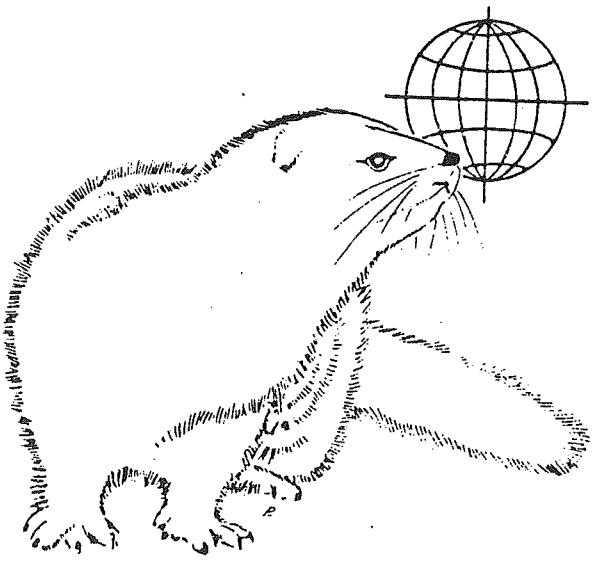

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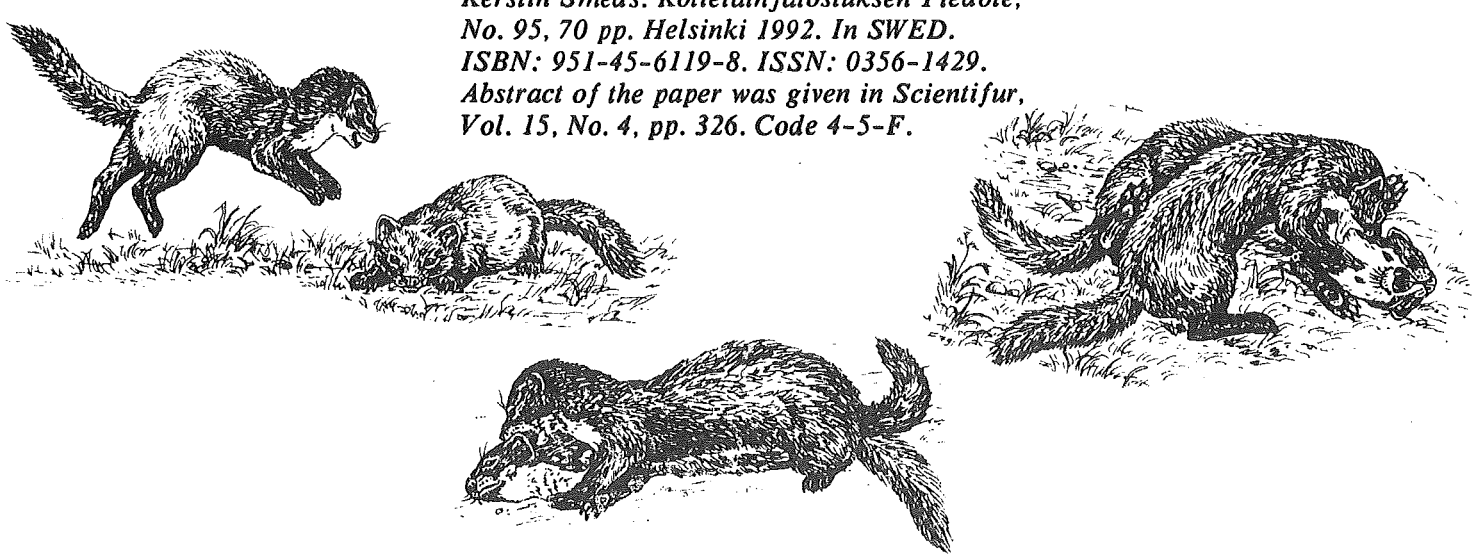
Titles of other publications - not abstracted

Hematological studies on black cross mink. *X.Y. Deng. Maopi Dongwu Siyang, No. 4, p. 3-6, 1990. In CHIN. Code 2-3-M.*

Determination and analysis of serum lipids and lipoproteins in raccoon dogs. *M.P. Fan. Maopi Dongwu Siyang, No. 2, p. 13-15, 1990. In CHIN. Code 3-O.*

Titles of other publications - not abstracted

Inheritance of some reproduction traits in foxes.
Kerstin Smeds. Kotieläinjalostuksen Tiedote, No. 95, 70 pp. Helsinki 1992. In SWED. ISBN: 951-45-6119-8. ISSN: 0356-1429. Abstract of the paper was given in Scientifur, Vol. 15, No. 4, pp. 326. Code 4-5-F.



5. Reproduction

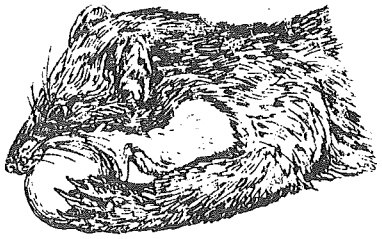
Titles of other publications - not abstracted

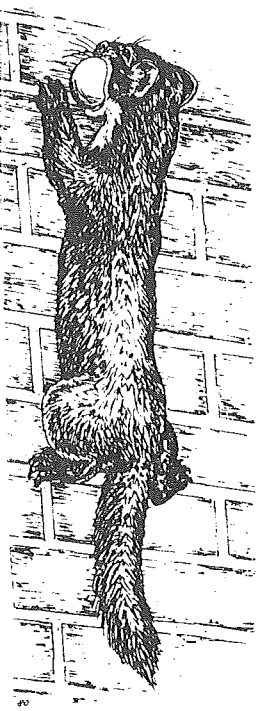
Seasonal changes of male genital organ of raccoon. *Yuan Hongye, Wang Enming, Yang Chongmin. Chinese Journal of Zoology, Vol. 25 (4), P. 33-35, 1990. In CHIN. Code 2-5-O.*

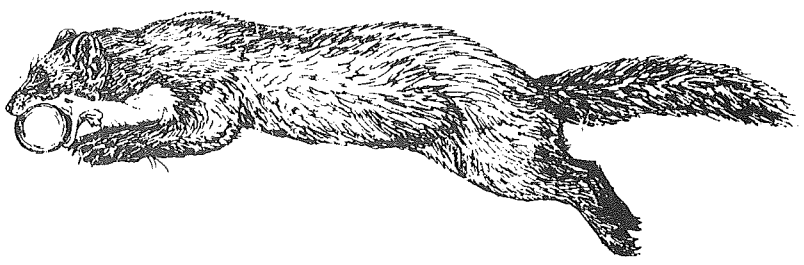
A study on changes of serum estradiol, progesterone levels and cell portrait of vaginal secretion of female raccoon dogs during their reproductive period. *Xiao Yongjun, Tong Yuren, Song Jianhua. Chinese Journal of Zoology, No. 5, p. 30-33, 35, 1990. In CHIN. Code 3-5-O.*

Normal female ferret *(Mustela putorius furo)* reproduction. *Lotta Ericsson. The Agicultural University of Sweden, Uppsala, 17 pp, 1990. In SWED, Su. ENGL. Code 5-O.*

6. Nutrition







Titles of other publications - not abstracted

Histological studies on the digestive system and intestinal glands of the raccoon dog (north-east China subspecies. *H.L. Feng. Maopi Dongwu Siyang, No. 3, p. 8-11, 1990. In CHIN. Code 2-6-O.*

Experience of therapy of B1 avitaminosis in raccoons. *Cao Lijun. Heilongjiang Journal of Animal Science and Veterinary Medicine, No. 7, p. 31, 1990. In CHIN. Code 6-9-O.*

Effect of zeolite as a feed additive to mink during its growing up period. *Jiangsu Agricultural Sciences, NO. 4, p. 61, 65, 1990. In CHIN. Code 6-M.*

7. Veterinary

Titles of other publications - not abstracted

Clinical applications of lipase marking of T lymphocytes in mink. *X.M. Lin. Maopi Dongwu Siyang, No. 2, p. 4-7, 1990. In CHIN. Code 3-9-M.*

Dialysis culture of Clostridium botulinum type C for a mink vaccine. *S.M. Zhang. Maopi Dongwu Siyang, No. 3, p. 4-5, 1990. In CHIN. Code 9-M.*

Notes
SCIENTIFUR
Vol. 17, No. 1, 1993

Hereby we wish "old" and new readers of SCIENTIFUR welcome to the start of Volume 17 of the journal which keeps everybody interested informed about the latest scientific and technical information in the FUR ANIMAL WORLD.

Over the years SCIENTIFUR has developed very well as far as the informative value is concerned, even though the technical standard has for economic reasons not increased to the level desired. Over the same period we have seen too many very fine technical journals dealing with breeder and market information as well as technical and scientific information giving up for economic reasons. The interest from subscribers and advertisers has simply been too limited.

In these years of economic crisis in the fur animal trade, we are in IFASA and SCIENTIFUR extremely satisfied that the number of subscribers and the contributions from the European Fur Breeders Association have so far ensured the production of SCIENTIFUR.
We still hope that in the near future it will be possible to change the concept of SCIENTIFUR towards more issues per year because of inclusion of relevant technical, market and local information as well as advertisements.

We are convinced that all fur animal countries which do not today have their own local journal could together with IFASA benefit from developing a concept attracting scientists as well as breeders and advertisers. It is the best way to obtain the highest amount of efficient information at the lowest possible price.
Think about it when you contemplate how to spend the little money you have got for information purposes in the best possible way.
The past, and certainly also the crisis, has taught us - again - that what is impossible for the individual is possible in cooperation.

As the editor of SCIENTIFUR I will in future have much more time to work with a possible future increase in the international cooperation due to the fact that I shall retire from my position as head of the fur animal department of the National Institute of Animal Science.
At the age of 60 and after 35 very inspiring years in fur animal science, I look forward to being able to put an even greater effort into the international cooperation and the development of SCIENTIFUR as THE JOURNAL of fur animal production.

All our subscribers and members of IFASA have already received their 1993 invoices. We hope you will pay attention to the invoices and pay them as soon as possible. Those of you who, for one reason or another, do not want to continue, please return the invoice with your message, so that we can cancel your subscription or membership.
We got some new IFASA members at the 5th congress in Oslo, and some "old" members paid their outstanding membership fees. Rest assured, however, that IFASA does not accept membership only in the congress years. At the congress in Poland 1996 the membership discount will be given in relation to the number of years the membership fee has been paid. Think about that before you "forget" to pay your annual fees.

SCIENTIFUR INDEX. Can it be correct that less than 20 scientists feel that they see an advantage in the use of the electronic version of the SCIENTIFUR INDEX covering the first 15 volumes of the journal? It cannot be because of a realistic cost/benefit analysis, as the price of the index is only DKK 300.- + postage (approx. DKK 335,- incl. postage). If you have missed the information you can still order your copy and obtain the benefit of quick and efficient information.

On the 30th of April of this year from 1 - 5 p.m. your Editor at the National Institute of Animal Science, Research Centre Foulum, Denmark will celebrate no less than 3 milestones, i.e. his 60th birthday - his 35th anniversary at the institute - and his retirement from the position as head of department for research in fur animals. If you have the possibility to come and participate in the celebration, it would make your old Colleague and Editor very happy.

Kind regards

Gunnar Jørgensen
Your Editor

Institute of Cytology and Genetics,
Siberian Department of the Russian Academy of Sciences
Novosibirsk 630090, Russia
Tel: 7-383-2-354-754
Fax: 7-383-2-356-558

Dr. G.Jorgensen,
National Institute of
Animal Science, Foulum
P.O.Box 39, DK-8830 Tjele
Denmark

Dear Gunnar,

I have the pleasure of informing you about the new biotechnological products, which can be useful for studies and welfare maintenance of fur animals. Enclosed herewith are two leaflets which, I hope, would be of interest for readers of SCIENTIFUR.

Yours sincerely

Alexander V.Taranin

MONOCLONAL ANTIBODIES IN THE FORM OF ASCITIC FLUIDS

1. Mouse monoclonal antibodies (clone no. G44) to Fc portion of Mink Ig gamma chains.*

2. Mouse monoclonal antibodies (clone no. G80) to Mink Ig lambda light chains.*

3. Mouse monoclonal antibodies (clone no. G88) to Mink Ig kappa light chains.*

*** react with both the native and SDS-denaturated and reduced forms of MINK, FOX, ARCTIC FOX, and DOG Ig in immunoblot assay. Working dilution in this assay is at least 1:1000. Working dilution in ELISA is at least 1:50,000. May form precipitate with MINK, FOX, ARCTIC FOX, and DOG Ig in agar gel in the presence of 3% PEG. Available also as affinity purified antibodies [1]**

4. Mouse monoclonal antibodies (clones no. AD1, AD3, AD11, AD13) to VP1 and VP2 structural proteins of Aleutian Disease virus.**

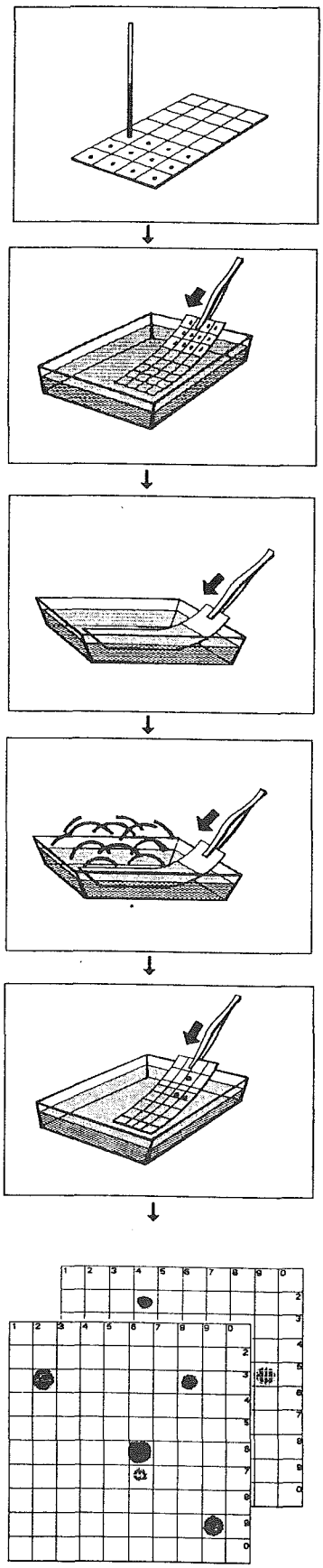
**** react with both the native and SDS-denaturated forms of VP1 and VP2 proteins in immunoblot assay. Working dilution in this assay is at least 1:500. React in counterimmunoelectrophoresis [2]**

References:

1. Peremislov, V.V., Mechetina, L.V., Bovkun, L.A., Taranin, A.V. Mouse monoclonal antibodies detect epitopes of immunoglobulin gamma, kappa and lambda chains common to several fur animal species. Proceedings of the 5th IFASA Congress. Norw. J. Agricul. Sci., 1992, Suppl. No. 9, pp. 180-184.
2. Miroshnichenko, S.M., Peremislov, V.V., Taranin, A.V. Enzyme immunoassay of antibodies against Aleutian disease virus. Proceedings of the 5th IFASA Congress. Norw. J. Agricul. Sci., 192, Suppl. No. 9, pp. 388-392.

For more information, please, contact Dr. A.V. Taranin, Institute of Cytology and Genetics, Siberian Department of the Russian Academy of Sciences, Novosibirsk 630090, Russia.
Tel: 7-383-2-354-754; Fax: 7-383-2-356-558; Email: dach@sse.nsk.su

ENZYME-IMMUNOASSAY KIT FOR DIAGNOSIS OF ALEUTIAN DISEASE OF MINK



This kit is based on dot-immunoassay technique and it was developed to detect specific antibodies to the Aleutian disease virus (ADV) in mink sera. Serum samples (0.5-1.0 1) are applied directly onto nitrocellulose sheets (100-400 samples per sheet depending on kit size) providing irreversible binding of protein. A set of sheets (up to 50) is incubated in solution blocking residual apsorption sites of nitrocellulose followed by transfer to solution containing enzyme-labeled viral antigen. The antigen binds to the application sites of those blood samples. Which samples contain ADV-specific antibodies and enzymatic activity are revealed in solution containing chromogenic substrate for the enzyme.

Testing with this kit is highly specific. Sensitivity exceeds that of the generally used counterimmunoelectrophoresis (CIEP) by 50-100 times.

Positive reactions appear as intensely colored spots and are read easily and reliably.

Little time and labor consumption are required in comparison with CIEP. The design ensures performance of thousands of tests in a short time.

The blood collection procedure is conventional. The amount of blood to be collected is 10-fold less than with CIEP.

No special training is needed. Small scale tests do not require equipment. Large scale tests require only a shaker.

The method is particularly advantageous for custom service. Any number of sheets with applied samples can be sent by mail without any special precaution. After applying the samples the sheets can be stored at room temperature for several weeks. Up to 20,000 tests per day may be performed by a technician.

Two variants of the kit are available each based on its own technology of ADV labeling. In the first variant biotin-streptavidin is used and in the second variant monoclonal antibodies to ADV are used. Both variants are highly economical because they require only a small amount of ADV antigen (5-20 times less then CIEP).

Both variants include everything needed to perform the tests with the exception of distilled water. With these kits, mink farmers can perform tests under home conditions.

Reference: Miroshnichenko, S.M., Peremislow, V.V., Taranin, A.V. Enzyme immunoassay of antibodies against Aleutian disease virus. Proceedings of 5th IFASA Congress. Norw. J. Agricul. Sci., 1992, Suppl. No. 9, pp. 388-392.

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SCIENTIFUR
P.O.Box 13
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Phone +45 89 99 15 01
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BOOK CLEARANCE

SCIENTIFUR is going to move again some time in 1993. Therefore it is important for us to reduce the stock of books and previous volumes of SCIENTIFUR.

OFFER UNTIL JUNE 1ST 1993

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incl. postage and printed indexes:	DKK 1,500.-
Single volumes:	DKK 100.-

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Original Report

The connection between biochemical and cytochemical mink blood indices with litter size

V.A. Ilukha, L.B. Uzenbaeva, H.I. Meldo

Institute of Biology, Karelian Research Centre, Russian Academy of Sciences, Petrozavodsk, Pushkinskaya, 11

Summary

The dependence between different blood indices and mink litter size was investigated. The highest connection was found between litter size and ASAT, ANAE and LAP activtity. These characteristics are inherited well. Selection in this direction produced an increase in index of litter size heritability of 50%.

Introduction

In fur bearing animals the litter size is one of the principal production characteristics, but selection concentrating only on it does not give effective results (*Einarsson, 1988b*). The litter size is more difficult to improve through selective breeding and its heritability is only 5-15% (*Jorgensen, 1985*). On the other hand, the all-important fur characteristics are dependent on the biochemical processes in the fur animal organism (*Brandt, 1989*). The selection work may be more effective on the basis of biochemical criteria.

Materials and methods

The experiment was made from December 1989 to September 1992 in Karelia. The biochemical and cytochemical blood indices of one-year-old standard female mink were analyzed (parent-group, PG, n=30). All animals used in the experiment were healthy. The content of erythrocytes, hemoglobin, total protein, electrophoretic patterns of the serum protein, the level of transaminases (ASAT, ALAT), alkaline phosphatase (AP), lactate dehydrogenase (LDH) (as described by Berestov; Kozhevnikova, 1981), lymphocytes alpha-naphthylacetatesterase (ANAE) (*Uzenbaeva, 1989*), polymorphonuclear leucocyte alkaline phosphatase (LAP%) activity and medium cytochemical coefficient (MCC) LAP (see Burstone, 1962) were measured. The breeding results were also registered. Using component analysis the same blood indices connected to the litter size at birth were selected. After this procedure, two groups of animals were formed. In the first group, females had many kits and "best" blood indices connected with high litter size (mothers group, MG1, n=5). In the second group, females had few kits and "bad" blood indices connected with low litter size (mothers group, MG2, n=4).

