) and 4.6% were defective .

Sbornik Nauknykh Trudov, Moskovskaya Vet. Akademiya, 94-98, 1986. 6 tables. In RUSS. CAB-abstract.

Use of a feed mixture containing hide wastes in feeding of young mink.

O.A. Komov.

Young mink in 3 groups were fed for 123 days on a diet containing fish 12.1, 12.1 and 12.1 g/100 kcal, cattle slaughter wastes 8 in common, blood 4.3 in common, extruded wheat 9 in common, protein-and-vitamin concentrate 4 in common, fish meal 2.6, 0.8 and 0.0, ground hide wastes 0.0, 2.4 or 3.6, and fat 4.22, 4.20 or 4.17 g/100 kcal. The hide waste meal contained moisture 13.2, protein 63.0, fat 7.4 and ash 16.4%. At the end of the trial, average body weight of males was 2.37, 2.37 and 2.33 kg; and that of females 1.34, 1.30 and 1.25 kg; the differences were not significant. Average areas of pelt was 1077.5, 1121.1 and 1079.3 cm^2 for males, and 705.8, 704,2 and 700,5 cm^2 for females. Average quality score for pelt quality was 98.3, 99.6 and 98.4%.

Sbornik Nauchnykt Trudov, Moskovskaya Veterinarnaya Akademiya, 101-105, 1986. 6 tables. In RUSS. CAB-abstract.

Studies on using protein concentrate F1 in feeding polar foxes slaughtered for skin production.

Andrzej Zon, Kazimierz Jablonski, Zbigniew Sieron.

Studies were conducted on 176 foxes divided into 4 feeding groups. Group 0 was fed a diet without F_1 concentrate. In the diets for groups I, II and III, respectively 20, 40 or 60% of protein of fresh meat-fish feedstuffs were replaced by F_1 concentrate. Body weight of foxes before slaughter was equal in groups 0, I and II, and was 5900 g in males and 5550 g in females. In group III body weight was lower by, respectively, 200 and 150 g.

The results of licence evaluation were similar in both males and females (26.4-28.0 points). About 80% of skins was qualified as grades II and III. Replacing up to 40% of protein of fish-meat-feedstuffs by the protein of F_1

concentrate made it possible to obtain high qualty skins and to save up to 30 kg/fox of scarce feedstuffs of fish and meat origin.

Roczniki Naukowe Zootechniki, Poland. 13,1, 229-238, 1986. 3 tables, 18 references. In POLH. Su. GERM, ENGL, RUSS. Authors' summary.

Carbohydrates in diets for fur bearers.

Ilpo Pölönen, Tuula Dahlman.

For mink females in Finland fed a diet containing 40% protein, 38% fat and 22% carbohydrates during the mating period and gestation, the number of kits born per mated female averaged 5.02 vs. 4.63 for females fed a standard diet of 43% protein, 40% fat and 17% carbohydrates; the av. percentage of infertile females was 9.1 vs. 13.3, and kit body weight on 23 June averaged 364 g vs. 324. For blue fox females fed a high carbohydrate diet (33% protein, 41% fat and 26% carbohydrates), the number of cubs born per mated female averaged 5.56 vs. 6.53 for females fed a standard diet (40% protein, 38% fat and 22% carbohydrates), and the percentage of infertile females was 35.3 vs. 28.9. Results are compared with those in previous years.

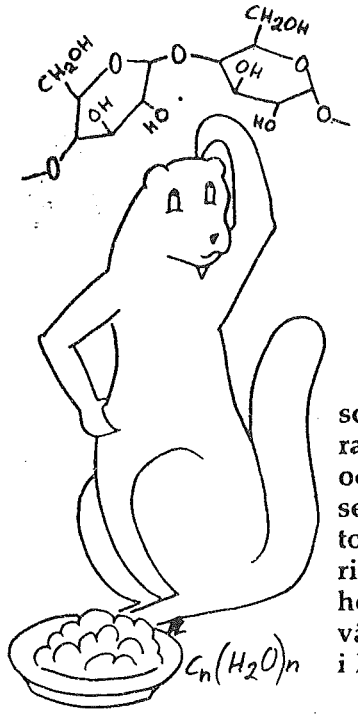
Finsk Pälstidskrift, 22, 12, 487-489, 1988. 2 tables. In SWED. CAB-abstract.

ILPO PÖLÖNEN, TUULA DAHLMAN

KOLHYDRATER

i

pälsdjursfoder I



Kolhydraterna är en viktig näringsämnesgrupp som består av socker, stärkelse och fibrer. Kolhydraterna i pälsdjursfodret är till största delen amylos och amylopektin som ingår i spannmålets stärkelse, men också sackaros (i socker och melass), maltos, fruktos och glykos (i kokt spannmål ochageribiprodukter), laktos (mjölksocker), cellulosa och hemicellulosa (den smälta delen i växternas cellväggsämnen) samt glykogener (animalisk stärkelse i lever och muskelvävnad).

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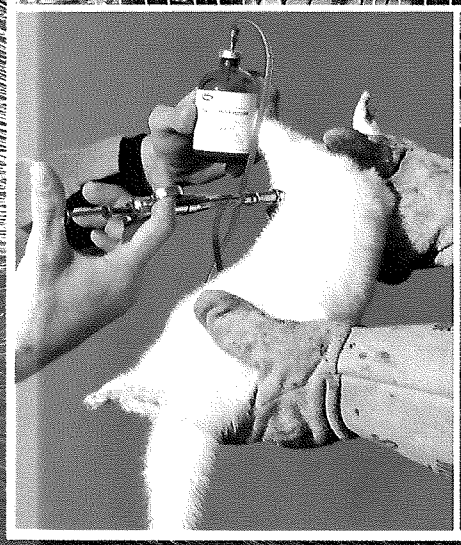