The blood indices of 20 females born from the MG1 (daughter group 1, DG1) and 5 females born from the MG2 (daughter group 2, DG2) were analysed in December 1990. The 15 females from DG1 were selected for breeding. Using the Mann-Whitney U-test the differences between MG1 and MG2, and DG1 and DG2 were calculated.

The verification of the ASAT influences on the breeding results of the different colour mink was made. Two groups of standard mink (n=4905, n=3195), a group of sapphire mink (n=1272), and demi buff mink (n=665) were used. The ASAT levels from 10 randomly chosen female mink from each group were analysed.

Results and discussion

Using component analysis we separated the components connected to the number of live-born kits per litter. The level of erythrocytes, hemoglobin, total serum protein, ALAT, ASAT, LDH, AP, LAP%, MCC LAP, lymphocytes ANAE, and litter size had a high correlation. However, the influences of the genetic factor on some of these indices is less than environment. The level of total protein, erythrocytes, hemoglobin, ALAT, AP, LDH have influence on the litter size, but the heritability is low (table 1).

The increasing content of ASAT, LAP%, MCC LAP, esterase positive lymphocytes with diffusion painting and 4-8 or more than 8 granules was connected with higher litter size (fig. 1-2).

This conclusion is adequate only for healthy mink, because some diseases (Aleutian disease, pseudomonas, liver dystrophy, etc.) increase the activity of ASAT, LAP, and ANAE (*Berestov, Kozhevnikova, 1981; Uzenbaeva, 1989*). All these parameters are well inherited. The correlation between these indices and litter size was not linear. It was exponential for ASAT, negatively binomial for LAP% and MCC LAP, and logarithmal for ANAE 8 d and ANAE 4-8 d.

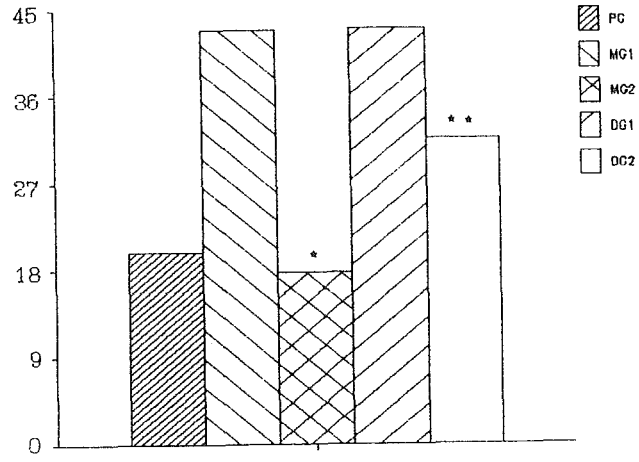


Fig. 1. The correlation between the level of ASAT and litter size.
* - significant differences between MG1 and MG2
** - significant differences between DG1 and DG2
(P<0.01, Mann-Whitney U-test, two-tailed).

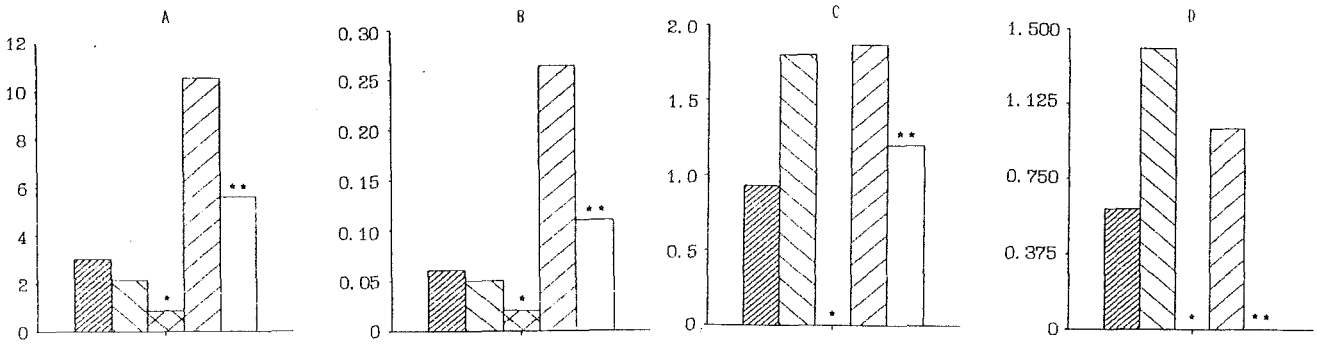


Fig. 2. The connection between cytochemical parameters and litter size.
A - LAP%, B - MCC LAP, C - ANAE 4-8 d (lymphocytes alpha-naphtylacetatesterase with 4-8 granules in cells and diffusion painting), D - ANAE 8 d (with >8 granules in cells). Symbols as in fig. 1.

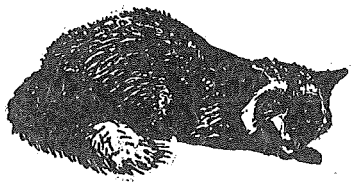
Table 1. The blood indices for mink females from the different groups

Group								
Parameter	PG	MG1	MG2		DG1	DG2		
ALAT (units)	47.10	47.40	44.33	S	43.87	43.40	NS	
AP (units)	10.70	12.40	8.00	S	10.74	11.98	NS	
LDH (units)	7.61	8.02	7.11	S	7.89	8.46	NS	
ERYTHROCYTES (10^{12}/l)	9.78	10.04	8.97	S	9.39	9.20	NS	
HEMOGLOBIN (g%)	21.49	20.78	20.08	S	20.83	20.74	NS	
PROTEIN (g%)	7.99	7.80	8.20	S	8.43	8.32	NS	
LITTER SIZE (kits)	5.20	7.00	2.33	S	6.20 !			

Differences between MG1 and MG2, and between DG1 and DG2 (S - significant, P<0.01), Mann-Whitney U-test, two-tailed; NS - nonsignifant). ! - data was obtained for 15 females selected from this group.

The effect of the selection index including information for litter size of parents at about three weeks postpartum was estimated at about 0.1 kits per year in commercial farming (*Einarsson, 1988a*). Selection based on the ASAT and cytochemical indices produced an increase in litter size heritability of 50% (see table 1). The cytochemical parameters measurement is hard work and its use in practice is limited. The automatic ASAT measurement is increasing and may be used in selection extensively.

According to our investigation in the previous year, the ASAT level influenced litter size. In December 1991, we tested the ASAT level of 10 female mink from each of four different colour groups. The breeding results confirm the prediction about influences this enzyme has on litter size (fig. 3).



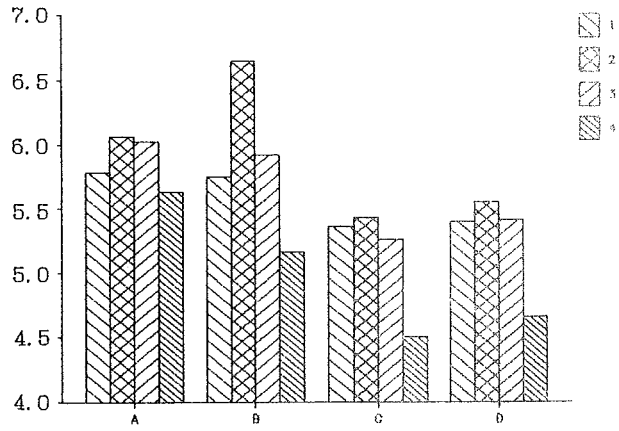


Fig. 3. The influences of ASAT levels on the breeding results of different colour groups of mink. A,B - two groups of standard mink, C - a group of sapphire mink, D - a group of demibuff mink. 1 - activity of ASAT (x10 units), 2 - number of kits per litter (at birth), 3 - number of kits per female with normal birth, 4 - number of kits per female.

The litter size was dependent on the ASAT level connected with the energetic balance of the mink. The changes of this enzyme level may increase mortality in different stages of the prenatal ontogenesis and oogenesis. All these factors may influence the number of kits per litter at birth (*Einarsson, Elofson, 1988*).

As described by E. Einarsson (1988b), the single trait selection for litter size did not show any negative correlated effects on other economically important traits. At the same time, the changes of resistance and immunological reactivity, which are determined by the cytoenzymatical properties of leucocytes, and the intensity of energy production connected with transaminase activity may be expected.

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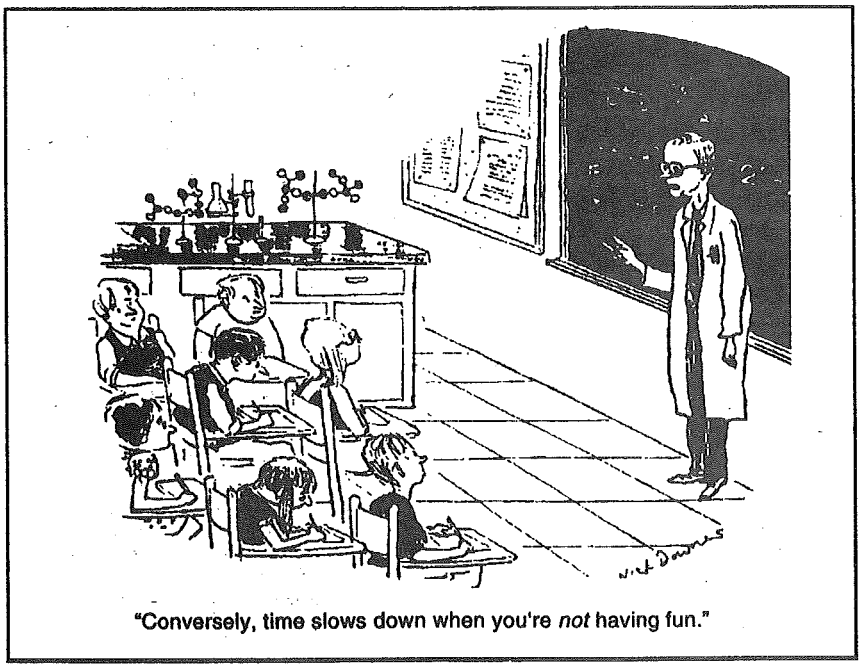


"Conversely, time slows down when you're *not* having fun."

Original Report

Effect of melatonin on change of winter fur and spermatogenesis in male polar foxes

Vladimir Parkanyi[1], Michal Zeman[2], Imrich Tocka[3], Dusan Mertin[1], Emilia Dravcova[1]

[1] *Research Institute of Animal Production, Hlohovska 2, 949 92 Nitra, Czechoslovakia*

[2] *Institute for Biochemistry and Genetics of Animals of the Slovak Academy of Sciences, 900 28 Ivanka pri Dunaji, Czechoslovakia*

[3] *University of Agriculture, 949 01 Nitra, Czechoslovakia*

Summary

Five male polar foxes were given subcutaneous implants in 3 terms (in November 1989 in silastic capsule: 30 mg; in February 1990 in beeswax: 10 mg; in April 1990 in beeswax: 10 mg). The change of winter coat was significantly blocked compared with the control male polar foxes (a 6-point system of evaluation was proposed). Melatonin (N-acetyl-5-methoxytryptamin) protects the spermatogenesis which was evaluated by means of electroejaculation until 21st June, 1990 (motility of spermatozoa was 60-70%). Melatonin does not influence the reproduction of male polar foxes negatively (10 vital cubs were born after mating with one of the experimental males).

Introduction

Physiological mechanisms which regulate the function of the hypothalamus, epiphysis and gonads in furbearing animals by means of changes in the length of the light phase of the day, and control of the seasonal hormonal secretion are not yet fully clear. The share of the epiphysis is in this regulation realized by hormonal signal-melatonin which brings the photoperiodic information up to the sexual organs. The chemical character of melatonin is N-acetyl-5-methoxytryptamin.

Melatonin can be secreted more intensively also during the period with shorter light regime. Pinealocytes secrete serotonin during the light phase of the day. Impulses for the synthesis of melatonin and serotonin come from the hypothalamus, the dependence on light stimulations being evident. The level of enzymes which take share in the melatonin synthesis in the epiphysis decrease under the influence of light (*Ham and Cormack, 1983*). Melatonin is very important for the regulation of maturation of sexual organs. It acts as the signal and regulator of their synthesis. It blocks the secretion of prolactin at the same time. Prolactin is a hormone important for the change. Starting from the natural properties and effects of melatonin it is obvious it can be used to effectively block the change of fur in furbearing animals and to prolong and protect the activity of sexual organs. Smith et al. (1987) applied melatonin to male polar foxes which evidently prolonged spermatogenesis and the winter fur retained until August. Haresign et al. (1990) utilizated melatonin implants in sheep during the off-season period which resulted in an increase of number of litters and number of lambs per year. They used the commercial pre-

paration Regulin. Ravault et al. (1986) observed the plasmatic level of melatonin in pregnant and pseudopregnant mink. Martinet et al. (1983) observed the influence of melatonin injections on the pregnancy and delay of fur change in mink.

It is obvious from the above given survey that melatonin influences the block of fur change and prolongation of gametogenesis in mammals. However, purposeful utilization of melatonin implants was not used and is not used in the furbearing animals reared in our country.

Material and methods

In our experiment we used 5 male polar foxes influenced with melatonin and 3 male polar foxes as control. The trial males were each given subcutaneous implants of melatonin in silastic capsules (30 mg each) between the shoulders on 3rd November 1989. Next implantation of melatonin followed on 16th February 1990. The melatonin was implanted in beeswax (10 mg each animal) in this case. The third implantation was done on 6th April 1990 (10 mg). We observed the effect of melatonin implants by means of visual evaluation of fur quality, combing out the hair and weighing it. We also observed the gradation of spermatogenesis in experimental male polar foxes. We also tested the implant influence on the reproductive ability of one experimental male polar fox, which was used in mating. We used 6 degrees of classification for the qualitative and quantitative evaluation of fur: 1 - pale winter coat, 2 - moderate release of hair, moderate combings in the comb, when pulled out with fingers the hairs are held firmly in the skin, 3 - the release of hair is more visible, larger combings, the hair releases when pulled out with fingers, 4 - full extent of moulting, large combings in the comb, good release of hair in form of bunches when pulled out with fingers, 5 - visible summer coat with remnants of winter coat, 6 - typical dark summer coat. We combed and controlled the back, abdomen, lower part of hind legs and the top of the head. The hair of the observed male polar foxes was released also in topological places, in the above mentioned order.

Table 1. Evaluation of the fur release in male polar foxes according to a 6-point system (1 - light winter hair, 6 - dark summer hair, 2-5 see text)
B - back, A - abdomen, L - leg, T - top of head

Terms		Experiment (melatonin)				Control			
		B	A	L	T	B	A	L	T
14.3. 1990	n	5	5	5	5	3	3	3	3
	x	2.02	1.80	2.02	1.60	3.17	3.03	3.03	1.67
	s	0.04	0.45	0.04	0.55	0.29	0.06	0.06	0.58
	s_x	0.02	0.20	0.02	0.24	0.17	0.03	0.03	0.33
	v	2.21	24.85	2.21	34.23	9.12	1.90	1.90	34.64
t-test		9.20	4.61	28.06	0.16	++	++	++	-
15.4. 1990	n	5	5	5	5	3	3	3	3
	x	2.02	2.02	2.02	2.02	3.67	3.33	3.03	2.00
	s	0.44	0.44	0.44	0.04	0.58	0.58	0.06	1.00
	s_x	0.20	0.20	0.20	0.02	0.33	0.33	0.04	0.58
	v	2.21	2.21	2.21	2.21	15.75	17.32	1.90	50.00
t-test		6.72	5.36	28.06	0.05	++	++	++	-

continued on next page

Terms		Experiment (melatonin)				Control			
		B	A	L	T	B	A	L	T
18.4. 1990	n	5	5	5	5	3	3	3	3
	x	2.02	2.02	2.02	2.02	4.03	4.03	3.33	2.67
	s	0.04	0.04	0.04	0.04	0.06	0.06	0.58	0.58
	s_x	0.02	0.02	0.02	0.02	0.03	0.03	0.33	0.33
	v	2.21	2.21	2.21	2.21	1.43	1.43	17.32	21.65
t-test		55.76	55.76	5.36	2.64	++	++	++	+
8.5. 1990	n	3	3	3	3	3	3	3	3
	x	3.03	3.03	2.67	2.67	4.67	4.03	3.67	2.67
	s	0.06	0.06	0.58	0.58	0.58	0.06	0.58	0.58
	s_x	0.03	0.06	0.33	0.33	0.33	0.03	0.33	0.33
	v	1.90	1.90	21.65	21.65	12.37	1.43	15.75	21.65
t-test		4.88	21.21	2.09	0.00	++	++	-	-
23.5. 1990	n	3	3	3	3	3	3	3	3
	x	3.03	3.03	3.03	3.03	5.03	4.33	4.67	4.03
	s	0.06	0.06	0.06	0.06	0.06	0.58	0.58	0.06
	s_x	0.03	0.03	0.03	0.03	0.03	0.03	0.33	0.03
	v	1.90	1.90	1.90	1.90	1.15	13.32	12.37	1.43
t-test		42.43	3.88	4.88	21.21	++	+	++	++
7.6. 1990	n	3	3	3	3	3	3	3	3
	x	4.03	3.03	3.03	3.03	5.03	4.33	5.67	4.67
	s	0.06	0.06	0.06	0.06	0.06	0.58	0.58	0.58
	s_x	0.03	0.03	0.03	0.03	0.03	0.33	0.33	0.33
	v	1.43	1.90	1.90	1.90	1.14	13.32	12.37	12.37
t-test		21.21	3.88	4.88	4.88	++	+	++	++
21.6. 1990	n	3	3	3	3	3	3	3	3
	x	4.03	3.33	4.33	3.03	--	--	--	--
	s	0.06	0.58	0.06	0.06	--	--	--	--
	s_x	0.03	0.33	0.03	0.03	--	--	--	--
	v	1.43	17.32	1.43	1.90	--	--	--	--
t-test		--	--	--	--	++	++	++	++
9.7. 1990	n	3	3	3	3	3	3	3	3
	x	5.03	4.33	4.33	4.00	--	--	--	--
	s	0.06	0.58	0.58	1.00	--	--	--	--
	s_x	0.03	0.33	0.33	0.58	--	--	--	--
	v	1.15	13.32	13.32	25.00	--	--	--	--
t-test		--	--	--	--	++	++	++	++
23.7. 1990	n	3	3	3	3	3	3	3	3
	x	5.67	4.67	5.03	4.67	--	--	--	--
	s	0.58	0.58	0.06	0.58	--	--	--	--
	s_x	0.33	0.33	0.03	0.33	--	--	--	--
	v	10.19	12.37	1.15	12.37	--	--	--	--
t-test		--	--	--	--	++	++	++	++

Table 2. Evaluation of combed out hair weight (g) in male polar foxes (B - back, A - abdomen, L-legs, T - top of the head)

Terms		Experiment (melatonin)				Control			
		B	A	L	T	B	A	L	T
14.3. 1990	n	4	5	--	--	3	3	--	--
	x	0.03	0.04	--	--	0.08	0.05	--	--
	s	0.02	0.05	--	--	0.03	0.02	--	--
	s_x	0.01	0.02	--	--	0.01	0.01	--	--
	v	62.63	109.2	--	--	41.62	48.95	--	--
t-test		2.09	0.21	--	--	--	--	--	--
15.4. 1990	n	5	5	5	--	3	3	3	--
	x	0.18	0.16	0.03	--	0.61	0.17	0.06	--
	s	0.09	0.13	0.02	--	0.60	0.11	0.04	--
	s_x	0.04	0.06	0.01	--	0.34	0.06	0.02	--
	v	47.76	84.72	74.65	--	98.98	66.41	63.26	--
t-test		1.22	0.09	1.05	--	--	--	--	--
18.4. 1990	n	5	5	5	5	3	3	3	3
	x	0.56	0.13	0.05	0.01	0.88	0.29	0.08	0.04
	s	0.33	0.06	0.02	0.01	0.45	0.21	0.02	0.02
	s_x	0.15	0.03	0.01	0.002	0.26	0.12	0.01	0.01
	v	59.84	43.59	37.48	45.38	51.19	72.41	25.33	55.99
t-test		1.08	1.27	2.39	2.12	--	--	--	--
8.5. 1990	n	3	3	3	3	3	3	3	3
	x	0.31	0.05	0.04	0.03	1.33	0.31	0.09	0.08
	s	0.15	0.04	0.01	0.01	1.11	0.29	0.03	0.05
	s_x	0.09	0.03	0.004	0.008	0.64	0.16	0.02	0.03
	v	49.92	88.42	18.89	52.47	82.93	92.88	35.32	65.25
t-test		1.59	1.55	2.35	1.64	--	--	--	--
23.5. 1990	n	3	3	3	3	3	3	2	2
	x	0.31	0.13	0.07	0.03	1.18	0.27	0.10	0.06
	s	0.19	0.06	0.04	0.006	1.11	0.12	0.04	0.05
	s_x	0.11	0.03	0.02	0.003	0.64	0.07	0.03	0.04
	v	61.20	44.76	62.57	19.47	94.08	44.26	40.07	86.49
t-test		1.34	1.92	0.96	0.85	--	--	--	--
7.6. 1990	n	3	3	3	3	2	3	2	3
	x	0.48	0.10	0.05	0.06	0.69	0.17	0.05	0.02
	s	0.13	0.04	0.01	0.03	0.42	0.05	0.05	0.02
	s_x	0.07	0.02	0.00	0.01	0.20	0.03	0.03	0.009
	v	26.03	38.42	22.02	42.95	61.49	30.57	94.72	104.9
t-test		0.67	1.94	0.02	2.59	--	--	--	--

continued on next page

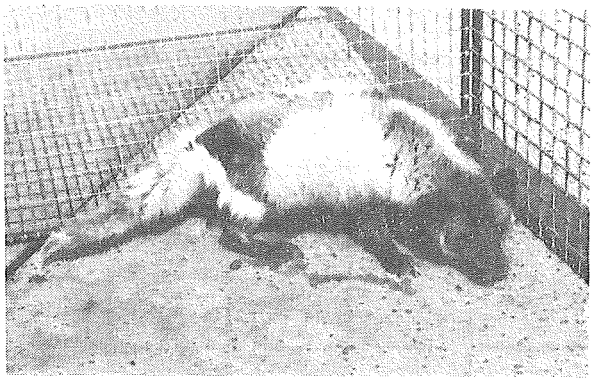
Terms		Experiment (melatonin)				Control			
		B	A	L	T	B	A	L	T
21.6. 1990	n	3	3	3	3	3	3	3	3
	x	1.01	0.20	0.11	0.05	--	--	--	--
	s	0.40	0.11	0.09	0.04	--	--	--	--
	s_x	0.23	0.06	0.05	0.03	--	--	--	--
	v	39.61	57.51	81.78	87.79	--	--	--	--
t-test		--	--	--	--	--	--	--	--
9.7. 1990	n	3	3	3	3	3	3	3	3
	x	1.67	0.38	0.18	0.05	--	--	--	--
	s	0.69	0.17	0.27	0.04	--	--	--	--
	s_x	0.40	0.09	0.15	0.02	--	--	--	--
	v	41.38	44.37	147.8	74.50	--	--	--	--
t-test		--	--	--	--	--	--	--	--
23.7. 1990	n	3	3	3	2	3	3	3	3
	x	0.88	0.18	--	0.00	--	--	--	--
	s	1.22	0.13	--	0.00	--	--	--	--
	s_x	0.70	0.08	--	0.00	--	--	--	--
	v	138.08	71.95	--	82.40	--	--	--	--
t-test		--	--	--	--	--	--	--	--

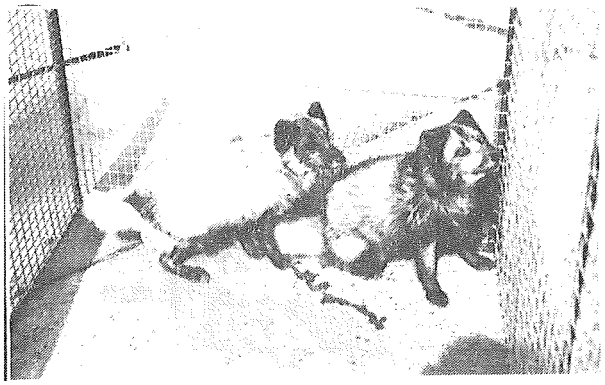
Results and discussion

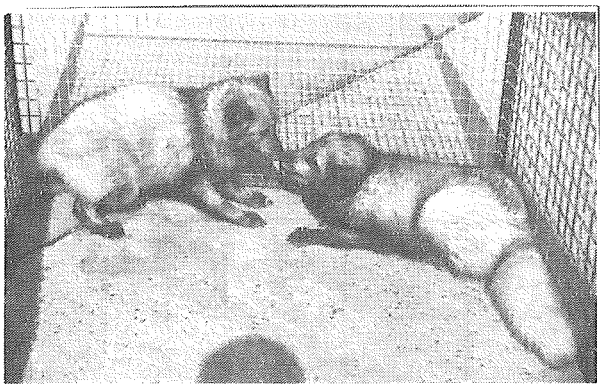
Table 1 gives the results of the evaluation of coat according to 6 degres of qualification, and in table 2 is the control of combed out hair by weighing. We took into consideration the comparison of the observed traits between the experimental males with melatonin implant and control males without melatonin. The difference between the experimental and control groups is explicitely obvious from the results. The hair change was delayed in experimental animals compared with the control group. There were significant differences between the experimental group and the control one in the point system considering the back and abdomen already from 14th March 1990 until the end of the observed period (23.7.1990).

We noted significant differences from 14th March 1990 to the end of the observed period on hind legs (with the exception of 8th May 1990). Significant differences in coat release in the region of the top of the head between the experimental and control groups were not observed before 23rd may 1990. The evaluation of the weight of the combed out hair showed that there exists a very large variability in the obtained values (v=147.89%). There were observed no significant differences between the trial and control in the period from 14.3 to 7.6.1990. From the mentioned facts follows that the evaluation of coat release on the basis of weight of hair is not adequate to the given physiological state, and it does not express the individual stages of moulting in the whole span. We recommend therefore the evaluation of the fur release according to the 6 point system we proposed.

We observed the course of spermatogenesis by means of ejaculate collection from the experimental and control animals using electroejaculation. The ejaculate collection began on 14th March 1990 in both observed groups. The control males without melatonin implants finished their spermatogenesis in the first half of May 1990. The experimental males with melatonin gave thick ejaculates with quite good motility of spermatozoa (60-70%) even on 7th and 21st June 1990. It represents a month interval after the regular reproduction season.







One experimental male with melatonin implant was used for natural mating to female polar fox (13.3.1990) to check the influence of melatonin on his reproductive ability. 10 viable and vital cubs were born after that mating. From the given data follows that melatonin has no negative influence on the course of spermatogenesis.

The control of hair release in female polar foxes by combing out: 7.3.1990- the hair offer resistance which is characteristic for mature coat during the combing out. In the combed out matter occurs only the undercoat. The guard hairs occur in the combed out matter only sporadically; 14.3.1990- the hair offer resistance typical for winter coat. However, in the combed out matter there occurs a tendency to release the undercoat and to release the single guard hairs; 5.4.1990- the inclination to the beginning of moulting is observed during the combing out. The moulting is most visible on the back and tail, less on the abdomen and least on the lower part of hind legs and top of the head. There occurs a visible difference in the intensity of the moulting onset in light (less pigmented) animals of the control group. There is no indication of moulting visible either on animals or in the surroundings; 18.4.1990- the beginning of moulting is visible during the combing out already. The strongest tendency to moulting is on the back, on the lower abdomen and lower part of the hind legs, and least on the top of the head. A stronger tendency to the onset of moulting and of its course becomes evident in the control animals compared with the experimental ones. Bunches of moulting hair are visible on the grid and under the cage with the light control animal. Dark areas of the summer coat growing in the sacral region occur on this animal, too; 8.5.1990- moulting hair appears under the cages in general. The animals of the experimental group appear to be still in the winter coat when examined visually. The strongest tendency to hair release during the combing out appears to be on the back and on the abdomen. The least tendency is on the top of the head and partly on the lower part of hind legs. A strong onset of moulting is observed in the control group, mainly in less pigmented animals. The hair is releasing or is fallen out already in the sacral region, sometimes up to the withers region. Dark areas of summer coat appear on the pelvic limbs of animals in the control group; 23.5.1990- in spite of the onset and course of moulting the experimental animals appear to be in the winter coat. Visible areas of the summer coat appear in the control group, mainly on the back and legs. Stronger tendency to moulting appears also on the abdomen. The strongest tendency to hair change is with the light control male. The top stage completion of the fur change can be stated in the control group, mainly in the back and also on the limbs, and to a lesser extent, on the abdomen. The difference between both groups (control:experimental) is also visible in the amount of fallen out bunches of hair under the cages. The change of coat in the experimental animals can be characterized as the onset of the more intensive moulting; 7.6.1990- the experimental animals appear to be still in the winter coat according to the general visual judgement. Strong course is visible in control animals, completion of the hair

change with the light male. The area of summer hair marks the extent of the entire hair change, it shifts from the sacral region to the withers. The summer coat is visible on the outer and inner side of the pelvic limbs. For the time being the abdomen is characterized with winter fur with strong tendency to the fur release. It can be stated that the findings are similar to findings of 23.5.1990; 21.6.1990- experimental animals still appear as being in winter coat. The tendency to fur release is observed when pulling the hair with fingers and combing it on the upper part of the body, i.e. mainly on the back. The tendency to hair change is visible only on the outer side of the pelvic limbs by visual observation. The control animals are in the summer coat on the whole. Releasing bunches of winter hair occur still on the sides of the body and mainly on the abdomen; 9.7.1990 - experimental animals visually seem to be in the advanced stage of winter coat release. The summer coat is visible on the thighs. Bunches of moulting winter coat are visible mainly on the back. Summer hair appears at the base of tail. It becomes visible also on the head. The least progress of the fur change was noted on the abdomen and on the inner side of the pelvic limbs. Bunches of moulting hair are visible under the cages. The control animals are all in the summer coat. The remnants of the winter coat are partially on the flanks of the body and on the abdomen as well as on the back; 23.7.1990- the experimental animals can be characterized as partially in summer coat. The dark summer coat is visible on the thighs and on the top of the head, however, there are some remnants of winter coat left. The dark summer colouring is on the back, however, with large remnants of the winter coat. Bunches of moulting hair are characteristic mainly of the flanks of the body and the tail. The largest amount of winter fur is on the inner part of the thigh and mainly on the abdomen. However, the fur releases visibly also on these parts, and the dark colouring of the summer hair begins to appear in the lower horizon. The control animals are in the summer coat.

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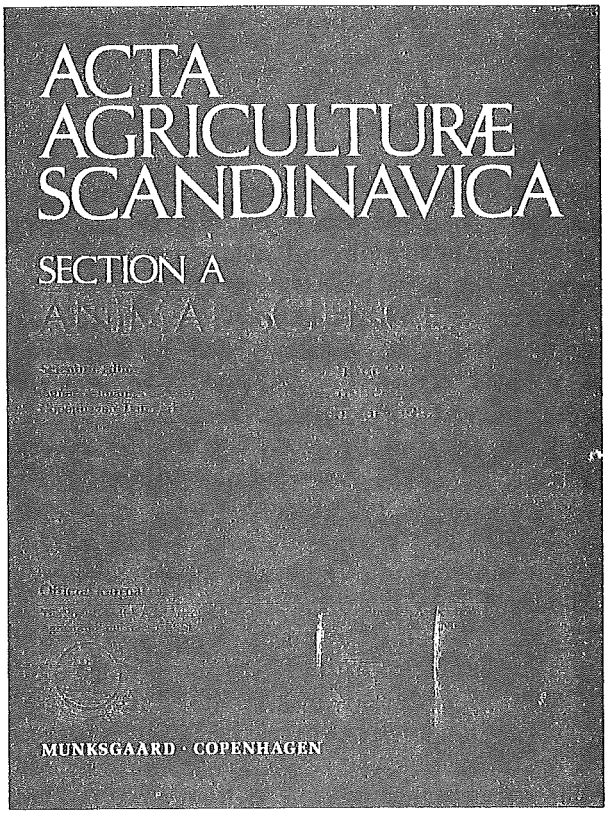

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Short Communication

Behaviour of foxes in the rain

Hannu Korhonen[1], Sakari Alasuutari[2]

[1] Fur Farming Research Station, SF-69100 Kannus, Finland

[2] Muddusjärvi Exp. Farm, SF-99910 Kaamanen, Finland

Introduction

Concern over the welfare of fur-bearing animals has increased in recent years. Anti-fur campaigns have not only opposed the use of animals in general, but have also questioned the conditions in which these animals are housed in particular. Demands for large cages, including rest shelves and nest boxes, are especially common. Speculations that farmed foxes may freeze in their cages are available, although previous studies have shown that foxes are naturally well-adapted to harsh environmental conditions (*Scholander et al., 1950; Frafjord, 1992*). The summer of 1992 was very rainy in Finland, and thus the present authors had the possibility to gather behavioural data on some blue foxes housed in large enclosures under wet, rainy conditions. The present observations aim to provide a clearer perspective by which the environmental adaptability of blue foxes may be better understood.

Materials and methods

The observations were made at the Muddusjärvi experimental farm in Finnish Lappland. The following ground floor enclosures were employed: (1) 17 m x 8 m (holding 3 male and 3 female blue foxes), (2) 11 m x 8 m (2 males and 2 females) and (3) 11 m x 8 m (3 male and 3 females). Each enclosure contained four standard type nest boxes and 3-5 large stones. The foxes, which were juveniles, had dug several ground burrows within the enclosures, also under the stones.

Results

The behavioral patterns of the foxes were carefully observed between Sept. 1 and Sept. 3 (from 8:00 a.m. to 8:00 p.m.). All three days were rainy: On Sept. 1 it rained midly (5 mm water/-day), on Sept. 2 it rained heavily (42 mm/day; maximum amount for the whole summer), and on Sept. 3 the rainfall was mild again (3 mm/-day). Ambient air temperatures ranged between +2.9 and +11.1°C. Wind velocity varied from 1 to 6 m/s. The presence of nest boxes and ground burrows within the enclosures afforded the foxes the possibility to selectively seek shelter during the rain. However, most often they stayed out in the open, either sleeping, lying or moving about, even during heavy rainfall. On Sept. 1, we carefully watched Encl. 3; these 6 foxes stayed inside the nest boxes as following; 0, 1, 4, 5, 45 and 84 min/day. On Sept. 2 (rained very hard all day) 6 foxes in Enc. 1 stayed inside the nest boxes as follows: 9, 9, 38, 43, 89 and 102 min/day. On Sept. 3, the 4 foxes in Encl. 2 remained inside the nest boxes for 0, 1, 9 and 112 min/day.

Conclusions

The results revealed that foxes manage well also in the rain. Although the foxes had the possibi-

lity to shelter themselves in nest boxes during a rain shower, they most often preferred to stay outside. Their fur coat seems to be fairly waterproof; when they stood up from a curled sleeping position, they normally shook the water off their coats. This is a typical pattern for dogs also. It may therefore be concluded that blue foxes are surprisingly well adapted to variable environmental conditions.

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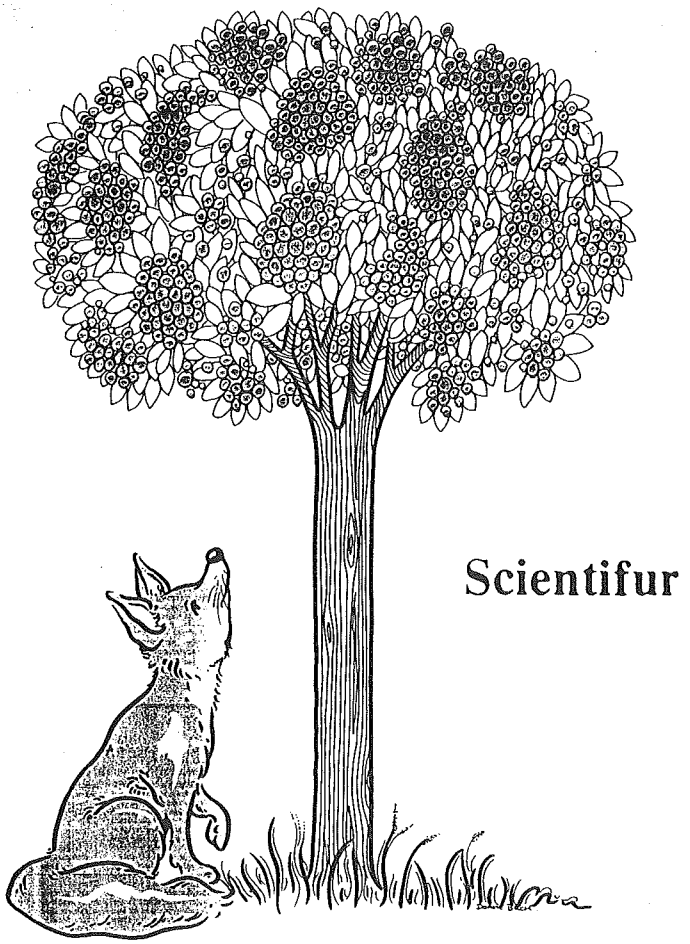

Short Communication

Episodes of kit carrying

Hannu Korhonen[1], *Sakari Alasuutari*[2]

[1] *Agricultural Research Centre of Finland, Fur Farming Research Centre of Finland, Fur Faming Research Station, SF-69100 Kannus, Finland*

[2] *University of Helsinki, Muddusjärvi Exp. Farm, SF-99910 Kaamanen, Finland*

Introduction

It is a documented fact that wild foxes may carry their kits, one by one in the jaws, from one den to another even up to 100 m (*Macdonald, 1988*). On fur farms kit carrying patterns have also been observed in housed foxes and raccoon dogs (*e.g. Korhonen & Alasuutari, 1992*). It has been assumed that the manifestation of such behaviour under farm conditions can be an indication of stress or of some disturbance, however, no final explanation has been agreed on as yet. The present authors observed some interesting episodes of kit carrying in animals housed in large enclosures, which we carefully documented to provide more data in order to obtain a better understanding of this behavioural pattern.