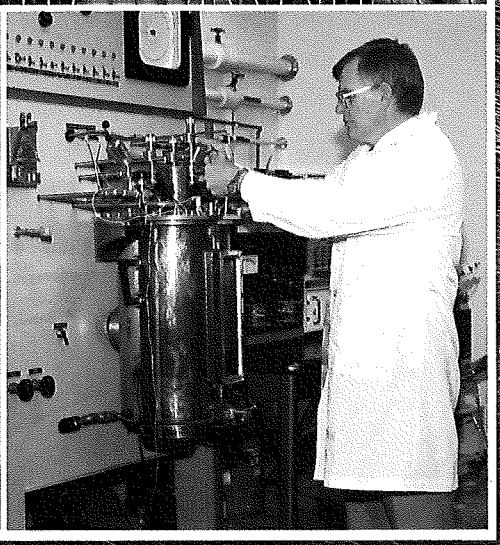

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Case Report.

An outbreak of Aleutian Disease Pneumonitis in mink with deformation of the facial bones.

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** *National Veterinary Laboratory, DK 8200 Aarhus.*

Introduction.

Aleutian disease (AD) in mink has been known as a problem in mink herds for more than 3 decades and the disease was first described in 1956 by *Hartsough and Gorham.* The typical symptoms are abortions and increased kit mortality during the growth period. Additionally, a reduced pelt quality and pelt size are common findings in AD-infected farms (Hansen, 1984).

In May 1982 AD occurred in a new type with a high kit mortality due to acute interstitiel pneumoni or pneumonitis *(Bøtner and Jørgensen, 1983; Jørgensen and Bøtner, 1983; Larsen et al., 1984).* The AD-pneumonitis has been diagnosed at the National Veterinary Laboratory every year since 1983 and as an average 5 to 15 farms are affected every year. The mortality can vary from 1% to more than 50% of the kits.

This case-story describes an acute outbreak of AD-pneumonitis in a large mink herd where a pronounced deformation of the facial bones was seen along with the high kit mortality.

Case-story.

The herd had 3700 breeding females. The farm had been examined serologically with the counter immune electrophoresis-test against AD since 1981 and in the period 1981 to 1985 the frequency of sero-positive reactors varied from .1% to .3%. In June 1986 the breeding stock was tested again and only 2 females were sero-positive (.05%). In December 25% of the females and kits were sero-positive and all sero-positive reactors were pelted in January 1987. In February 1987 2% sero-positive reactors were found and these were also pelted.

In April 1987 abortion occurred in 30 females and May 16th 1987 the kits started to die with severe signs of dyspnoea. The histopathological examination revealed pneumonitis with hyaline membranes and basophilic intranuclear inclusion bodies typical of AD-pneumonitis as described by *Larsen et al. 1984.* About 15% of the kits died during the last 2 weeks of May 1987. In July and August approximately 20 kits died every day mainly due to AD with secondary infection with either Streptococci or Staphylococci.

Medio August 1987 all mink were treated orally with sulfadiazine + trimethoprime (100 mg sulfadiazine + 20 mg trimethoprime) in 4 days and the mortality decreased dramatically during the next weeks.

In September 1987 a few mink kits with dorsal deviation of the nose were observed. During the next weeks more and more kits developed severe deformation and deviation

of the facial bones. At pelting approximately 2000 kits (12% of the total number of kits in the herd) showed the facial changes.

Pathological examination.

In October 1987 4 mink kits with the typical facial deformations were euthanized with pentobarbital intraperitoneally.

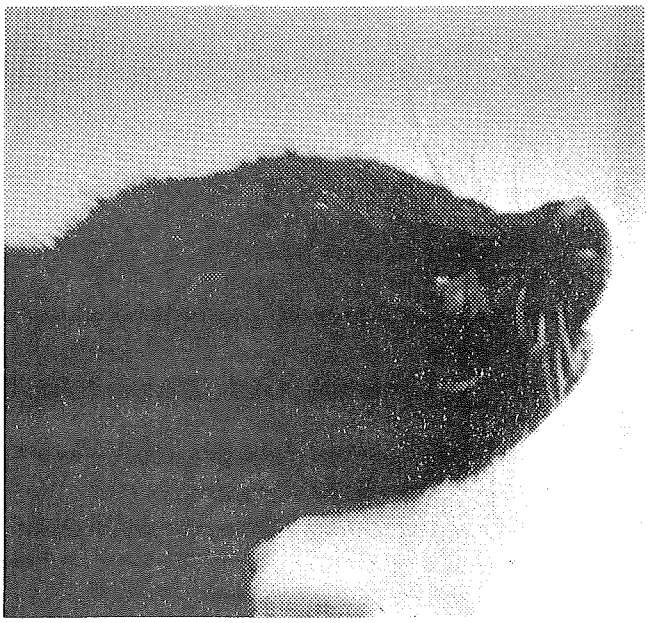
Gross pathology: The nose was shortened with a dorsal deviation and new bone formation in the maxilla around the carnivores (Fig. 1). The mandibles were without changes. In cross section of the nose atrophia of the chonchae and new bone formation in the dorsal part of cavum nasi were observed. There was no sign of inflammation in the cavum nasi. The other organs were without lesions.

Histopathology: The epithelium in cavum nasi was without alterations. The lamina propria and the periost had severe infiltration with lymphocytes, plasmacells and macrophages. Polyarteritis nodosa was prominent in the periostal connective tissue. Increased osteoblast and osteoclast activity was observed in the facial bones. In the dorsal part of the cavum nasi a formation of bone was observed and the bone plates was lined with active osteoblasts and many plasmacells and lymphocytes. There was no signs of inflammation.

The liver showed mild periportal accumulation of plasmacells and lymphocytes and multiple hematopoietic foci. The kidneys revealed mild interstitiel infiltration with lymphocytes. The glomeruli and vessels were without changes.