Materials and methods

The experimental areas (located in Finnish Lapland; 69°N, 27°E) were comprised of three ground floor enclosures measuring (1) 11 m long x 8 m wide, (2) 17 m long x 8 m wide (fig. 1) and (3) 19 m long x 17 m wide (fig. 2). The animals were housed as follows: one pregnant arctic blue fox female and a male were housed in Encl. 1, one pregnant arctic blue fox female alone in Encl. 2, and one pregnant arctic blue fox female and two surplus females and three males in Encl. 3. The entire housing area (100 m long x 70 m wide) was additionally surrounded by a wire mesh wall (see fig. 1), inside of which a pair of raccoon dogs (pregnant female, male) lived freely. The whelping behaviour and locomotor patterns of the animals were monitored by direct visual observations.

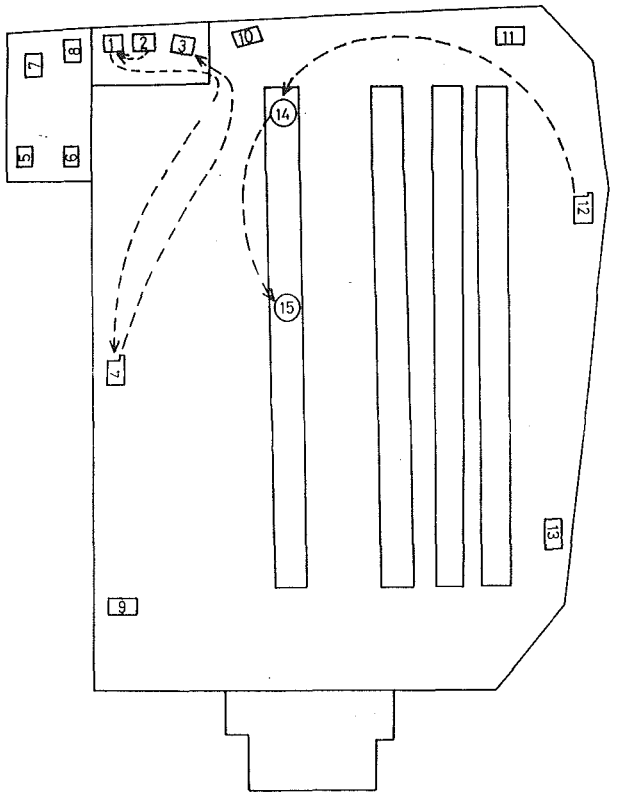

Fig. 1. Schematic presentation of kit carryings in 1991. Numbered boxes are wooden nest boxes. Numbered circles are ground holes.

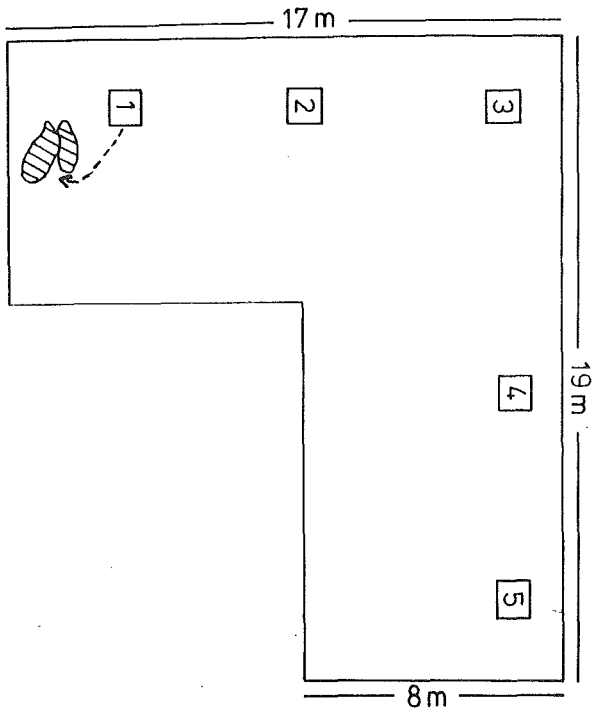

Fig. 2. Schematic picture of kit carrying in Encl. 3 (in 1992). Shaded areas indicate the stones below which the ground hole was situated. Numbers 1-5 are the nest boxes.

Results

Episodes in 1991

Fig. 1 gives a schematic presentation of the carrying episodes in 1991. On May 20th the blue fox female in Encl. 1 whelped (8 kits) in nest box n.2. Four days later, however, she carried the kits into nest box n.1. The female in Encl. 2 whelped (5 kits) in nest box n.5 on May 14th. Both females displayed aggressive behaviour, including vocalizations and postural threats towards each other, althouth they were in separate enclosures. At this time we noticed that the female and male in Encl. 1 were digging a tunnel beneath the cage wall. On May 26th, the tunnel was completely open, and the female carried her kits (one by one in her jaws) out in the the farming area, finally placing them into nest box n.4 (distance from the enclosure 35-40 m). Although the tunnel was open at all times, the male remained within the original enclosure. After transferring the kits into nest box n.4, the female nursed her kits normally. On the evening of May 28th, the female started to carry her kits back to Encl. 1. She finally placed them into nest box n.3. She nursed the kits until weaning in this nest box without any problems. The female in Encl. 2 nursed her kits from birth to weaning in nest box n.5. The female raccoon dog whelped (6 kits) in nest box n.12 on May 14th. Two days later, however, she (and her mate) transferred all of their kits into the ground nest (n.14) located below the mink shadehouse (distance carried, about 60 m). When the blue fox female kept her kits in nest box n.4, she every now and then visited close to the ground nest (n.14) of the raccoon dogs. Several aggressive encounters between the blue fox female and raccoon dogs ensued. On the afternoon of May 28th, the raccoon dogs carried their kits (in their jaws) to the other ground hole (n.15) where they finally nursed them until weaning.

Episodes in 1992

In 1992, the wall that connected Encls. 1 and 2 was removed, and 3 arctic blue fox females and 3 males were housed there until mid-summer. The same raccoon dog pair as in the previous year was allowed to run free within the farming area. Only one of the blue fox females whelped (on May 20th; 8 kits). Whelping occured in nest box n.1 (fig. 2). We now noticed that one of the males brought feed to the nest box of that female. The enclosure also included two large stones below which the foxes dug a hole resembling a den during the spring. Two days after whelping, the female carried the kits into the ground hole below the stones. Some aggressive exchanges between the female that had whelped and other foxes were observed, including alarm vocalizations. Two days later, all of the kits were dead and mostly eaten. The female raccoon dog did not whelp during this year.

Conclusive remarks

The present observations confirmed the occurrence of kit carrying behaviour in captive blue foxes and raccoon dogs. Furthermore, they clearly showed that a trigger for carrying activity can be another animal either of the same or different species. The role of the farming staff in inducing the observed carryings was probably

slight. It was interesting to note that both blue foxes and raccoon dogs are able to nurse their kits successfully also after carrying activity, causing no visible harm to the later development of the kits. In addition, the observations from Encl. 3 indicated that individuals of the same species can also cause kit losses. To what extent this correlates with the social status of animals is an open question, but such an indication has been described at least in red foxes (*Macdonald, 1988*). The present observations also indicated that, in some cases, a ground den is preferred to a wooden nest box when disturbances occur.

References

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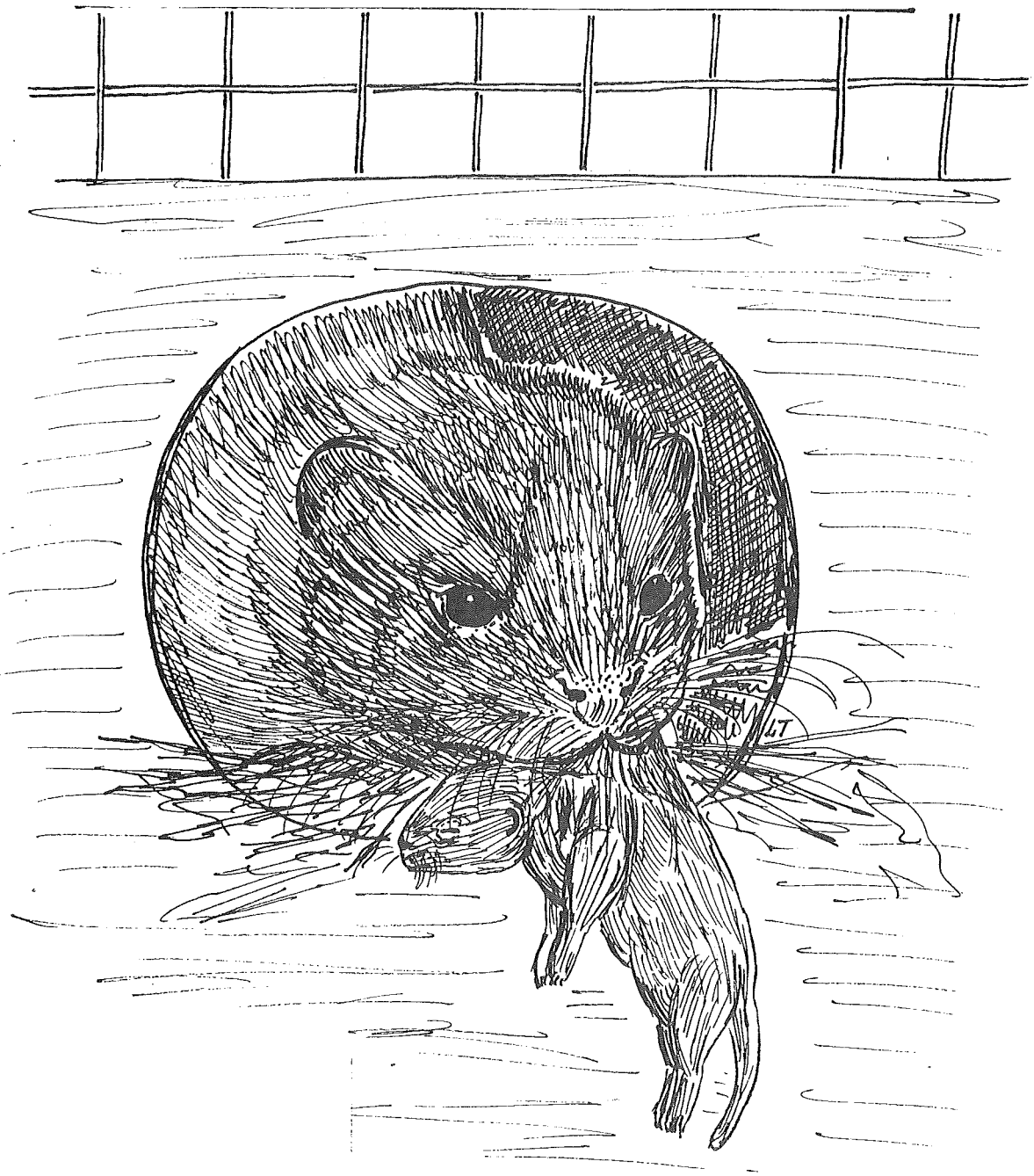
Macdonald, D. 1988. Running with the Fox. UnwinHyman Limited, London.



Investigations concerning the behaviour of farm silver fox (*Vulpes vulpes L.*) and an attempt to utilize the results for breeding and keeping improvement

Tadeusz Kaleta

In this study the agonistic behaviour of farm silver foxes (*Vulpes vulpes* L.) was investigated and general behaviour of this type was outlined on the basis of activity cycle observations. A comparison between the behaviour of the silver fox and the red one (wild type) was made. The effect of various farm conditions on foxes' agonistic behaviour was subsequently investigated. The final part of this work concerned the interdependence between the agonistic behaviour and reproduction performance. The author obtained results as follows:

1. The study of farm silver fox behaviour revealed its rather close proximity to the behaviour of wild red fox.
2. Some indicators of fox behavioural adaptation to the farm conditions were also observed (in adult and young specimens) e.g. occurrence of new types of behaviour and omissions in comparison with the wild type. This fact may be interpreted as a sign of domestication changes.
3. In the set of tests used by author the sound emitted by the dummy and approaching man turned out to be more useful as regards differentiation of foxes agonistic behaviour.
4. Flight distance in young foxes and adult males depended on the aisle breadth (the distance between rows of cages). It may be seen as an indicator of the animals' adjustment to farm conditions.
5. Other maintenance conditions also affected the foxes' behaviour: cage position and the number of animals per cage. The adaptation to man's presence seemed to be more compulsory in pavilions. The keeping of single young foxes in pavilion cages should be eliminated.
6. The effect of sex on silver foxes behaviour was visible in the case of adult animals where females showed more passive reaction symptoms than males.
7. The chosen parameters of males reproductive capacity were not significantly influenced by an agonistic behaviour.
8. Comparing the agonistic behaviour of vixens well and badly rearing cubs (infanticide), the hypothesis of stress susceptability as a possible cause of reproductive losses was accepted by the author. The differences found concerned the whole reaction pattern. The females showing hesitation and evasion in their responses and maladjustment (flight distance) turned out to be more prone to negative reactions towards their cubs.
9. In future, to diagnose the maternal behaviour two-degree test including dummy is recommended. It is crucial that two different objects are used, since two identical stimuli practically do not differentiate foxes agonistic behaviour. The time of single observation proposed in this study seems to be satisfactory.
10. It seems that the date of birth may influence fox behaviour and indirectly their inclination to infanticide.
11. The above-mentioned results should be supplemented by laboratory studies concerning stress hormones.

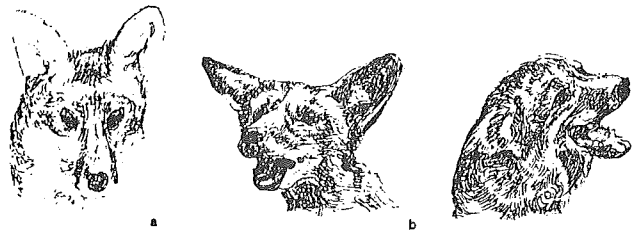


Fig. 8. Facial display observed in farm silver foxes: a - neutral; b - offensive threat; c - defensive threat.

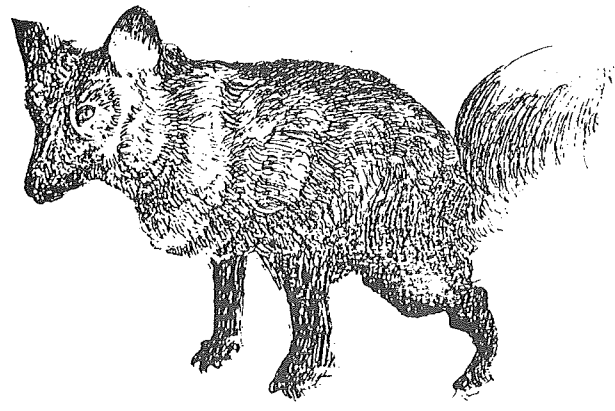


Fig. 9. Defecation posture in silver fox.

Book. In ENGL. Monograph, 64 pages. 25 tables, 19 figs., 108 refs. Author's conclusion.

Sleeping distance in relation to sexual state in the Arctic blue fox

H. Korhonen, S. Alasuutari

The paper provides comparative data concerning sleeping distance in relation to sexual state and hierarchical dominance in the Arctic blue fox. Increasing levels of vulval swelling and electrical resistance of vaginal tract were inversely related to sleeping distance between the highest-ranking male and each female on heat. A mating pair typically slept no further than 50 cm from each other. One month after copulation, the distance was already more than 200-250 cm. It can be concluded that oestrus-associated changes in sexual hormone levels have an influence on observed changes in sleeping distance.

Reprod Nutr Dev, 32, 123-127, 1992. 1 table, 13 refs. Authors' summary.

Repeatability of subjective grading in fur animals. I. Grading of live foxes (*Vulpes vulpes*).

Hilkka Kenttämies, Harri Käyhkö

Repeatabilities of subjective grading were studied for colour and body size in silver foxes, and for general appearance in various colour types of the fox. Statistically significant differences between scoring times were found for each trait. However, the judge factor had the greatest effect on scores for colour and body size in silver foxes. There were differences between the mean scores in general appearance given for the various colour types. Colour tended to be easier to judge than body size or general appearance. The coefficients of repeatability were 0.74 for colour, 0.55 for body size and 0.57 for general appearance. The repeatabilities among the various judges were 0.68-0.82 for colour and 0.51-0.59 for body size. Among the various colour types the "silver types" seemed to be easier to judge than the "golden types". The repeatabilities were 0.57 to 0.59 vs. 0.50 to 0.55 for general appearance.

Agric. Sci. Finl. 1, 303-307, 1992. 7 tables, 8 refs. Authors' summary.

Repeatability of subjective grading in fur animals. II. Grading of mink and blue fox pelts

Hilkka Kenttämies, Kerstin Smeds

Repeatabilities for subjectively scored colour, clarity and quality traits as well as for measured and classified pelt sizes were studied in mink and blue fox pelts. Mink pelts appeared to be more difficult to grade than blue fox pelts. Among the scored traits, colour was found to be easiest to judge, while clarity as well as some pelt defects tended to be difficult to grade.

Repeatabilities for size confirmed by measuring were greater as compared with the traits scored subjectively. Differences between repeatabilities attained by various persons were obvious.

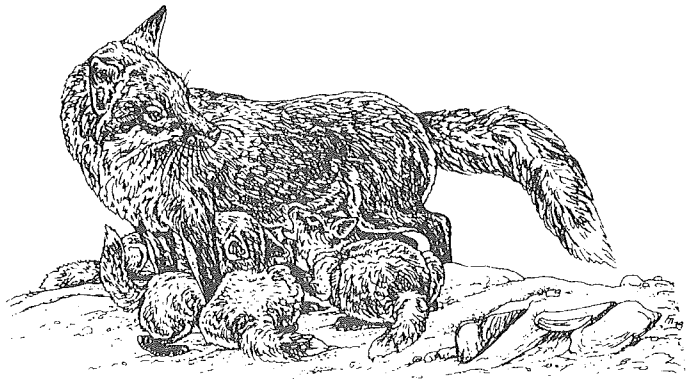
Agric. Sci. Finl. 1, 309-314, 1992. 4 tables, 1 refs. Authors' summary.

Repeatability of subjective grading in fur animals. III. Grading of live blue foxes in different environmental conditions.

Hilkka Kenttämies, Kerstin Smeds

Association between repeatedly scored body size and fur characteristics were studied in live blue foxes. Gradings in cages and outside cages in lamplight and daylight were also compared. Colour tended to be easier and clarity more difficult to evaluate than the other traits. Differences between judges in accuracy of grading were greater than between various grading environments. The grading was more reliable outside cages than within cages. The most uniform results were obtained when the same judge graded the animals in the same environmental conditions.

Agric. Sci. Finl. 1, 315-322, 1992. 6 tables, 10 refs. Authors' summary.



Studies on abnormal moulting in the farm-raised blue fox (*Alopex lagopus*).

P.V. Rasmussen, B.M. Damgaard

In a farm-raised, adult female blue fox (*Alopex lagopus*) it was observed that apparently the winter coat was shed abnormally. Furthermore, the individual was never recorded as being on heat. Comparative histological and clinical-chemical examinations showed that the winter coat cycle was postponed approximately 6 months, and that the hair growth therefore took place in the spring. At first a kind of biological summer coat was produced, and then a biological mature winter coat. This was compared with and partly documented by changes in plasma estradiol and cortisol profiles. It could be concluded that the hair growth cycle and the plasma estradiol profile showed an abnormal seasonal variation in the abnormal fox. The two variables seemed, however, to be correlated as in a normal animal.