Bacteriology: A mixture of hemolytic Streptococci, Staphylococcus intermedius and micrococci was isolated. Selective cultivation for Pasteurella multicida was negative. Pasteurella toxin could not be detected.

Counter immune electrophoresis: There was antibodies against AD-virus in serum samples from 4 mink kits.



Examination at pelting time.

In december 1987 twenty heads from mink kits with facial deformations were examined for Pasteurella multocida and its toxin. Neither the bacteria nor the toxin could be identified. All mink in the herd showed antibodies against AD-virus.

The pelt size and the pelt quality were reduced with about 20% when compared with the previous years.

Conclusion.

Acute AD-pneumonitis in mink can cause a high kit mortality in May. Additionally, abnormal growth of the facial bones can occur. The pathological changes are macroscopically similar to those described in atrophic rhinitis in pigs *(Jubb and Kennedy, 1985)*. In this case Pasteurella multocida or its toxin, which is related to the development of porcine atrophic rhinitis *(Pedersen and Elling, 1984)*, could not be isolated from any of the mink heads. The primary cause of the abnormal growth of the facial bones could not be identified, but the pathological changes was not similar to those described in atrophic rhinitis *(Elling and Pedersen, 1985)*. A possible pathogenesis is a changes activity of the osteoblasts and osteoclasts due to the vascular changes in the periostal layer.

The economical losses can be severe by the outbreak of AD-pneumonitis. The losses are mainly due to the kit mortality and the reduced pelt size and pelt quality.

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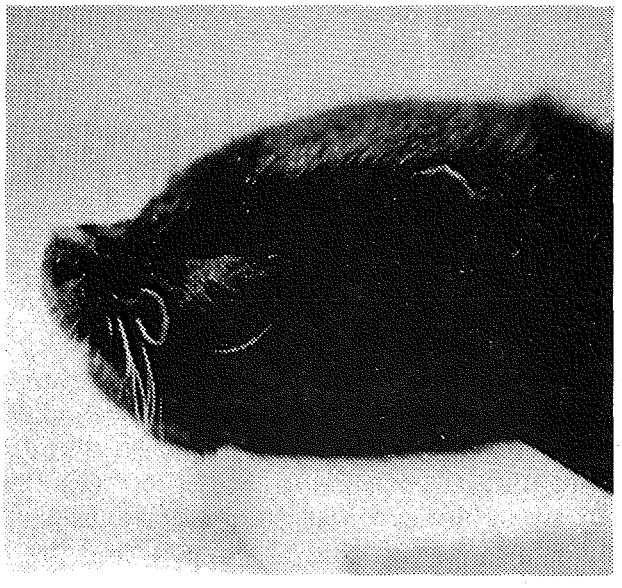

Mink enteritis virus. Methods to determination of the humoral immunity.

Åse Uttenthal.

Chapter 1. Review of the literature concering MEV, especially laboratory methods to diagnose the disease.

A review of the evolution of mink enteritis virus (MEV) since the original outbreak in 1947 based on literature from scientific papers and books is given. Shortly after the first outbrak it was shown, that the disease, which gives a high mortality among infected mink, could be prevented by vaccination. The clinical picture of the disease and the development of vaccines against it is described. The taxonomy of the virus and the closely related parvoviruses of dog (CPV) and cat (FPLV) is mentioned. The three viruses are compared at the DNA level, in order to stress their homology. The main interest is on the literature concerning diagnostic methods to be used in the laboratory. Both methods for detection of antigen and of antibody are described and compared.

Chapter 2. Investigations to characterize MVE.

The cell culture grown virus MEV-2_{cp} was titrated by immunofluorescence on cell cultures infected with virus. The titer of the virus was 10^4-10^5 $TCID_{50}$ per ml. The amount of viral antigen at different densities was determined after CsCl gradient centrifugation of the cell culture adapted virus. Maximal virus content was found at a density of approximately 1.35 g/ml. Field strains of virus were investigated by the same methods, antigen from faecal samples was distributed throughout the gradient, but the highest content of antigen was found at densities ≥1.3 g/ml. Purification of antigen, and immunization of rabbits with this antigen is described. The rabbit anti MEV was tested by various methods.

Chapter 3. Establishing and employing methods to determine the specific antibody titer aginst MEV.

Rocket line immuno-electrophoresis (RLIE) was adapted to test specific antibodies towards MEV. The method was employed to titrate the amount of specific serum antibody in mink after natural infection with MEV. The specificity an sensitivity of the test is good, but the method is time consuming, and demands large volumes of concentrated antigen. Hemagglutination inhibition on African green monkey erythrocytes was established in the laboratory. This method is less time and antigen-consuming than the former. The two methods were compared by titration of approximately 100 samples. There is a good correlation between the test systems.

Chapter 4. Experimental infection of mink with MEV.

In the beginning of the chapter, experimental infection of dog, cat and mink is reviewed. Then two experiments are described, the first is a challenge experiment to test vaccination in mink kits. The animals consisted of four groups of mink, 1) not vaccinated kits to serve as a control, 2) vaccinated kits from not vaccinated dams, 3) vaccinated kits from vaccinated dams and, 4) vaccinated kits with a concurrent ADV infection. All animals were infected with MEV. The antibodies and virus-excretion was followed for at least one month. The specific antibody content was very similar in all 4 groups. There were no detectable antibodies towards MEV in serum, following vaccination. After virus challenge the antibody titer increased from post infection day (pid) 5 or 6 and the animals kept their high titers (HI-titers ranging between 320 and 10240) till the end of the experiment. Both vaccinated and not vaccinated animals excreted virus during pid 4-7, but the percentage of animals with clinical signs was significantly lower in the vaccinated groups. This means that apparently healthy animals can harbour and spread the virus.

The second experiment was of shorter duration, only 8 days. Besides the titration of virus in faeces, the viral content in urine and stomach-contents was measured. The antibody content in serum and bile was deter-

mined. The distribution of virus in the tissue was investigated by dot-blot of phenol extracted DNA and subsequent hybridization with a CPV-probe. The amount of antibody in serum was as described in the former experiment. The antibody titer in bile was at least as high as in serum. No virus was detected in urine. The distribution of virus as measured by hybridization to viral DNA gave similiar results to those that have earlier been published on viral isolation in cell culture, which means that virus was mainly detected in the intestine and mesenteric lymph node. Small amounts of virus was detected in spleen and liver pid 4 and 6.

Chapter 5. Development of antibodies after vaccination of mink towards MEV.

Vaccination has been accepted worldwide, as a prophylactic tool to prevent disease due to MEV. Generally vaccination has fulfilled its purposes and farms with vaccinated animals have not had the disease. If the vaccine was used to stop an infection in a newly infected farm, the losses stopped shortly after vaccination. In Denmark, however, problems arose with disease outbreaks in vaccinated farms, starting about 1980. Therefore experiments were set up, to investigate the changes in serum antibody titer in mink kits and dams after vaccination with commercial vaccines. It was shown, that mink kits did not show any increase in specific antibody titer following vaccination with inactivated vaccines. In adult females, boosted in February there was a sligh increase in serum antibodies. The antigen contents in 5 vaccines was tested after desorption of adjuvant. Slight differences in antigen content showed up, but the total antigen content was low in all the vaccines. There was no correlation between content of the measured antigen in the vaccines and increases in specific antibodies after vaccination with the same vaccines.

Chapter 6. Virus enteritis in Denmark. Epidemiology and prophylaxis.

The approach to the epidemiology for MEV in Denmark is made in this chapter. The infection is evaluated concerning the frequency of the disease, and the mortality due to the disease. An epidemic outbreak was investigated with a questionnaire. The results concerning clinical signs and the losses correlated to concurrent infection with ADV was investigated. The material is not sufficiently large to make exact conclusions, but there is a strong indication, that the more animals with circulating antibodies towards ADV, the more severe are the losses due to MEV infection.

The ordinary diagnosis of MEV is based upon histology of sections of the intestine and/or virus detection in fecal samples. The ELISA test to determine virus antigen contents in faecal samples was applied to samples from mink from 14 farms where MEV had been diagnosed 3-77 days prior to the sampling. All samples from 6 of 14 farms were totally negative by this method. The limitations of the method is discussed. An alternative method, based on serum antibodies is suggested, but till now there are too many unknown factors. The serum antibody titer is a more stable method, as the high antibody titer remains for long periods. The problem is, how to test animals on a farm that had the infection some time ago, since they might still have high antibody titers.

Chapter 7. Conclusion.

In this chapter the results from the experimental chapters are combined. It is shown, that during natural conditions the antibody titer is very high for at least a year after an acute outbreak. The fact that vaccinated animals are able to excrete virus is discussed. The consequence is, that if the vaccine will not eliminate the multiplication of virus then virus will be excreted to the environment. Therefore the disease is spread in spite of the vaccination, and a diagnosis based on antigen content in virus will be positive even though the animals are vaccinated. Other infections (e.g. bacterial) might be diagnosed as virus enteritis if the virus is in a faecal sample in combination with the bacteria. At the present time we

have too little knowledge of the states of the virus in animals.

The mortality and maybe also the morbidity is much lover in 1987 than it was in 1958, indicating that either the virus has changed, or the mink population has been selected to rèsist the disease.

Dissertation, Royal Vet.- and Agric. Univ., Copenhagen, Denmark. 1988. 120 pp, 39 tables and figs., 139 references. Author's summary.

Induction of protective immune response by vaccination against Pseudomonas Pneumonia of mink.

L. Elsadig Elsheikh, K.-A. Karlsson, R. Bergman, S. Abaas.

Protection of mink against experimental Pseudomonas hemorrhagic pneumonia was examined after a single vaccination dose with formaline killed bacteria. Humoral immune response to sonicated antigen (SA) or purified lipopolysaccharide (LPS) of *P. aeruginosa* were assesed by ELISA (Enzyme Linked Immunosorbent Assay) and PHA (Passive Hemaglutination). Although ELISA was more sensitive and reproductible when SA was used, the PHA test proved equally reliable in measuring LPS antibodies. Significant levels of IgG (Immunoglobulin class G) antibodies were measurable through a whole year period both by ELISA and PHA. IgM antibodies were mainly detectable in the first two weeks after vaccination. Vaccinated mink were resistant to challenge infection by a lethal dose of 10^9 cfu of the challenge strain. The vaccine induce a serotype specific immunity with IgG antibody as a predominant component.

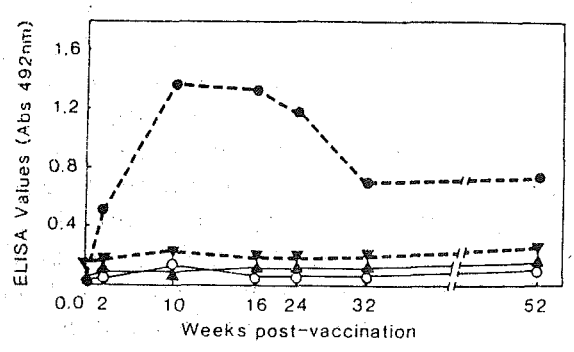

Fig 3. Kinetics of IgG-antibody response to *P. aeruginosa* sonicated cells (Ag II) in mink serum after a single vaccination. Homologous antibodies in vaccinated (●), control (▼) and heterologous response in vaccinated (▲) and control (△) groups as measured by ELISA.

J. Vet. Med. Bull., 35, 256-263, 1988. 2 tables, 4 figs., 22 references. Authors' summary.

Antibody titers in domestic ferret jills and their kits to canine distemper virus vaccine.