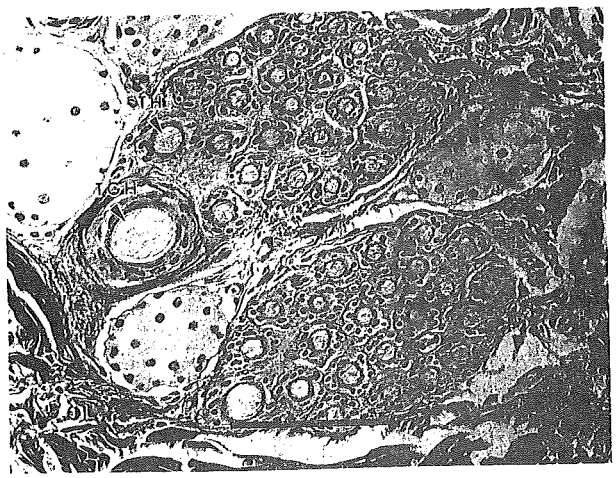


Fig. 5. Cross section of two hair follicle groups of the abnormal blue fox in telogen phase (dated 14.8.87). TH: underhair in telogen. TGH: Guard hair in telogen. Scale: 100 μm.

J. Vet. Med. A 39, 502-508, 1992. 7 figs., 12 refs. Authors' summary.

Two autumn moults in mink skin caused by melatonin treatment

Shigeharu Fukunaga, Kaoru Kohno, Fumio Nakamura, Keiji Kondo

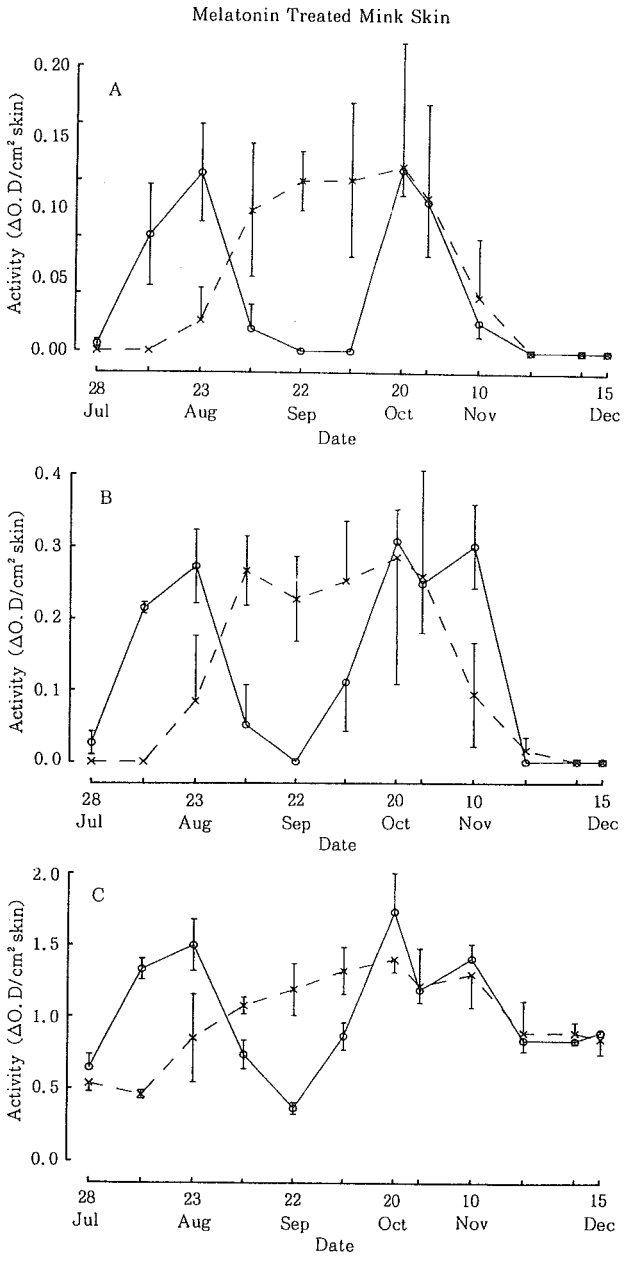


Fig. 2. Seasonal variations of mink skin tyrosinase activity. The mean values after the incubation period of 6 hours (A), 12 hours (B) and 24 hours (C) are given.

The effect of melatonin on the autumn moult in mink skin was investigated by the means of the changes of tyrosinase activity and histological parameters. Melatonin treated mink moulted twice in autumn, and their hair activity, underfur number and tyrosinase activity also showed twin peaks during the experimental period. Seasonal changes of tyrosinase activity were correlated with that of histological parameters in both control and melatonin treated mink. These results indicated that the exogenous melatonin accelerates not only hair production but also melanogenesis in mink skin. All of the tyrosinase samples showed the incubation time dependent two-phase activity, first an initial low reaction phase and then a late high reaction phase. The initial low reaction phase might simulate the actual mink skin condition. The integrated tyrosinase activity throughout the experimental period was reduced to three quarters by the melatonin treatment.

Anim. Sci. Technol. (Jpn.) 63 (7): 694-703, 1992. 1 table, 4 figs., 23 refs. Authors' summary.

Isolation of keratinophilic fungi from hair of wild fox (*Vulpes vulpes schrenckii*) and soil from the affected areas in Hokkaido Prefecture of Japan

Hitoshi Kubo, Toshiya Tamura, Hajime Iizuka, Hideomi Shibaki, Shun-ichi Udagawa

A total of 200 soil samples from a fox reservation and 24 wild fox burrows in the eastern part of Hokkaido Prefecture were examined for keratinophilic fungi using Vanbreuseghem's hair-baiting technique. The fungi isolated were as follows: 112 strains of *Trichophyton ajelloi*, 48 of *Microsporum cookei*, 29 of *Arthroderma cuniculi*, 18 of *Chrysosporium* anamorph of *A. tuberculatum*, 4 of *Chrysosporium tropicum*, 4 of *C. keratinophilum* and 2 of *Trichophyton terrestre*.

Thirty captured wild foxes in the eastern part of Hokkaido Prefecture were examined for keratinophilic fungi by the hair-brushing method. *Arthroderma cuniculi* was obtained from the hair of 7 of the animals and *Trichophyton verrucosum* from one. The isolation of the latter species was epidemically important as a potential source of infection.

Arthroderma cuniculi, which seems to be associated with wild fox colonization, has been reported for the first time from Japan.

Japanese Journal of Medical Mycology, 31; 4, 317-324, 1990. In JAPN, Su. ENGL. 1 table, 5 figs, 14 refs. Authors' summary.

Hematological and plasma chemical characteristics in beech marten (*Martes foina*)

B.M. Damgaard, S.W. Hansen

1. The normal values of hematological and clinical-chemical variables in plasma of 21 males and 27 females of beech marten (*Martes foina*) have been illustrated and compared to corresponding normal values in mink (*Mustela vison*) and ferret (*Mustela putorius*).
2. The number of erythrocytes, the hematocrit value, and the hemoglobin concentration were higher in male than in female beech marten.
3. Divergences according to age in the investigated variables have been found.
4. The erythrocytes in beech marten are clearly smaller in size and volume and have a lower mean corpuscular hemoglobin than the erythrocytes in mink and ferret.

Comp. Biochem. Physiol. Vol. 102A, No. 4, pp 721-725, 1992. 5 tables, 18 refs. Authors' abstract.

Morphological observations on the lingual epithelium of the ferret

A. Awad

The morphological features of the lingual epithelium of ferret were studied with special reference to the papillae. The rostral 2/3 of the dorsum was characterised by the presence of a rasplike area due to the filiform papilae. It was followed by a smooth, relatively triangular area free of papillae or folds except 2 vallate papillae present caudally in that area. The most caudal area of the dorsum showed irregular folds except transeverse folds of the foliate papillae laterally. Four subtypes of filiform "two simple and two compound", fungiform, 2 vallate and rudimen-

tary foliate papillae were identified. Most of the fungiform and the vallate papillae carried taste buds.

Zagazid Vet. J. Vol. 17, No. 4, pp 156-172, 1989. 17 figs., 17 refs. Author's summary

Effects of different storage methods on quantities and chemical composition of manure from fur-bearing animals

Kjetil Aarstrand, Anders Skrede

Manure from mink, blue fox and silver fox was collected during two consecutive 12-month periods either in watertight trays or on the ground on a substratum of sand. In the first test period, the content of N, P and K in manure dry matter (DM) was 5.1% Kjeldahl-N, 2.3% NH_4-N, 6-2% P, 1.4% watersoluble P and 2.4% K on an average of 36 samples. In the second test period, the corresponding values were 4.8% Kjeldahl-N, 1.8% NH_4-N, 8.0% P, 0.7% watersoluble P and 1.5% K on an average of 48 samples. The calculated quantity of manure per adult female was on an average 41.7, 36.4 and 22.4 kg/year for mink, blue fox and silver fox, respectively for the watertight collection system. Corresponding values for collection on sand were 8.8, 14.9 and 16.1 kg/year. The content of DM in manure was 16-36% higher when collected on sand. The differences were significant. Manure collected on sand had a significant, lower content of NH_4-N, water-soluble P and K. There was no significant difference in content of total N and total P between the two collection systems.

Norsk Landbruksforskning 6: 339-358. ISSN 0801-5333. In NORG, SU. ENGL. 9 tables, 4 figs., 12 refs. Authors' summary.

Effects of housing mink in cages of different sizes, containing 1, 2 or 3 animals, on the incidence of stress

R.J. Aulerich, S.J. Bursian, H.C. Napolitano, R.J. Balander

From 29 July (at approx. 12 wk of age) to pelting, 72 male pastel mink were housed (1) singly, in a large (38 x 28 x 31 cm) cage with a nest box, (2) singly, in a small enclosure (76 x 31 x 46 cm) with a wooden nest box, (3) in a small enclosure containing 3 mink, or (4) in a small enclosure containing 3 mink, with a nest box, allowing 0.2, 0.1, 0.055 and 0.036 m^3 space resp. per animal, and their performance was compared with that of mink in standard cages. Although mink in group 4 had a lower body weight than those in the other groups, the differences were only significant during the first 6 wk of the trial. Mink in groups 3 and 4 had a somewhat greater incidence of hyperactive and aggressive behaviour and of damaged pelts than those in groups 1 and 2, but there were no significant differences between the groups in the incidence of stress monitored on the basis of blood cortisol concentration, the number of circulating eosinophils and weight of the adrenal glands.

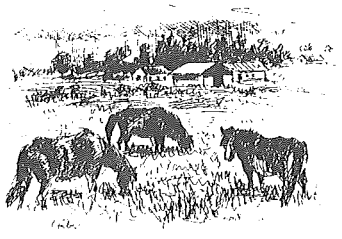
Deutsche Pelztierzüchter, 65, 5, p. 97-100, 1991.. In GERM. CAB-abstract.

Breeding of fur bearers in Denmark

Anonymous

On 14 Aug. 1991, there were 2,093.321 mink breeding females in Denmark, of which 35.16% were Scanblack, 44.69% Scanglow plus Scanbrown, 8.96% Pastel and 3.77% Pearl. For females of the 4 types, the number of kits born per mated female averaged 4.51, 5.40, 4.90 and 4.88, and the percentage of mated females failing to produce a litter was 11.6, 8.1, 9.5 and 9.9. There were 19,824 fox breeding females at 386 farms. Litter size averaged 5.49 cubs for blue and shadow foxes and 3.06 for silver foxes. Data are tabulated for the number of pelts produced and sold, and details are given of feed production and health.

Vara Pälsdjur, 62, 6, p. 177-178, 1991. In SWED, 4 tables. CAB-abstract.



Genetic models for the colour of foxes.

Flemming Skjøth

The report deals with genetic models for the colour of foxes. The models are evaluated through analysis of data on pedigreees. The method, which is probabilistic, is based on an algorithm for collecting information related to individuals on a pedigree, providing the possibility of handling uncertainties, exploiting ancestral information and extracting all information available. It is described how inference concerning gene-frequency, genotypic penetrance and linkage is performed. Genotypes of individual foxes can be estimated as well as expected phenotypes of potential offspring. This is used to investigate cases where it is doubtful which sire is the actual father. The given data consists of four pedigrees covering 248 foxes, including information of their colours and colour-types. Two models with two di-allelic loci and one model with one di-allelic and one tri-allelic locus are proposed and analysed in this framework. Analysis on penetrance models confirms difficulties in classification of foxes through subjective evaluations of fur colour phenotype. Especially crossfoxes emerge as being difficult to differentiate. No evidence of linkage between Agouti locus and Extension locus is found in this dataset.

M.Sc.Thesis, 60 pp. 13 refs. Dina Research Report no. 12.

Hormonal effects in silver-black foxes during domestication in relation to the photoperiod

L.V. Osadchuk, L.N. Trut

Silver-black vixens from a domesticated and a wild population (13-15 per group) were housed in sheds with controlled light, and, compared with natural daylight, were given an additional 3-h light daily in the morning, evening or at night. Supplementary light at night adversely affected the number of vixens exhibiting oestrus (6 out of 15 vs. 11 out of 13). Supplementary morning light had no effect and supplementary evening light had a slight adverse effect on the wild vixens only. For domesticated and the wild vixens housed in a shed with natural light only, the difference between the 2 types of vixen in the concentration of oestradiol was non-significant, but for progesterone (0.38 and 0.72 ng/ml in the 2 groups resp.) the difference was significant. Similar progesterone levels and significant differences were also obtained under the morning and evening experimental lightning regimes; at night, the concentrations were 0.85 and 1.58 ng/ml in the 2 types of vixen, the difference being significant. For oestradiol, the only significant difference between the domesticated and the wild type was obtained for vixens given supplementary light at night (26.67 and 17.5 pg/ml).

Sibirskii Vestnik Sel'skokhozyaistvennoi Nauki; No. 1; 74-78, 1989. In RUSS. 2 tables, 16 refs. CAB-abstract.

Cloning and sequence analysis of an Ig light chain cDNA from the spleen of American mink (*Mustela vison*)

A.M. Nayakshin, E.S. Belousov, A.V. Taranin, S.S. Bogachev, I.B. Rogozin, O.K. Baranov

A cDNA library in the λgt11 phase was constructed using poly (A^+)-mRNA from mink spleen as a template. Immunoscreening of the library allowed the identification of 2λ-related clones containing 370 and 803 bp insertion (λIGL-1 and λIGL-2). Analysis of the primary structure of λIGL-2 demonstrated that it contains a large portion of V_λ-segment, J_λ-segment, C_λ-gene and its 3′-untranslated part. The nucleotide sequences known for the immunoglobulin genes were compared to the sequence of the λIGL-2 clone. The highest degree of homology was established for the rabbit λ-genes, this being 63, 94 and 72% for the RF3 region of V_λ-segment, J_λ-segment and C_λ-region, respectively.

Genetika (Moskva); 26; 8; 1527-1531, 1990. In RUSS, Su. ENGL. 2 figs, 23 refs. Authors' summary.

The use of mink-mouse hybrid somatic cells for the mapping of six genes in American mink (*Mustela vison*)

S.D. Pak, N.S. Zhdanova, M.A. Sukoyan, M.R. Mullakandov, P.S. Stenin, O.L. Serov

The genes for uridine monophosphate hydrolase-2, adenine phosphoribosyltransferase, pepti-

dase S and phosphoglycollate phosphatase were mapped to chromosomes No. 8, 7, 7 and 6 resp.

Tsitogenetika i Biotekhnologiya Materialy 2 Vsesoyuznoi Konferentsii po Tsitogenetike Sel'skokhozyaistvennykh Zhivotnykh, Leningrad-Pushkin, 146-147, 1989. In RUSS. CAB-abstract.

The silver-black fox: mapping of 22 gens coding for biochemical markers

T.B. Nesterova, S.M. Zakiyan, V.G. Matveeva, N.G. Rubtsov

Using silver fox X Chinese hamser somatic hybrid cells, 22 genes controlling various enzymes were mapped to chromosomes 12 and X (3 genes each), 1, 4, 15 and 16 (2 genes each), and 2, 4, 5, 6, 7, 8, 10 and 11 (1 gene each).

Tsitogenetika i Biotekhnologiya Materialy 2 Vsesoyuznoi Konferentsii pp Tsitogenetike SEl'skokhozaistvennykh Zhivotnykh, Leningrad-Pushkin, p. 148-150, 1989. In RUSS. CAB-abstract.

The use of fox circles in evaluation and selection of males

Ilona Alhoniemi

The aim of the study was to investigate factors affecting reproduction and pelt traits in blue foxes and the genetic parametres of these traits. The results were to be used to justify whether fox circles are an improvement in breeding foxes and in that case how the circles should be organized.
The material consisted of insemination and live animal grading records from a blue fox circle in Kruunupyy, Finland in 1987 and 1988. 37 farms were connected to the circle, and 22 males were used during the period. Total number of pups during the two year period was 3312, and 1517 of them were graded for body size and fur traits. The data were analysed by WSYS statistical program. The traits analysed were: litter size, body size, fur quality, colour intensity and clarity. Factors affecting these traits were analysed with the least squares method. The components of variance used in estimating the heritability of litter size were calculated both by sire model of half-sib correlations and by mother-daughter regression model. Half-sib correlations were also used in pelt traits.

Components affecting litter size varied depending on the material and the choice of model. Pelt traits were affected by farm, year and litter size, to some degree also by the age of the dam and birth date. The heritability of litter size was 0.46 when half-sib correlation method was used and 0.18 by mother-daughter regression method. The heritabilities of other traits were: body size 0.00, fur quality 0.23, colour intensity 0.09 and clarity 0.24.

Fox circles are necessary as genetic links between farms. In order to serve the breeding purpose, it is necessary that the males are used and have progeny on several farms. All pups should be graded before pelting. In order to perform progeny tests on reproduction traits each male should also have several daughters in breeding. All farms using the fox circle should be included in the control. This would help to standarize the information on females. The grading results could be used to plan the production of new breeding animals by means of top combinations of males and females.

M.Sci. thesis. In FINH, 15 tables, 97 refs. Abstracted by Outi Lohi. Kotieläinjalostuksen Tiedote No. 97, 56 pp, Helsinki 1992.

A new mutation in mink

V.I. Eremeeva, N.V. Barkova, G.A. Kuznetsov

In a litter born to Standard parents in 1984, 6 kits were of Standard coloration and 1 appeared similar to Pastel. Two additional mutant females and 4 males were born later to other parents. From these mutant mink, a population of 216 males and 204 females of the mutant type were bred. Mutants had a lightening of colour of the guard hairs and undercoat fibres compared with Standards, the fibres being greyish-blue with a dark tip. The mutation was provisionally designated "Talitsa". The gene for Talitsa was shown by breeding tests to have a dominant dilution effect on colur, and a recessive lethal effect.

Krolikovodstvo i Zverovodstvo, No. 6, 8-9, 1991. In RUSS. CAB-abstract.

Plasma prolactin during the luteal phase and pregnancy in non-parturient and parturient blue fox vixens

N.M. Valberg, M. Mondain-Monval

Plasma prolactin secretion during the luteal phase and pregnancy was studied in 11 mated but non-parturient and 26 parturient blue fox vixens. Prolactin was measured in blood plasma once or twice a week using a heterologous double-antibody radioimmunoassay. Data for all females were fitted with an animal model. In both groups of females, prolactin concentrations increased slowly during the early post-mating period. For the parturient vixens the prolacting values increased further until parturition, whereas there was only a slight increase in the non-parturient vixens. Statistically significant differences ($p<0.05$) were observed in prolactin release between the non-parturient and parturient animals from day 36 after mating. A possible role of prolactin may exist in the luteotrophic complex maintaining pregnancy in blue fox vixens, because higher levels of plasma prolactin and progesterone appeared in the parturient vixens compared to the non-parturient during the second half of gestation.