Max J.G. Appel, William V. Harris.

Antibody titers were measured in domestic or European ferret (*Mustela putorius furo*) jills vaccinated with modified-live canine distemper virus (CDV) vaccine and in their kits. The half-life of maternal antibody to CDV in ferrets was 9.43 days. Ferret kits should be vaccinated against CDV at 6, 10, and 14 weeks of age.

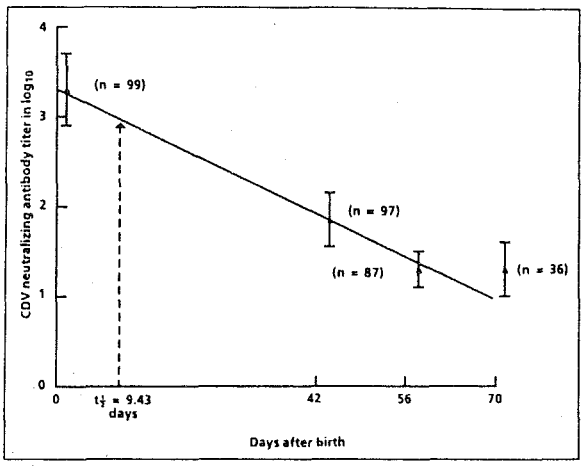

Figure 1—Decrease of maternal antibody titers against canine distemper virus (CDV) in ferret kits. Bars indicate SEM; n = No. of kits; $t_{1/2}$ = half-life.

JAVMA, 193, 3, 1988. 1 fig., 13 references. Authors' summary.

The structure of Serotype H10 hemagglutinin of influenza A virus: Comparison of an apathogenic avian and a mammalian strain pathogenic for mink.

Heinz Feldmann, Evelyne Kretzschmar, Berndt Klingeborn, Rudolf Rott, Hans-Dieter Klenk, Wolfgang Garten.

The primary structure of the hemagglutinin of the apathogenic avian influenza virus A/chick/Germany/N/49 (H10N7) and of the serologically related strain A/mink/Sweden/-84 (H10N4) pathogenic for mink has been elucidated by nucleotide sequence analysis, and the carbohydrates attached to the polypeptide have been determined. The H10 hemagglutinin has 65, 52, 46, 45, and 44% amino acid sequence homology with serotypes H7, H3, H1, H2, and H5, respectively. H10 and H7 hemagglutinins are also most closely related in their glycosylation patterns. There is a high sequence homology between both H10 strains supporting the concept that the mink virus has obtained its hemagglutinin from an avian strain. The sequence homology includes the cleavage site which consists of a single arginine as is the case with most other hemagglutinins exhibiting low susceptibility to proteolytic activation. The similarity in hemagglutinin structure between both H10 strains is discussed in light of the distinct differences in the pathogenicity of both viruses.

Virology, 165, 428-437, 1988. 3 figs., 1 table, 53 references. Authors' summary.

Cecal and fecal bacterial flora of the Mongolian gerbil and the chinchilla.

John M. Worthington, Robert S. Fulghum.

The Mongolian gerbil is being increasingly used as a laboratory animals and as a pet. Both chinchillas and gerbils are used as animal models for otitis media and other otic research. Previously, only incomplete information was available regarding the indigenous bacterial flora of the lower intestinal tracts of these coprophagic animals. Using the strict anaerobic methodology of the Virginia Polytechnic Institute Anaerobe Laboratory, we studied the predominant bacterial flora of the cecum and fecal pellets of the gerbil and the chinchilla and the bacterial flora of digesta pellets in the proximal colon. We found species of the following anaerobic genera in high dilutions of gerbil fecal pellets: *Bifidobacterium, Clostridium, Propionibacterium, Lactobacillus,* and *Bacteroides.* Only lactobacili were found in high dilutions of digesta from the upper colon, although the cecum yielded *Peptostreptococcus, Bifidobacterium, Clostridium, Lactobacillus, Propionibacterium,* and *Bacteroides* species from high dilutions of cecal contents. The facultatively anaerobic and aerobic flora isolated consisted of species of *Bacillus, Streptococcus, Staphylococcus, Acinetobacter, Alcaligenes, Escherichia, Pasteurella,* and *Pseudomonas* plus several unidentifiable organisms. Species of *Bifidobacterium, Bacteroides, Eubacterium,* and anaerobic *Lactobacillus* were isolated from chinchillas.

Applied and Environmental Microbiology, 54, 5, 1988. 4 tables, 25 references. Authors' summary.

Canine host range and a specific epitope map along with variant sequences in the capsid protein gene of canine parvovirus and related feline, mink, and raccoon parvoviruses.

Colin R. Parrish, Charles F. Aquadro, Leland E. Carmichael.

Canine parvovirus (CPV) is a recently recognized pathogen of dogs that is similar to the long-recognized feline, mink, and raccoon parvoviruses. Relationships between the viruses determined from DNA sequences of the capsid protein genes of 10 virus isolates showed the CPV isolates to be closely related to the other viruses, althoug comprising a distinct group. No immediate ancestor of CPV was observed amongst the mink, cat, or raccoon viruses examined. Three different directly repeated sequences were present within the noncoding region downstream from the capsid protein genes. Analysis of recombinants between CPV and feline panleukopenia virus at restriction sites within the capsid protein genes mapped a CPV-specific neutralization epitope on the virus capsid, differences in the pH dependence of hemagglutination, and part of the determinant of canine host range between 59 and 64 genome map units (m.u.). Those differences were therefore the result of up to three nucleotide or predicted amino acid sequence differences in that region. A se-

cond region between 64 and 73 m.u., which may affect the viability of certain recombinant viruses, contained four nucleotide diferences, one of which was a coding change.

Virology, 166, 293-307, 1988. 3 tables, 10 figs., 71 references. Authors' summary.

Detailed transcription map of Aleutian mink disease parvovirus.

Søren Alexandersen, Marshall E. Bloom, Sylvia Perryman.

We studied the transcription program of Aleutian mink disease parvovirus (ADV) by using a combination of cDNA cloning and sequencing, primer extentison, and Northern (RNA) blot hybridization with splice-specific oligonucleotides. The 4.8-kilobase ADV genome was transcribed in the rightward direction, yielding plus-sence polyadenylated transcripts of 4.3 (R1 RNA), 2.8 (R2), 2.8 (R3), 1.1 (RX), and 0.85 (R2') kilobases. Each RNA transcript had potential translation initiation sites within open reading frames, suggesting protein translation, and a scheme encompassing ADV structural and nonstructural proteins is proposed. Each of the five RNA transcripts had a characteristic set of splices and originated from a promotor at nucleotide 152 (map unit 3 (R1, R2, R2', and RX) or at nucleotide 1729 (map unit 36 (R3)). The transcripts terminated with af poly (A) tail at one of two positions: either at map unit (R2' and RX) or map unit 92 (R1, R2, and R3). Similarities with and differences from the transcription maps of other parvoviruses are discussed, and possible roles of the unique features found in ADV transcription are related to the special pathogenic features of this virus.

Journal of Virology, 62, 10, 1988. 8 figs., 50 references. Authors' summary.

Nucleotide sequence and genomic organization of Aleutian mink disease parvovirus (ADV): Sequence comparisons between a nonpathogenic and a pathogenic strain of ADV.

Marshall E. Bloom, Søren Alexandersen, Sylvia Perryman, David Lechner, James B. Wolfinbarger.

A DNA sequence of 4,592 nucleotides (nt) was derived for the nonpathogenic ADV-G strain of Aleutian mink disease parvovirus (ADV). The 3' (left) end of the virion strand contained a 117-nt palindrome that could assume a Y-shaped configuration similar to, but less stable than, that of other parvoviruses. The sequence obtained for the 5' end was incomplete and did not contain the 5' (right) hairpin structure but ended just after a 25-nt A+T-rich direct repeat. Features of ADV genomic organization are (i) major left (622 amino acids) and right (702 amino acids) open reading frames (ORFs) in different translational frames of the plus-sence strand, (ii) two short mid-ORFs, (iii) eight potential promoter motifs (TATA boxes), including ones at 3 and 36 map units, and (iv) six potential polyadenylation sites, including three clustered near the termination of the right ORF. Although the overall homology to other parvoviruses is <50%, there are short conserved amino acid regions in both major ORFs. However, two regions in the right ORF allegedly conserved among the parvoviruses were not present in ADV. At the DNA level, ADV-G is 97.5% related to the pathogenic ADV-Utah 1. A total of 22 amino acid changes were found in the right ORF; changes were found in both hydrophilic and hydrophobic regions and generally did not affect the theoretical hydropathy. However, there is a short heterogeneous region at 64 to 65 map units in which 8 out of 11 residues have diverged; this hypervariable segment may be analogous to short amino acid regions in other parvoviruses that determine host range and pathogenicity. These findings suggested that this region may harbor some of the determinants responsible for the differences in pathogenicity of ADV-G and ADV-Utah 1.

Journ. of Virology, 62,8, 2903-2915, 1988. 8 figs., 74 references. Authors' summary.

Detection of Aleutian disease antibodies in mink by the Dessau Aleutian test on certain farms in Czechoslovakia.

T. Zuffa, O. Rejholcova.

When 5913 blood serum samples from 1-2-year-old mink of various genotypes kept on 8 farms (6 collective, 2 private) were examined by countercurrent electrophoresis with a kit made in East Germany, 2341 reacted positively and 3572 were negative. A distinct precipitation line between the antigen and the serum sample was considered as positive. The number of positive reactions ranged from 1.3% of 401 samples on one collective farm to 75.9% of 29 samples on a private farm. 3764 samples were also examined by a non-specific iodine agglutination test; only 49 of them were positive, which showed that this test was completely unsuitable.

Veterinarstvi, 38, 5, 217-218, 1988.
In SLOE. CAB-abstract.

Dracunculus insignis: experimental infection in the ferret, Mustela putorius furo.

M.L. Eberhard, E. Riuz-Tiben, S.V. Wallace.

The laboratory study of dracunculiasis has suffered from the lack of a suitable, readily available animal model. We have been able to experimentally infect ferrets, *Mustela putorius furo*, with the North American dracunculid, *Dracunculus insignis*. Ferrets were inoculated with 75 to 100 infective larvae and were necropsied 90 to 240 days later. Guinea worms were recovered from 10 (56-%) of 18 ferrets. A total of 44 worms were recovered, for an average of 4.4 worms per infected ferret. Gravid female worms were recovered as early as 128 days postinoculation. Thirteen (87%) of 15 gravid female worms were recovered from the extremities. Living male worms were recovered at 200 days of age, indicating that not all male worms die shortly after mating. First-stage larvae recovered from gravid females as early as 200 days of age were found to be infective to the copepod, *Acanthocyclops vernalis*. These observations suggest that the ferret is an excellent laboratory animal for dracunculiasis research.

Journ. of Helminthology, 62, 265-270, 1988. 6 figs., 1 table, 11 references. Authors' abstract.

Trichinellosis in nutria.

Z. Nowakowski.

The possibility of trichinellosis in the nutria (*Myocastor coypus*) and data of literature are given. The results of Trichinella inspection by a digestion method of the nutria slaughtered in Poland in 1980-1987 are presented. Trichinellae were found in 77 (0.008%) out of 963,018 slaughtered nutria. The intensity of parasitic invasion in muscles of the infested animals is also included.

Medycyna Weterynaryjna, 44, 5, 301-303, 1988. 3 tables, 7 references. In POLH. Su. ENGL, RUSS. Author's abstract.