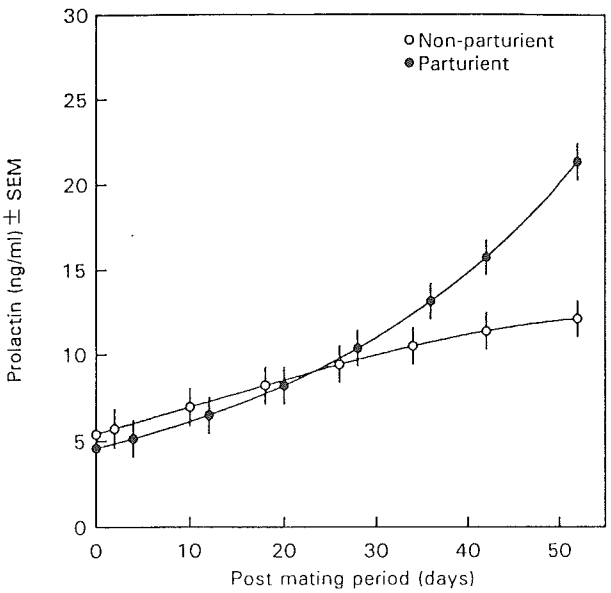


Fig. 1. Estimates of prolactin concentrations±SEM during the luteal phase/pregnancy in non-parturient and parturient vixens.

Acta Agric. Scand., Sect. A, Animal Sci. 42: 240-245, 1992. 2 tables, 1 fig., 27 refs. Authors' summary.

Plasma progesterone during the luteal phase and pregnancy in parturient and barren blue fox vixens

N.M. Valberg, W. Farstad

The variation in progesterone secretion during the luteal phase and pregnancy in blue fox vixens was analyzed. Progesterone was measured in blood plasma once or twice a week using radioimmunoassay. The material was allocated into three groups; five mated, but barren, blue fox vixens, six mated vixens with implantation zones in the uterus, but no cubs at parturition, and 26 normally parturient vixens. The progesterone profiles for the three different groups of females showed a steady increase in progesterone immediately after mating. Maximum values were observed on days 8-12 of pregnancy. Then the progesterone levels decreased gradually until delivery around day 52. The levels of progesterone were found to be significantly different ($P<0.05$) between non-pregnant and pregnant females from day 22 after mating. The plasma progesterone level seems to be affected by the presence of conceptuses.

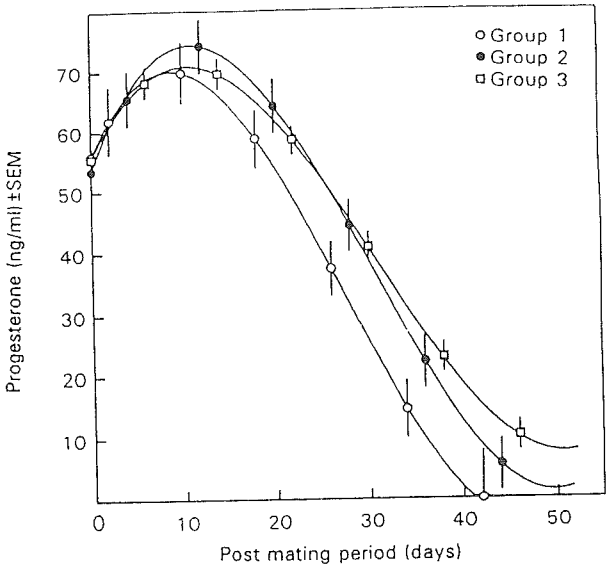


Fig. 1. Plasma progesterone concentrations±SEM during the luteal phase/pregnancy in the three groups of blue fox vixens. Group 1: mated vixens with no signs of implantation in uterus. Group 2: mated cixens with implantation zones in uterus, but no cubs at parturition. Group 3: parturient vixens.

Acta Agric. Scand., Sect. A, Animal Sci. 42: 232-239, 1992. 3 tables, 2 figs., 28 refs. Authors' summary.

Activated mammary number and litter size in the mink

H. Korhonen

The dependence of activated mammary number on litter size was studied in standard type farmed mink in an attempt to clarify its effects on early kit mortality. The results showed highly positive correlations between litter size and the number of activated teats at 2 days, 4 weeks and 8 weeks of age. Total kit mortality was rather low and independent of litter size. The body weights of the mothers were independent of either litter size or age during the lactation period. The body weights of male kits were of the same order of magnitude in spite of litter size or age until weaning. In female kits, the body weights in the largest litters were lowest at weaning.

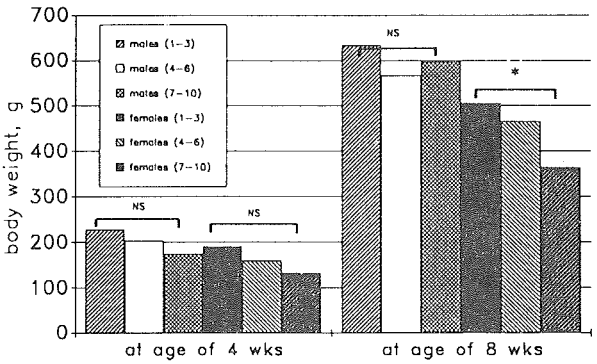


Fig. 2. Body weight of male and female kits in relation to litter size. Statistical significance: NS=non-significant; *=P<0.05.

Reprod Nutr Dev, 32, 67-71, 1992. 2 tables, 2 figs., 9 refs. Author's summary.

Environmental variation of the reproductive traits in chinchillas (*Chinchilla laniger gray*) in confinement

Ximena Garcia, Roberto Neira, Ricardo Scheu

Information taken from 1982 to 1986 (273 parturitions), in a commercial flock of chinchillas located in Santiago was analyzed. The objetives were to study the effect of year and season of parturition number, luminosity and floor, on number of born alive (NNV), litter size at birth (PCN), litter weight at weaning (PCD), mortality at birth (MN) and mortality from birth to weaning (MND). Year and season of parturition influenced almost all the studied variables, with better performance in summer and spring. Chinchilla's prolificacy changes according to parturition number: primiparas had less prolificacy and those in their second parturition had a very good performance. Females localized in the clear part of the shed had larger NNV, TCN and TCD than those in the dark sector, although this effect did not occur with females localized in the intermediate floor (light x floor interaction).

Avances en Produccion Animal, No. 14 (1-2): 121-127, 1989. In SPAN, Su. ENGL. 7 tables, 4 figs., 12 refs. Authors' summary.

Descriptive analysis of reproductive and growing performance of chinchillas (*Chinchilla Laniger Grey*) in confinement

Roberto Neira, Ximena Garcia, Ricardo Scheu

A descriptive analysis of reproductive and growth traits of chinchillas, with information taken from 1982 to 1986 in a flock located in Santiago, was done. The objective was to characterize biologically this species in confinement. The following averages were obtained; litter size at birth (TNC): 1.75; number of born alive (NNV): 1.59; litter size at weaning (TCD): 1.31; litter weight at birth (PCN): 83.3 g; litter weight at weaning (PDC): 342.8 g; mortality at birth: 10.4%; mortality from birth to weaning: 21.5%. Females had on average 459 ds of age to first crop: 214 ds of parturition interval; 110.4 ds of gestation length, and 605, 742 and 648 g as mating, parturition and non-parturition weights. Young animals were weaned at 54 ds of age, and their growth rate was fast (3.6 g/day) until one month of age, then decreased to 1.56 g/day from 2 to 6 months, and to 0.65 g/day from 6 months one year of age. The principal reasons for culling were infertility (44%), age (24%), illness (20%) and fights (12%). The higher frequency of mating occurred in winter. Phenotypic correlations were high between NNV, TCN, TCD, PCN and PCD. The association of these variables and age and gestation length was low, but significative. A low relation between the different weights of the young animals was obtained up to 4 months of age; subsequently the degree of relation increased.

Avances en Produccion Animal, No. 14 (1-2): 109-119, 1989. In SPAN, Su. ENGL. 12 tables, 2 figs., 24 refs. Authors' summary.

Original Report

The influence of differing nutritional levels on nutria growth and fur quality

Stanislaw Niedzwiadek, Malgorzata Piórkowska
National Research Institute of Animal Production
Balice nr Cracow, Poland

Summary

The experiment included 240 young Greenland nutria fed different rations during the summer and winter. The animals were divided into 3 groups with 40 animals in each feeding season. Group I was fed traditionally. Group II received a balanced concentrate with 12-13% protein and 9-10% fiber with a green forage supplement during the summer and roots during the winter. Group III received a balanced concentrate with 15-16% protein and 9-10% fiber with green forage and roots added as in group II.

It was observed that the balanced concentrate with 16% protein was very effective. Young animals had high growth rates and weighed at 8 months: 5 kg - males and 4.6 kg - females. The use of nutrients was very good for making it possible to lessen the amount of concentrate during rearing by approximately 2 kg in comparison to nutria fed traditionally. The mean class of the furs was 2.4-2.6, depending on the feeding period.

Introduction

Nutria (*Muocastor coypus Mol.*) are one of the more important furbearing animals. In spite of the critical economic situation, nutria furs are valued and are a desired raw product for the fur industry. One factor determining production results and also economics is animal nutrition. In practice, only a few breeders follow nutritional norms. The lack of norms and the feeding of incomplete feeds are basic reasons for not attaining potential goals in mass nutria production.

Complete granulated concentrates gave good production results (*Kladovscikov, 1980; Niedzwiadek, 1983*). This feeding system has not yet been put into widespread use. Research within the country on determining a complete concentrate did not give the desired results (*Kowalczyk et al., 1975; Kawinska et al., 1975; Kuzniewicz, 1980*).

In other countries, nutria are fed a specialized concentrate (*Kladovscikov, 1980; Aleksandrova et al., 1980*) or a concentrate intended for other farm animals (*Scheelje, 1979*).

It was therefore considered expedient by the National Research Institute of Animal Production to develop a balanced concentrate for nutria that would improve nutrition and at the same time give better production results and fur quality.

Materials and methods

Research was carried out on the nutria farm of the Experimental Station in Zator. The material included 240 young Greenland nutria from we-

aning to 8 months. The animals were reared in cages without bathing facilities. Two nutritional periods were taken into consideration - summer (120 animals) and winter (120 animals). The number of animals of each sex was the same in the various groups and nutritional periods. Three groups in each nutritional season were established:

Group I: traditional feeding system according to Frindt and Majewski (1981).

Group II: Fed a balanced concentrate with 12-13% protein and 9-10% fiber with green forage and root supplements in the summer and winter, respectively.

Group III: Fed a balanced concentrate with 15-16% protein and 9-10% fiber with green forage and root supplements as in group II.

The rations for nutria in group I included a feed concentrate (barley, oats, corn), yeast (2-3 g daily), Polfamiks F (2 g daily) and green forage during the summer and roots during the winter. The composition of the feed concentrate is presented in table 1. The values of the rations were determined by chemical analysis done in the laboratory of the Zator.

Research and observations included: - individual weighing at weaning (28-days-old), - individual weighing at 2, 4, 6 and 8 months, - feed and ration (tastiness), - amount of feed consumed (weighing unconsumed feed), - animal deaths, - evaluation of grading of nutria before slaughter, - organoleptic evaluation of fur.

At the middle of the rearing period, when the nutria were 4.5 months old, using a balance method, digestibility was determined in 24 animals (4 animals from each experimental group and nutritional season).

Table 1. Composition and nutritive value of concentrates

	Contents (%)	
Components	Group II	Group II
Grass meal	20.0	20.0
Ground barley	20.0	33.0
Ground wheat	20.0	10.0
Soya bean meal	12.0	10.0
Rapeseed meal	5.0	5.0
Wheat bran	16.0	15.0
Fodder yeast	2.0	2.0
Fish meal	2.0	2.0
Premix F	1.0	1.0
Mixture MM	1.6	1.6
Salt	0.4	0.4
	100.0	100.0
Crude protein	16.3	13.2
Ether extract	2.4	2.2
Crude fibre	10.6	10.3

Results

The nutritional values of the formulated concentrate as shown by chemical analysis fell within the assumed norms (table 1). The protein levels differed by approximately 3% while the fat percent and raw fiber were the same. Fat values and fiber for all groups and feeding seasons were on a similar level (table 2).

Table 2. Chemical composition of rations for nutrias (%).

Group*	Crude protein	Ether extract	Crude fibre	Nitrogen-free extract
		Summer feeding		
I	14.8	2.8	12.8	55.8
II	16.3	3.1	12.9	56.3
III	17.2	3.0	13.1	56.2
		Winter feeding		
I	15.0	2.9	12.3	56.2
II	16.7	2.9	12.7	57.3
III	17.3	3.0	12.7	57.2

* Group I: control, feeding standard rations
Group II: concentrates 12-13% protein levels
Group III: concentrates 15-16% protein levels

Observations on the willingness to eat the rations showed that the nutria in groups II and III ate willingly during both feeding seasons.

The mean body weight at the beginning of the experiment were comparable in all groups and for males ranged from 608 to 612 g during the summer, and for females, from 611 to 612 g (table 3). During winter feeding, the differences between groups in the separate sexes were not great, a bare 3 g. Differences between sexes could be observed when the animals were 120-days-old. Males in all groups were heavier. At 8 months, males in group III weighed the most during both feeding periods (4950-4910 g). The same was true for females although the difference in relation to the body weights of females in group II was not great - 70 g during the summer and 60 g during the winter. The differences in male and female body weights between group I and II as well as II and III were not statistically significant. Also, differences between respective groups and sexes between feeding season were not statistically significant.

Variation in body weight at the commencement of the experiment was similar for both sex and group (V=9.4-13.2%). At 8 months of age there was a significant equalling out of body weights (V=7.3-9.3%).

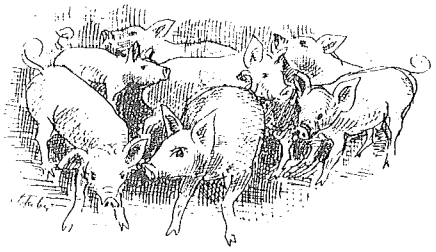


Table 3. Average body weight of nutrias (g)

Group*	Sex	Age (months)									
		At weaning		2		4		6		8	
		x	v	x	v	x	v	x	v	x	v
Summer feeding											
I	♂	610	12.3	1140	14.7	1920	11.3	3520	10.1	4720[a]	8.6
	♀	612	11.7	1180	16.2	1840	10.2	3120	9.8	4410[c]	9.2
	♂ + ♀	611	12.1	1160	15.4	1890	10.8	3320	10.0	4560	8.8
II	♂	611	9.8	1150	14.3	2140	12.3	3840	9.4	4890	7.3
	♀	612	11.3	1180	13.7	1985	11.8	3750	8.6	4510	9.3
	♂ + ♀	612	10.6	1165	14.1	2080	11.9	3795	9.1	4700	8.4
III	♂	608	12.3	1190	12.6	2350	12.6	3980	9.3	4950[a]	7.8
	♀	611	10.7	1210	14.3	1990	13.2	3740	8.6	4580[c]	8.4
	♂ + ♀	609	12.0	1205	13.8	2200	13.0	3869	9.0	4760	8.1
Winter feeding											
I	♂	608	13.1	1170	13.4	1930	10.8	3510	9.6	4700[b]	8.6
	♀	610	12.7	1160	12.6	1850	12.8	3190	10.2	4400[d]	8.7
	♂ + ♀	609	12.9	1165	13.8	1885	11.9	3350	10.0	4550	8.7
II	♂	610	13.2	1200	11.6	2160	11.3	3900	9.8	4780	9.3
	♀	607	9.4	1180	14.3	2000	12.0	3800	10.2	4580	8.2
	♂ + ♀	608	11.3	1190	13.1	2080	11.8	3860	10.1	4640	8.8
III	♂	607	11.4	1210	14.2	2340	10.6	4040	10.0	4910[b]	9.1
	♀	608	12.3	1200	14.3	2100	11.2	3890	9.1	4560[d]	8.6
	♂ + ♀	608	11.8	1205	14.1	2240	11.0	3970	9.7	4740	8.8

* for group designation see table 2
Means followed by the same letters are significantly different ($p \leq 0.05$)

Nutria growth fell within accepted norms as indicated by body weight gains (table 4). Between 28 and 60 days of age weight gains were not great. Relatively high growth rates for both sexes and feeding seasons occurred between 181 and 240 days of age. For the entire rearing period both males and females in group III during summer and winter feeding had the highest body weight gains which were, respectively: 4342-4302 g and 3969-3952 g.

Males in group III from weaning to 8 months consumed 25.1-25.2 kg feed concentrate while in group II the animals consumed 1.1-1.3 kg more (table 5). Group I consumed the most, 27.0-27.3 kg. Females consumed less feed in comparison to males. In the respective groups and seasons the differences were from 0.8 to 1.7 kg. Green forage consumption for males in all groups was similar (34.0-35.3 kg). Females consumed from 32.0 to 33.2 kg green forage. Root and steamed potato consumption was similar in all groups and respective sexes.

Digestibility coefficients of basic nutrients were similar for all groups during both feeding seasons (table 6). Dry matter ranged from 79.7 to 82.7 % protein from 79.2 to 80.1 %. Fiber digestibility ranged from 44.6 to 46.8 %. Digestible fat was from 54.7 to 55.9 % and non-nitrogen extract 86.5 to 88.3 %.

Table 4. Body weight gains of nutrias of different ages - arithmetical means (x).

Group*	Sex	Age (days)				
		28-60	61-120	121-180	181-240	28-240
Summer feeding						
I	♂	530	780	1600	1200	4110
	♀	568	660	1280	1290	3798
	♂ + ♀	549	730	1430	1240	3949
II	♂	539	990	1700	1050	4279
	♀	568	805	1765	760	3898
	♂ + ♀	553	935	1715	905	4088
III	♂	582	1160	1630	970	4342
	♀	599	780	1750	840	3969
	♂ + ♀	596	995	1670	900	4151
Winter feeding						
I	♂	562	790	1580	1190	4092
	♀	550	690	1340	1210	3790
	♂ + ♀	556	720	1465	1200	3941
II	♂	590	960	1740	880	4170
	♀	573	820	1800	700	3893
	♂ + ♀	582	890	1780	780	4032
III	♂	603	1130	1200	870	4303
	♀	592	900	1790	670	3952
	♂ + ♀	597	1035	1730	770	4132

* for group designation see table 2

Table 5. Feed intake (kg) from weaning to 8 months of age

Group*	Sex	Concentrates	Green foods	Roots	Steamed potatoes
Summer feeding					
I	♂	27.0[a]	35.3		
	♀	26.2	33.2		
	♂ + ♀	26.0	34.2		
II	♂	26.2	34.3		
	♀	25.0	33.1		
	♂ + ♀	25.6	33.7		
III	♂	25.1[a]	34.0		
	♀	24.3	32.0		
	♂ + ♀	24.7	33.0		
Winter feeding					
I	♂	27.3[b]		14.6	12.1
	♀	25.7[c]		14.1	12.6
	♂ + ♀	26.2		14.5	12.4
II	♂	26.5		13.6	11.8
	♀	24.9		12.9	11.3
	♂ + ♀	25.7		13.2	11.5
III	♂	25.2[b]		13.0	11.0
	♀	24.0		12.8	11.1
	♂ + ♀	24.8		12.9	11.0

* for group designation see table 2
Means followed the same letters are significantly different ($p \leq 0.05$)

The results of grading for females and males in the groups were on the same level (table 7). Nutria in group III had the highest points during the winter - 28 points and group I the lowest during the summer (26.4 points). The highest points for grading correlated with the best fur class. Furs from group III during the winter had a mean class of 2.4 and during the summer, 2.6. Classified furs from the respective groups during the summer were poorer by 0.2 classes.