New records of chewing lice (Mallophaga: Trichodectidae) found on North American wild foxes North of Mexico.

K.C. Emerson, Roger D. Price.

A summary of trichodectid records is given for the five species of North American foxes, including finding *Neotrichodectes mephitidis* (Packard), a common louse on the Striped Skunk, on the Island Gray Fox from three of the off-shore Channel Island and on the Gray Fox in Santa Barbara County, California.

Journ. of the Kansas Entomological Society, 60,2, 332-333, 1987. 2 figs., 3 references. Authors' abstract.

Biology and Diseases of the Ferret

James G. Fox
Lea & Febiger (Philadelphia), 345pp.,1988.
ISBN 0-8121-1139-7.

The book is intended for veterinarians and scientists, especially those either providing veterinary care or utilize the ferret in biomedical research.

The hard cover book consisting of 19 chapters, is organized into 3 sections. Section 1.: Biology and Husbandry, contains chapters on Taxonomy, History and Use by J.G. Fox (Chapter 1), Anatomy of the Ferret by N.Q. An and H.E Evans (Chapter 2), The Neuroanatomy of the Ferret Brain by I.N.C. Lawes and P.L.R. Andrews (Chapter 3), The Physiology of the Ferret by P.L.R. Andrews (Chapter 4), Nutrition by D.E. McLain, J.A. Thomas and J.G. Fox, Housing and Management (Chapter 6), Normal Clinical and Biological Parameters (Chapter 7), Reproduction, Breeding and Growth (Chapter 8), all by J.G. Fox. Section 2.: Diseases and Clinical Applicacions has chapters on Diseases associated with Reproduction by J.G. Fox, R.C. Pearson and J.R. Gorham (chapter 9), Bacterial and Mycoplasmal Diseases by J.G. Fox (Chapter 10), Viral and Clamydial Diseases by J.G. Fox, R.C. Pearson and J.R. Gorham (Chapter 11), Parasitic Diseases (Chapter 12), Mycotic Diseases (Chapter 13), Systemic Diseases (Chapter 14) all by J.G. Fox, Neoplasia in Ferrets by M.E.P. Goad and J G. Fox (Chapter 15) and Anaesthesia and Surgery by J.G. Fox (Chapter 16). Section 3.: Research Applications consists of chapters on Viral Disease Models by R.C. Pearson and J.R. Gorham (Chapter 17), Use of the Ferret in Behavioral Research by M.J. Baum (Chapter 18) and Use of the Ferret in Reproductive Neuroendocrinology by M.J. Baum (Chapter 19).
The format of each chapter is built around well chosen subdivisions and clear headings with an easily read text.

The text is generally concise and the subjects are thorougly researched with both old and updated references placed conveniently at the end of each chapter.

The author has done a commendable job in successfully gathering both in depth and in crucial areas relative sporadic data on the biology and diseases of the ferret in a single book. The book is highly recommendable for veterinarians and researchers working with members of the genus Mustela who want an up-to-date well-written book in the area and for comparison.

Reviewed by Asbjørn Brandt, DVM.
Natl. Institute of Animal Science
Dpt. of Fur Animals
P.O. Box 39, 8830 Tjele, Denmark.

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An introduction for research workers and technicians

P. A. Flecknell

Comparative Biology Centre
The Medical School
Newcastle-upon-Tyne UK

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Gene H. Nesbitt.

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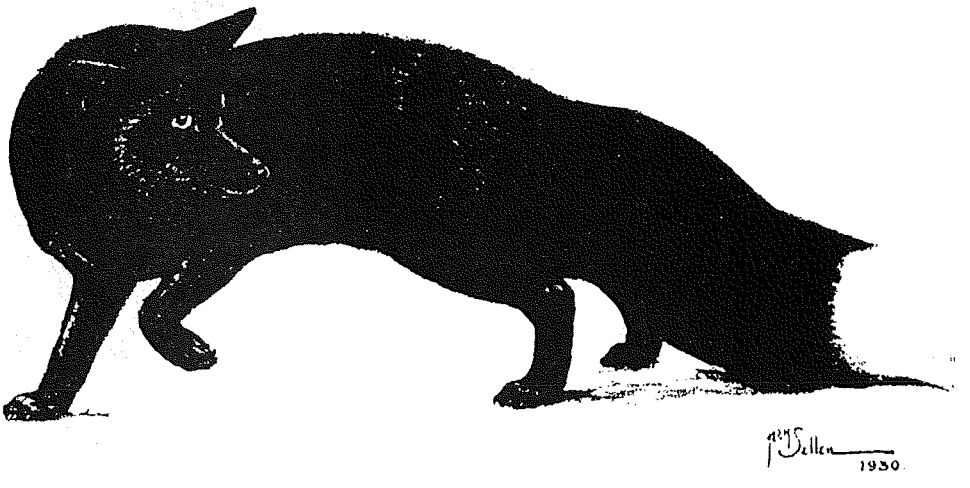

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Phagocytic reactions in the blood of mink and polar foxes.

V.A. Berestov, O.I. Moiseeva, L.B. Uzenbaeva.

Institut biologii (Akademiia nauk SSSR. Karel-'skii filial), USSR. QR187.P4B4.
32 tables, 29 figs., 232 references. 1983.
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Вячеслав Алексеевич **Берестов**,
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ФАГОЦИТАРНАЯ РЕАКЦИЯ КРОВИ У НОРОК И ПЕСЦОВ, СРАВНИТЕЛЬНАЯ ХАРАКТЕРИСТИКА

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Moskva Agropromizdat, SF403.5.S68S5. In RUSS. Abstract G. Jørgensen.