Table 6. Average digestibility coefficient of nutrients (%)

Group*	Dry matter	Protein	Ether extract	Fibre	Nitrogen-free extractives
Summer feeding					
I	81.7	79.3	55.9	44.6	86.5
II	82.3	79.2	54.8	45.3	87.2
III	82.7	80.0	55.9	45.3	87.1
Winter feeding					
I	79.7	79.3	54.7	46.2	87.2
II	80.2	79.8	55.2	46.8	88.3
III	81.3	80.1	54.9	47.3	87.9

* for group designation see table 2

Table 7. Results of organoleptic assessment of nutria and pelts

Group*	Size	Colour clarity	Density of fur coat	Length, resilience, silkiness of fur coat	Conformation and general	Total points	Average class of untreated pelts
Summer feeding							
I	3.0	7.6	8.2	4.8	2.8	26.4	3.0
II	3.0	7.7	8.3	4.9	2.7	26.6	2.8
III	3.0	7.8	8.4	5.0	2.8	27.1	2.6
Winter feeding							
I	3.0	8.4	8.4	4.8	2.7	27.8	2.8
II	3.0	8.6	8.6	4.7	2.8	27.7	2.6
III	3.0	8.7	8.6	4.9	2.8	28.0	2.4

* for group designation see table 2

Discussion

The concentrate composition that was formulated took into consideration national or imported components (soybean grain expeller) which are readily available. Fish meal was added in order to enrich the animal protein. Many authors feel that it is necessary to add animal protein to nutria feed (*Kladovscikov, 1982; Olsson, 1982*). The balanced concentrate was fed in a wettened loose state. No attempt was made to granulate the feed since in practice there are more possibilities for using this form of feed, even though the granulated form is certainly more efficient, especially on large farms.

The values of basic nutrients agreed with those presented for this animal (*Frindt and Majewski, 1981; Aleksandrova et al., 1980*). Nutritional differences were mainly in protein levels. This difference reached 2.3-2.4 % due to a 3% difference in protein values. For complete evaluation of the concentrate two feeding periods were taken into consideration (summer and winter). Summer feeding included a green forage supplement since a complete concentrate was not developed. Furthermore, green forage must be used as a complementary feed and to lower feeding costs. It was similar during the winter when supplementary feed included roots and steamed potatoes i.e. feed popularly used in feeding nutria (*Cholewa, 1988; Kuzniewicz, 1980*).

Nutria body weights at weaning, i.e. the beginning of the experiment, were comparable in all groups. It is difficult to refer to data in the literature since the most frequent age for weaning is 35 days (*Kipanski, 1981; Olsson, 1982*). Body weights of 28-day-old animals agreed with data from the same farm but a different experiment (*Niedzwiadek et al., 1984*). When the animals were 4 months old differences in body weights between groups occurred. Greater values were found in nutria fed a balanced concentrate during both feeding periods. Final body weights at 8 months were high. Males fed concentrates with 16% protein weighed almost 5 kg while females weighed 4.6 kg. Body weights for both sexes were approximately 0.3-0.4 kg higher than those found by other authors (*Kipanski, 1981; Kladovscikov, 1982; Niedzwiadek et al., 1986; Olsson, 1982*). Growth rate, measured as body weight gains at determined intervals, was high until 180 days. However it should be noted that from 181 to 240 days it was relatively high and 100-200 g higher than the data of Niedzwiadek et al. (1986 and 1988). The body weights of 8 month old nutria show that the fastest growth rates were found in animals fed a balanced concentrate with 16% protein.

Feed intake of concentrate and supplements (green forage, roots, steamed potatoes) were the lowest during both feeding seasons in group III. In comparison to the amount of concentrate used in the group fed traditionally it was significantly lower. Frindt and Majewski (1981). Kowalczyk et al. (1975), Kopanski (1981) recorded that 26-27 kg of concentrate were used during nutria rearing. Approximately 2 kg less feed were used.

Digestibility coefficients of basis nutrients showed that they were used very efficiently especially with higher protein levels. Digestibility coefficients of protein, fat and fiber were 2-3% higher than those reported by Gacek (1976) and Olsson (1982).

Grading before slaughter showed that the concentrate with 16% protein gave better results. All examined traits received high points, particularly during the winter feeding. The somewhat lower total number of points during the summer resulted from the low number of points for color clarity. In the opinion of the author the low values for this trait were not due to nutrition. During the summer there are high temperatures and a greater influence of sun rays. These factors have a negative influence on color clarity. A slight yellowing or browning of the cover hairs occurs in spite of the cages being covered. Untreated skins had a high classification, particulary in the groups with 16% protein.

In conclusion it can be stated that the composition of the concentrate with 16% protein was very effective in nutria feeding. Young animals had a high growth rate so that at 8 months males weighed approximately 5 kg and females 4.6 kg. Use of nutrients was very good, making it possible to use approximately 2 kg less concentrate during rearing. The furs were of good quality and belonged to high quality classes.

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Original Report

Mink diet energy during pre-weaning and early post-weaning periods

Ilpo Pölönen[1], Ronald Scott[2], James Oldfield[3]

[1] *Finnish Fur Breeders Association, Vantaa, Finland*

[2] *Dept. of Anim. Sci., Oregon State Univ., Corvallis*

[3] *Prof. Emeritus, Dept. of Anim. Sci., Oregon State Univ., Corvallis*

Summary

Vegetable oil and corn syrup were fed during lactation to ascertain whether this nutritional regimen would improve growth of kits and to maintain the female's condition. Lactating Blue Iris females with kits were fed either lard or vegetable oil as a fat source (40% of total fat) and cereal (wheat:barley) or corn syrup supplement as a carbohydrate source (40%). Positive effects of vegetable oil on kit weights and of corn syrup on weight loss of dams were revealed. Weight of kits fed lard and vegetable oil were 315 and 332 g (p=0.06) at 6 and 572 and 598 g (p=0.03) at 8 weeks of age, respectively. Weight losses of dams from parturtion to 6 weeks of age averaged 283 and 154 g (p=0.06) for cereal treatment and the corn syrup-supplemented treatment, respectively.

The weaning weight of mink kits is only 1/5 of their weight at pelting, but it is of great importance. Larger mink at weaning tend to continue growing fast and result in the largest mink at pelting (*Tauson, 1988; Therkildsen, 1988*). Therefore, it is important to provide adequate nourishment to both the female and her kits during the pre-weaning period. Mink kits are very small at birth, having almost no fat, and are totally dependent on their mother's milk for their nutrition until about 24 days of age (*Rochman, 1969*), i.e. the first half of the usual pre-weaning period.

A high energy diet is essential for kit growth and dam well-being during lactation but the fat content of the diet cannot be increased too much, or too early during gestation, since this may adversely affect fetal development and decrease litter size. Females fed at a high energy intensity can lose their appetite and have difficulties at the onset of lactation. Obese females often have difficulties in nursing and have higher kit losses even though their litter sizes may be smaller than those of females in normal condition (*Pölönen, 1989*).

Readily available carbohydrates in a lactation feed may prevent dams from losing weight and developing nursing sickness, which is associated with a strongly negative energy balance and acidosis (*Brandt, 1988; Clausen et al., 1989*). Hence, feeds that provide the female with high levels of energy without increasing the amount eaten and without causing a deficiency of protein, vitamins or minerals, are expected to protect her against nursing sickness. Nursing sickness continues to be a major problem in the reproduction of ranch mink.

The purpose of this study was to determine whether vegetable oil and syrup supplementation would im-prove the female mink's performance during lactation, and kit growth during pre-weaning and early post-weaning periods.

Materials and methods

Initially, 42 Blue Iris mink females with kits were allotted randomly to four treatments in which the variable factors were fat source (40% of the total diet fat) and the carbohydrate source. The fat source was either rendered lard or a vegetable oil mixture (equal parts of Canola, corn and soybean oils), while carbohydrates came from whole, cooked wheat:barley (50:50) cereal meal or partly (40%) from a food grade, light corn syrup.

The diets were designed to meet the requirements of mink during lactation as far as energy density and protein levels were concerned with out differences between different treatment groups. Analytical results from Nordic trials (*Bergh, 1986*) and a computerized ration formulation program (*Ration, 1991*) were used to balance the diets.

Feed samples were accumulated throughout the experiment and frozen (-20°C) until analyzed for dry matter (DM), crude protein (CP), crude fat or ether extract (CF) and ash. The feed ingredients and nutrient composition of the experimental diets are shown in table 1. Mink were placed on experimental treatments immediately after whelping, when the normal ranch diet was gradually changed into the experimental diet during the first week after parturition. Feed was prepared and full-fed daily, initially on the wire mesh of the cage and later on the nest box top, to improve access by the kits. Refused feed was collected and the amount that had been consumed by mink was calculated.

Table 1. Diet feed ingredients (% of diet) and nutrient contents

	Diets			
Feedstuff	1	2	3	4
Dover sole	35	35	35	35
Beef by-products				
Tripe & lungs	11	11	11	11
Liver	12	12	12	12
Herring meal	5	5	5	5
Blood meal	1	1	1	1
Soybean meal	1.5	1.5	1.5	1.5
Cereal*	10.0	10.0	8.5	8.5
Lard, rendered	3.0	-	3.0	-
Vegetable Oil**	-	3.0	-	3.0
Corn syrup***	-	-	3.0	3.0
Water	21.5	21.5	20.0	20.0
	100	100	100	100
Nutrient composition, %				
Dry matter	32.5	34.2	34.2	36.7
Ash	8.4	8.0	6.5	6.9
Crude protein	45.4	45.3	44.1	44.3
Fat (ether extract)	22.1	24.8	25.9	24.2
Carbohydrates	24.1	21.9	23.5	24.6
ME MJ/kg DM****	17.5	18.3	18.6	18.4
Kcal/kg DM	4200	4400	4450	4400
Percentage from:				
Protein	41.1	39.4	37.0	37.6
Fat	42.0	46.3	46.4	44.9
Carbohydrates	16.9	14.3	16.6	17.5

* Cereal: 50% whole cooked barley, 50% whole cooked wheat. Vitamins: Vitamin A, 26,000 IU/kg; vitamin B1, 18 mg/kg; biotin, 1.3 mg/kg; vitamin D3, 2,640 IU/kg; vitamin E, 10 IU/kg.

** Vegetable oil: 33.3% soybean oil, 33.3% corn oil, 33.3% canola oil.

*** Light corn syrup, DM 80.3%.

**** ME = Metabolizable energy; MJ = megajoules. Figures listed are based on ME energy values of 18.8, 39.7 and 17.6 MJ7g of digestible protein, fat and carbohydrates, respectively. Nutrient digestibility in raw materials was obtained from Nordic data (*Bergh, 1986*).

Kits and dams were weighed at birth, 3 and 6 weeks of age. In addition, kits were weighed at 8 weeks of age. Significance of the treatments was tested by analysis of variance through a statistical computing package (*Statgraphics, 1989*), which allowed for different litter sizes and different weights between male and female kits.

Results

The nutrient contents of the feeds proved to be as designed. Energy levels in all diets were at least 17.5 MJ/kg of dry matter, which has been recommended and shown to be adequate for lactation and early growth of kits (*NRC, 1982; Tauson, 1988*). Protein levels were high and equal in all diets and did not limit growth of kits or lactation rate of dams.

As a result of arson at the Experimental Fur Farm (apparently committed by "animal rights activists"), part of the data being gathered were destroyed including all individual mink identification cards, partially incomplete 3 week weight data and feed consumption data. Normal procedures on the Experimental Fur Farm were interrupted, which caused difficulties in the normal animal care and may have affected results of this experiment. Due to variation in litter sizes between treatments, only litters of 5 and 6 kits were used. Weights of kits and dams are shown in table 2.

Table 2. Mean weights (g) of dams and kits fed different energy sources[1].

	Cereal	Corn Syrup	p-value
Dam weights:			
at parturition	1281	1208	0.189
at 6 weeks of age	998	1054	0.421
Change	-228	-154	0.059
Kit weights:			
at birth	11.2	11.2	0.437
at 6 weeks of age	322	325	0.341
at 8 weeks of age	588	582	0.276
	Lard	**Vegetable Oil**	**p-value**
Dam weights:			
at parturition	1291	1202	0.081
at 6 weeks of age	1048	998	0.480
Change	-243	-197	0.546
Kit weights:			
at birth	11.2	11.3	0.704
at 6 weeks of age	315	332	0.057
at 8 weeks of age	572[a]	598[b]	0.032

[1] Data are from 24 litters of sizes 5 or 6 (N=149). Litter size significantly affected the results and was considered when data were analyzed. Variances were within normal range and were not different between treatments.

[2] Kit weight is a mean weight of female and male kits.

No major differences in weights between treatment groups or statistically significant interactions between treatments were found when mink performances were analyzed. However, the vegetable oil treatment tended to increase 6 week weight of kits (p=0.057) and significantly increased 8 week weights (p=0.032). A positive effect (p=0.059) of the corn syrup treatment was shown when data regarding weight losses of dams during the first 6 weeks after parturition were analyzed.

Mean birth weights (within 24 h) of male and female kits were 11.6 and 10.4 g, respectively. In addition to the influence of sex, weight of kits was also inversely correlated with litter size. Kits in large litters were smaller at birth and did not attain the weights of kits from smaller litters by 8 weeks of age but the difference in mean weights was small. When kit weight data were analyzed using regression analysis, it was found that at 6 and 8 weeks of age, the kit's live weight decreased 17 and 19 g (5 and 3 %), when litter size increased by one kit.

Discussion

This experiment suggests that vegetable oils are beneficial in improving early growth of mink kits, which agrees with Rouvinen (1989). Although the dam's milk as a sole source of nutrients is only essential until 24 days of age (*Rochman, 1969*), the growth of kits continues to be affected to some extent by the dam's milk production during the last 3 weeks of the usual preweaning period. The dam digests animal fats better than the kits do, and the difference between digestibilities of rendered lard and vegetable oil is not remarkable.

Weight loss of dams during the first 6 weeks after parturition was not affected by including vegetable oil in the diet. This is not surprising, because energy densities in all of the diets were high. There were minor differences in energy densities of the experimental feeds (range 17.5-18.6 MJ/kg DM). Within this narrow range of energy densities, the dam's milk production did not increase further when the metabolizable energy density of the diet reached a certain level (17.5 MJ/kg DM in this study). At this point, possibly the dam's genetic ability for milk production was reached, or some other factor in the feed became the lactation-limiting factor.

Corn syrup in the diet seemed to help maintain body weights of dams. Smaller (p=0.59) weight losses by the corn syrup-fed dams suggests that corn syrup supported these mink in milk synthesis to the extent that body energy reserves, possibly already those in muscle tissues, were saved.

Because weight loss precedes nursing sickness, anything that lowers or prevents this weight loss is beneficial and may prevent the female mink from becoming affected by this problem, which in clinical stage is difficult to cure and usually leads to death (*Jørgensen, 1985*). In attempts to prevent nursing sickness, energy from fat has usually been used to maintain the lactating dam's energy balance (*Brandt, 1988*). Although high quality syrups are more expensive than conventional crude sugar products (sugar cane and sugar beet molasses), the possible reduction in mortality of dams suggests that their use could be economical for a short period of time during the last part of lactation.

Loose feces occurred in all groups to some extent, but feeding corn syrup did not worsen the situation. It seems that corn syrup and perhaps also similar purified carbohydrate products have no detrimental effects in mink if fed during a part of, or throughout lactation.

Conclusions

This experiment demonstrated that feeding vegetable oils, a mixture of soybean, corn and Canola oils, improved early growth of mink. This advantage would probably be greater in diets based mainly on saturated fat (beef or sheep by-products) than in diets where the fat comes mainly from fish and chicken by-products. If the energy density of the diet meets requirements set for the lactation period, vegetable oils apparantly do not have any effect on the dam's condition. Due to high levels of essential fatty acids, these oils are valuable feedstuffs.

Light, food grade corn syrup tended to decrease weight losses of dams which is important in protecting them against nursing sickness. Levels up to 3% (equals about 4% molasses in sugar content) as in this experiment, could be used without noticeable negative side effects. If obtained at a wholesale price, corn syrup may be effectively used during the last 3 weeks of lactation.

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FERMENTATION OF ANIMAL BY-PRODUCTS

Microbiological aspects of processing, epidemiology and animal nutrition

Bert Urlings

DVM Bert Urlings
Faculty of Vet.
Medicine
Dep. of Science of
Food of Animal Origin
P.O. Box 80.175
NL-3508 TD Utrecht
The Netherlands

New doctor in the family.

We congratulate H.A.P. Urlings with the fine work and the new title

Summary

This thesis reports microbiological aspects of processing, epidemiology, and animal nutrition of slaughter by-products. Increasing volumes of slaughter by-products are produced at a decreasing number of locations as a result of centralisation and intensification of slaughtering. To avoid the dispersion of pathogens and to preserve the nutritional properties of slaughter by-products, processing at source is the most preferable method of valorization. Fermentation of slaughter by-products is seen as a method of processing whch could be applied at the slaughterhouse itself. It is speculated that in this way the high nutritional value of slaughter by-products could be preserved effectively, without using excessive heat, to produce high quality feedstuffs. This thesis deals mainly with scientific aspects of importance within the philosophy of an integrated quality assurance approach to the processing of slaughter by-products by means of fermentation.

In chapter two the main research objectives are formulated. Processed animal by-products need to be free of pathogenic microorganisms, any dispersion of pathogens into the environment must be prevented, and the biochemical safety of processed slaughter by-products is paramount. Toxic breakdown products, such as biogenic amines and ammonia, need to be avoided, while the high nutritive value of this product must be preserved. The application of high temperatures as a preservative treatment destroys the availability of important amino acids and consumes a lot of energy. Thus fermentation was seen as the most promising treatment of slaughterhouse by-products for the future, and different aspects of the fermentation of raw and pasteurized slaughter by-products are discussed. In chapter four and seven feeding trials with fermented poultry by-products are reported.

In chapter three the effect of fermentation of raw poultry by-products was studied. When these by-products were ground and mixed with sufficient carbohydrates and inoculated with starter culture, the pH dropped to between 4.5 and 4.0. The numbers of colony forming units of Enterobacteriaceae were reduced. Unfortunately, the breakdown of amino acids could not be reduced to an acceptable level. Different technological measures were tested to try to improve the preservation of these raw poultry by-products. Initial acidification with 0.4% lactic acid, a high inoculation level of 10^{9} colony forming units *Lactobacillus plantarum* per gram, combinations of starter cultures (*L. plantarum* and *Enterococcus faecium*) and (or) addition of high levels of dextrose prior to the fermentation, did not improve the stability of amino acids in the

poultry by-products. Breakdown of amino acids by means of decarboxylation and deamination could bot be stopped by fermentation of raw poultry by-products only. For this reason the applicability of fermentation as the only preservation to raw slaughter by-products was doubted.

The effect of feeding fermented animal by-products to mink was studied in chapter four. Mink is seen as a species that has a high demand for high quality protein and is therefore a useful model for this type of research. A ration containing 64% fermented raw poultry by-products resulted in a significantly decreased weight gain in young mink. When mink were fed a 100% fermented ration they totally failed to reproduce and the mortality rate of the females increased. It is still unclear whether this is a result of the high level of amino acid breakdown products, and (or) of a reduced palatibility of the diet because of the high acid content.