В.С. Слугин

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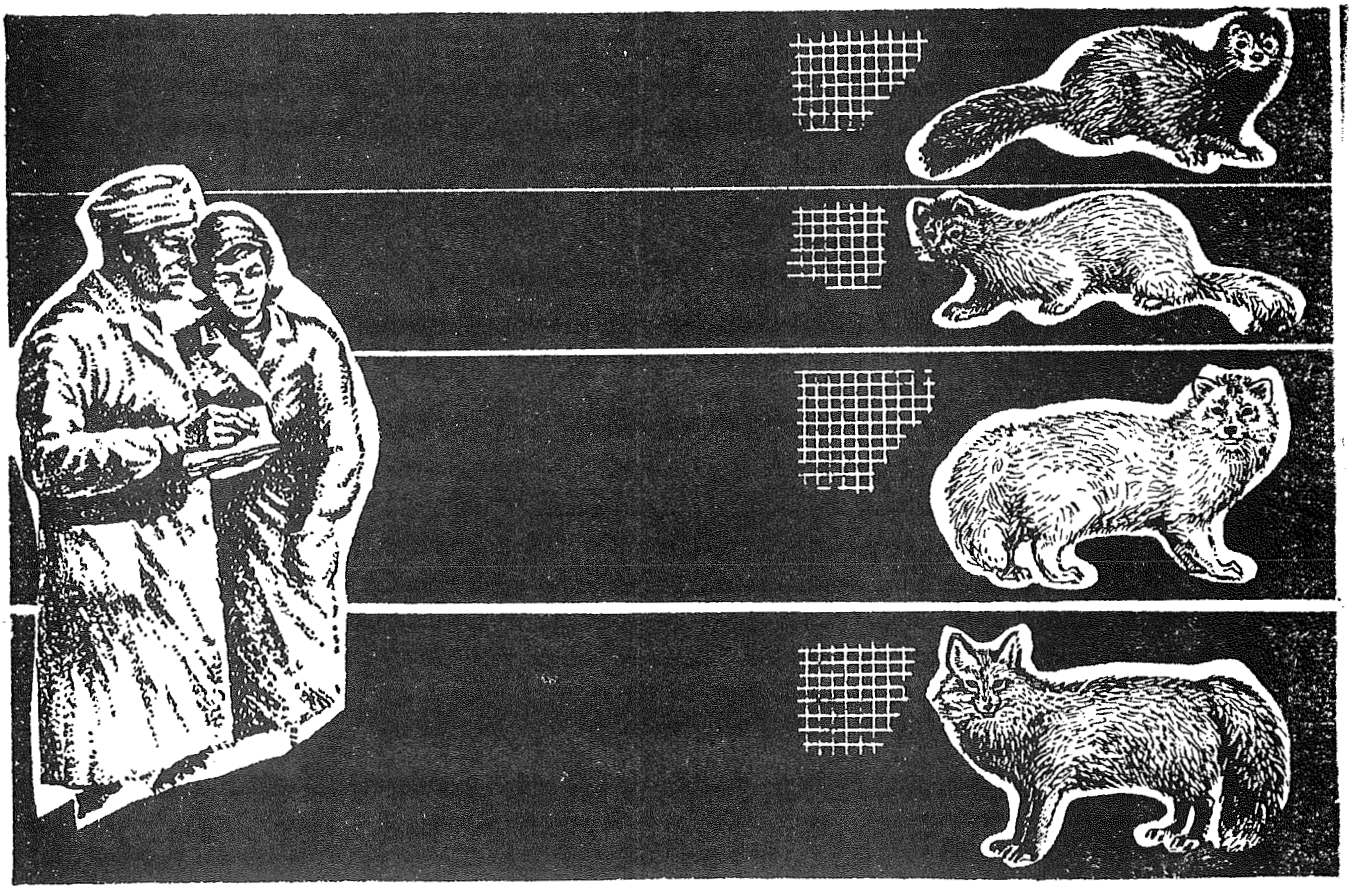

Beautiful Fur Animals – and their colour genetics

By Norodd Nes, Einar J. Einarsson and Outi Lohi
with contribution from S. Jarosz and R. Scheelje

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Beautiful Fur Animals – and their colour genetics is intended as a reference book for fur farmers and fur merchants and a textbook or manual of studies about qualitative genetics.

The book is a result of an age-long collaboration between the authors Norodd Nes and Einar Einarsson from Norway and Outi Lohi from Finland/Denmark. Stanislaw Jarosz from Poland and Reinhard Scheelje from West Germany have both contributed to the chapters concerning nutria and chinchilla.

The authors have done a great deal of research into qualitative genetics of fur bearing animals. They have also worked closely with practical fur breeding. The book is therefore written especially for people in praxis but it will also be a useful textbook and inspiration for additional reading into qualitative genetics or fur animals in general for most levels.

"Beautiful Fur Animals – and their colour genetics" is illustrated with about 300 unique colour pictures of mutants in different species of farmed fur animals, combinations of mutants and inter specific hybrids. As a result of a thorough investigation of previous literature it even includes historical documentation of the origins of the mutants.

As an illustration of the multiplicity of natural fur colours, this book is outstanding in documenting the enormous potential of applied qualitative genetics which can be used to renew and enrich life for the pleasure of fur producers and consumers alike.

Because of the thorough description of primary mutant types, their combinations and the effect of colour genes in inter specific hybrids, the book can be used in education and in private studies and it is also a wonderful picture book for animal lovers.

The book is published by SCIENTIFUR, the information service of the Fur Aimal Division of Scandinavian Association of Agricultural Scientists and the first Norwegian edition was presented at the 40th anniversary of the association in September 1987.

Besides the Nordic languages, Norwegian, Finnish, Swedish and Danish the book is translated into English to express the desire of the fur breeders' organizations of the four Nordic countries to support international collaboration between people working with fur animals.

The Scandinavian Board of Fur Farm Organizations has made this work possible with pre-publication orders.

The book can be ordered at:

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