A promising effect observed in mink fed a fermented diet was the drastic change in the gut flora. The prevalence of salmonella in 1 gram of mink feces in the control groups decreased from 20% in old females and 50% in kittens to zero in the test group. In addition the number of colony forming units of Enterobacteriaceae decreased significantly. Since mink is a simple monogastric animal, these beneficial effects to the gut flora could probably also be achieved in other monogastric species, e.g. pigs.

In chapter five the initial amino acid breakdown in samples of individually minced slaughter-fresh poultry viscera, heads and breast meat was studied as a model. These raw materials were 1) untreated, 2)γ-irradiated (15kGy), 3) heated for 2 min. at 80°C, and 4) γ-irradiated (15 kGy) and subsequently heated for 2 min. at 80°C. Samples were stored for 10 d at 20°C. Non-protein-nitrogen (NPN) levels only increased in the viscera during heating, as a result of high initial proteolytic activity. Initial amino acid breakdown in viscera was also observed even when bacterial proliferation was excluded by γ-irradiation. This resulted in high levels of TVN (total volatile nitrogen) and cadaverine (a breakdown product). Not only bacterial proliferation, but also initial enzymatic breakdown of amino acids has to be prevented. A mild heating prior to additional preservation was suggested in order to denaturate amino acid deaminating and (or) decarboxylating enzymes.

In chapter six experiments to inactivate chicken anemia virus (CAV) are discribed. CAV was choosen as a model for decontamination of viremic animal tissue, because of its properties; a small, circular single-stranded DNA without an envelope. CAV is more resistant to heating than other pathogenic viruses, such as swine fever virus, African swine fever virus, Aujeszky disease virus and foot and mouth disease virus and was inactivated after heating for 30 min. at 95°C, or 10 min. at 100°C core temperature. Fermentation for seven days did not inactivate CAV. It is concluded that during preservation of a nimal by-products a moderate heating could be an efficacious part of the process to reduce the risk of transmission of viremic disease.

In chapter seven the effect of feeding of pasteurized and fermented poultry by-products to fattening pigs was studied. Poultry by-products were heated for 4 min. at 90°C and fermented with *Lactobacillus plantarum*. This feedstuff was used as 18% of the dry matter of the fattening pigs diets. Production results showed that the pigs fed the fermented diet had improved significantly. It is not clear whether these better results are caused by the increased energy content in the feed, the increased digestibility of protein as a result of the applied preservation prcess, or the lower incidence of diarrhea. A significant change in the gut flora of pigs fed the fermented diet was observed. In the rectal content the bacterial counts of the mesophilic aerobic flora, the Enterobacteriaceae and the lactobacili were one logarithmic unit lower and the prevalence of salmonella was lower in the group of pigs fed fermented diets compared with the control pigs. The number of colony forming units of *Campylobacter jejuni/coli* were not different between both groups. It is speculated that the inhibited proliferation of e.g. Enterobacteriaceae in the gut could be benificial to both animal and human health by decreasing the contamination level of pathogenic bacteria belonging to this family, such as salmonella and *Escherichia coli*.

It is concluded that a mild pasteurization followed by fermentation of slaughter by-products could serve as an effective method of preserving slaughter by-products. The advantages of these preservation techniques compared with traditio

nal rendering processes are: 1) the nutritive value of the processed slaughter by-products is improved; 2) energy consumption of processing is reduced; 3) when processing at source, product differentation can be more easily achieved; 4) risks of dispersion of pathogens in the environment are reduced when processing at source, and 5) additional advantages in regulation of the gut flora of animals fed with fermented animal by-products could be achieved. This could result in an interruption of important pathogenic bacterial cycles, such as those of salmonella and *Escherichia coli* and should therefore be beneficial in preventive human and veterinary medicine.

Considering biological arguments pasteurization of animal by-products followed by fermentation should be seen as a promising alternative for processing of animal by-products at slaughterhouse level. More information about the economic basis of this method of valorization needs to be gathered before it can be applied in practice.

In ENGL, Su. DUTH. 135 pages, 58 refs. Author's summary.

The thesis is based on the following publications: chapter 2 (Slaughter by-products:problems, preliminary research and possible solutions); 3 (Fermentation of raw poultry by-products); 4 (Feeding mink fermented poultry by-products); 5 (Amino acid breakdown in poultry by-products); 6 (Inactivation of chicken anemia virus in chickens by heating and fermentation); and 7 (Feeding pigs pasteurized and fermented poultry by-products). Summary of chapter 2-6 are abstracted in this issue of SCIENTIFUR.

Chapter 2: **Slaughter by-products: problems, preliminary research and possible solutions**

H.A.P. Urlings, J.G. van Logtestijn, P.G.H. Bijker

The collection, storage, disposal and processing of slaughterhouse by-products is an important part of veterinary care in regions with intensive animal husbandry and meat production. Transmission of diseases and environmental pollution through an improper and(or) incorrect handling of slaughterhouse by-products needs to be prevented. The use of animal by-products as feedstuff could be of economical benefit to slaughterhouses and could add nutritive value to animal feed. As a result of the centralisation and intensification of slaughtering, the amount of slaughter by-products produced at a single location is increasing. Until now, hardly any attention, in practice or in research, has ben paid to the collection and disposal of these by-products. There are important socio-economic reasons to increase scientific knowledge of the handling of slaughter by-products. Several animal by-products were contaminated with salmonella. We also showed that rapid breakdown of amino acids in poultry by-products occurs during storage at 20°C. It is concluded that as far as safety, environmental care and nutritive value of animal by-products is concerned collection, storage, disposal and processing is necessary. Measures at source, the slaughterline, and some technologies are suggested for future use.

2 tables, 48 refs. Authors' abstract.

Chapter 3: **Fermentation of raw poultry by-products for animal nutrition**

H.A.P. Urlings, P.G.H. Bijker, J.G. van Logtestijn

Fermentation of raw, inedible poultry by-products mixed with beet-pulp and dextrose and inoculated with *Lactobacillus plantarum* and(or) *Enteroccocus faecium* resulted in a drop in pH in the by-products to approximately 4.0 to 4.5 within 48 h. To keep the fermented product stable for a period of 21 d, the addition of at least 3% (wt/wt) of a fermentable carbohydrate was necessary. With a high inoculation level of approximately 10^8 to 10^9 *L. plantarum* per gram, or with acidification of the initial mixture with .4% lactic acid, the number of Enterobacteriaceae decreased faster than with inoculation at 10^6 *L. plantarum* per gram, or without initial acidification. After 21 d of fermentation, a high level of enzymatic breakdown of proteins and amino acids was observed: the nonprotein nitrogen level increased from 5 to between 15 and 40% of total nitrogen and the volatile nitrogen level increased from 1 to between 3 and 11% of total nitrogen. An increase in histamine, cadaverine and putrescine was also observed. Despite the technological measures taken, such as the application of a high inoculum of starter culture and initial acidification with .4% lactic acid, this amino acid breakdown could not be reduced to an acceptable level. These results suggest that,

due to the biochemical deterioration, fermentation alone is not a useful method of valorization of raw poultry by-products.

7 tables, 51 refs. Authors' abstract.

Chapter 4: **The feeding of raw fermented poultry by-products: using mink as a model**

H.A.P. Urlings, G. de Jonge, P.G.H. Bijker, J.G. van Logtestijn

The safety of fermentation as a method of preservation of raw animal by-products used for animal nutrition was tested. Two feeding trials with mink, as a model for nonogastric animals, were carried out. In the first trial mink were given a fermented diet composed of raw poultry and fish by-products, and made up with cereals, glucose, lactic acid, premix, and starter culture (*Lactobacillus plantarum* and *Enterococcus feacium*). These mink failed to deliver kits and 7 of the 30 females in the test group died. At autopsy no specific cause of death could be diagnosed, although all the dead mink showed symptoms of cachexia. In a second trial, a group of mink kits, during the growth period, was given a diet composed of fermented poultry by-products, just before feeding mixed with raw fish. The weight gain of the mink in the test group decreased statistically compared with the control group, mainly for the male members of the group. In November, during pelt priming, some mink showed symptoms of severe weight loss.
It is suggested that the measured increase of amino acid breakdown, and(or) the acidic pH of the fermented diet caused these unfavorable results.

To examine the effect of the fermented diet on the gut flora, fecal samples were analyzed. The fermented diet changed the composition of the gut flora significantly. In the group that received the fermented diet the number of lactobacili and the mesophilic aerobic count increased and the number of Enterobacteriaceae and enterococci decreased compared with the control group. In addition the prevalence of salmonella decreased in the groups of mink fed the fermented diet. It is speculated that these beneficial effects on the gut flora could probably also be achieved in other monogastric animals.

5 tables, 30 refs. Authors' abstract.

Chapter 5: **Amino acid breakdown in poultry by-products**

H.A.P. Urlings, N.G. Fransen, P.G.H. Bijker, J.G. van Logtestijn

As a result of intensification and centralization of poultry slaughtering, the amount of slaughter by-products produced at a single location is increasing. These by-products are rich in protein, fat, and vitamins and, therefore, constitute a potentially useful raw material for feed production. To maintain the nutritive value of these by-products it is important to process them effectively. In this paper the initial amino acid breakdown in slaughter-fresh poultry viscera, heads and breast meat is studied as a model. Initial amino acid breakdown in viscera was observed (also when bacterial growth was excluded by γ-irradiation), which resulted in high levels of total volatile nitrogen and cadaverine. Putrescine was only produced in viscera after bacterial proliferation. In heads and breast meat no production of metabolites of amino acid degradation was observed as a result of initial enzymatic activity. It is concluded that during valorization of poultry by-products not only bacterial proliferation, but also enzymatic breakdown of amino acids, has to be prevented.

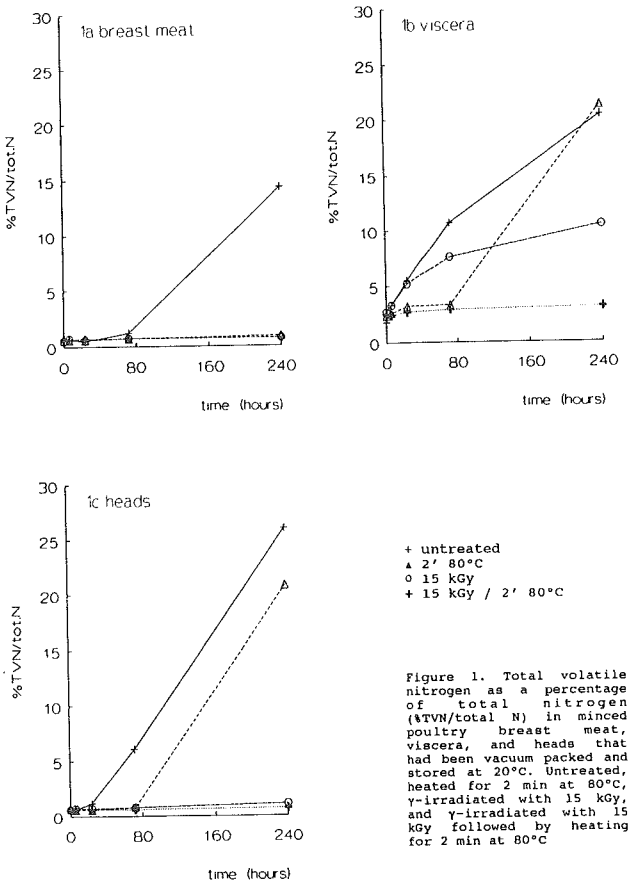

Figure 1. Total volatile nitrogen as a percentage of total nitrogen (%TVN/total N) in minced poultry breast meat, viscera, and heads that had been vacuum packed and stored at 20°C. Untreated, heated for 2 min at 80°C, γ-irradiated with 15 kGy, and γ-irradiated with 15 kGy followed by heating for 2 min at 80°C

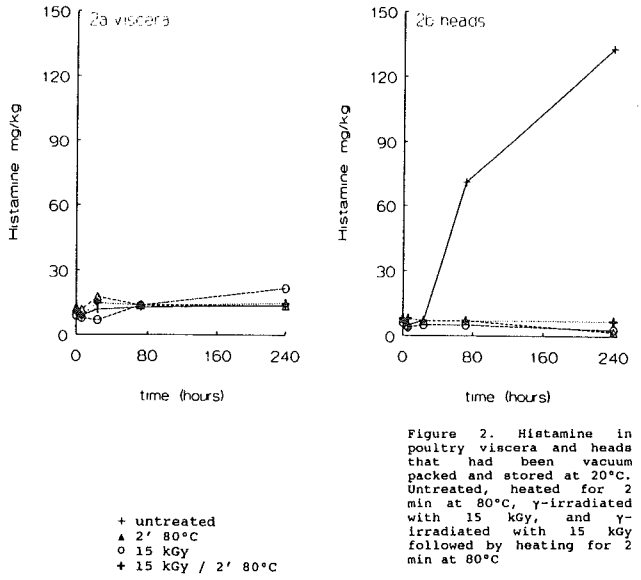

Figure 2. Histamine in poultry viscera and heads that had been vacuum packed and stored at 20°C. Untreated, heated for 2 min at 80°C, γ-irradiated with 15 kGy, and γ-irradiated with 15 kGy followed by heating for 2 min at 80°C

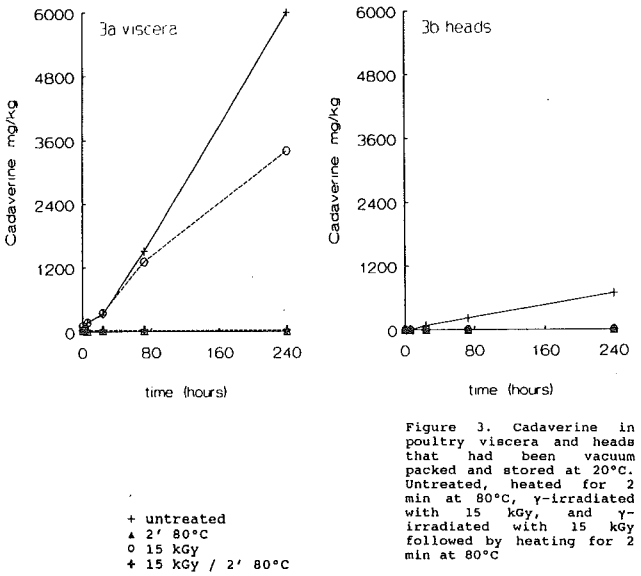

Figure 3. Cadaverine in poultry viscera and heads that had been vacuum packed and stored at 20°C. Untreated, heated for 2 min at 80°C, γ-irradiated with 15 kGy, and γ-irradiated with 15 kGy followed by heating for 2 min at 80°C

2 tables, 4 figs., 32 refs. Authors' abstract.

Chapter 6: Inactivation of chicken anemia virus in chickens by heating and fermentation

H.A.P. Urlings, G.F. de Boer, D.J. van Roozalaar, G. Koch

Transmission of pathogenic microorganisms such as viruses by the use of animal products in animal feeding constitutes a potential risk for the health of livestock. To reduce the risk it is necessary to understand the survival of viruses during processing of animal products to feedstuffs. Since chicken anemia virus (CAV) was found to be very resistant to inactivation, it was studied as a model for inactivation of pathogenic viruses during treatment of animal products. It is concluded that fermentation of CAV viremic tissue did not affect the inactivation of CAV, however, heating at a core temperature of 95°C for 30 min. or 100°C for 10 min. is sufficient to inactivate CAV. Compared with conditions of inactivation reported in literature for other pathogenic viruses, our figures are more stringent. This indicates that CAV viremic chickens are suitable as a model to test heat inactivation of pathogenic viruses.

3 tables, 30 refs. Authors' abstract.

Studies on feeding breeding fitches diets varying in protein and energy levels

Boguslaw Barabasz

Dr. Boguskaw Barabasz
University of Agricultural
Dept. of Fur Animal Breeding
30-059 Kraków
AL. Mickiewicza 24/28
Poland

New Doctor in the family

We congratulate Dr. Boguslaw Barabasz with the title and wish him all the best in the future

Summary

This study aimed at determining a degree of protein utilization by the fitch and at finding its optimal level in diets for these animals during various breeding periods. Attempts were also made to determine an optimal level for M.E. in the feed.

Experiments were carried out on the fur animal farm of the Institute of Animal Production at Chorzelow in the years 1986-1989. Stage I experiments included analysis of the levels of some physiological indices in experimental animals fed diets at three different protein levels. The following parameters were estimated:

1) Nitrogen balance and retention in pregnant fitch females at 1-4, 10-14, 25-28 and 38-41 days of pregnancy, fed diets with the following levels of protein: 13, 15.5 and 18 g per 1 MJ of M.E.

2) Nitrogen balance and retention in young fitches at 50, 80, 110 and 140 days, fed diets containing 14, 16.5 and 19 g of protein/1 MJ of M.E.

3) Digestibility coefficients of protein, fat and carbohydrates in young fitches during the growth period.

4) Level of crude protein and activities of transaminases ALAT and AspAt in the blood serum.

5) Activity of proteolytic enzymes in the stomach, pancreas and small intestine in young fitches at 25, 35, 90, 150 and 210 days.

Stage II experiments were performed under production conditions, on a greater number of animals (annually ca. 120 females and 50 males of foundation stock as well as 200-280 young fitches). Throughout all breeding periods during one year, studies were conducted on practical feeding of the fitches with diets at various levels of protein and energy. The results obtained indicate that the fitch is able to utilize protein from the feed to a relatively high degree, which is confirmed by their nitrogen retention, protein digestibility and also by the potential activities of proteolytic enzymes in their digestive tract. Based on the performed studies, the following requirements of fitches for feed protein and energy were determined:

Breeding period	g of protein/1 MJ	MJ of M.E./100 g
01. pre-reproduction and reproduction	17-18	0.60-0.7
02. lactation and early growth	18-19	0.55-0.6
03. fast growth of young fitches	19-20	0.55-0.6
04. formation of winter fur coat	15-16.5	0.60-0.7

Rozprawa habilitacyjna Nr 164, pp 75. ISSN 0239-8117. In POLH, Su. ENGL. 18 tables, 99 refs. Author's summary.

Effect of evening primrose oil as a feed supplement on reproduction in the mink

Anne-Helene Tauson, Maria Neil, Mats Forsberg

The effects of addition of evening primrose oil (EPO) to a mink diet in the breeding season on the reproductive performance and kit and female performance during the lactation period were investigated in an experiment with 4 groups of male and female mink. Matings were carried out so that control males were mated to both control and supplemented females. Similarly, supplemented males mated both control and supplemented females. Reproductive results were evaluated both on a group basis and as an effect of male or female treatment, respectively. After males supplemented with EPO, there was a tendency for a reduced rate of stillborn kits and kit losses during the first 21 days of life. These effects could not be explained physiologically. Female treatment did not affect reproductive performance, but there was a tendency for lower weight losses during lactation for EPO-supplemented females. Kit performance during the lactation period was independent of experimental treatment.

Acta vet. scand. vol. 32, no. 3, 337-344, 1991. 5 tables, 29 refs. Authors' summary.

Accumulation of dietary fish fatty acids in the body fat reserves of some carnivorous fur-bearing animals

Kirsti Rouvinen, Jaakko Mäkelä, Tuomo Kiiskinen, Seppo Nummela

Body fat composition of the mink (*Mustela vison*), polecat (*Mustela putorius*), and the raccoon dog (*Nyctereutes procyonoides*) was studied. The animals were fed a wet diet, supplemented with 5% lard (LA) or fish oil (FO) for 5-6 months. At pelting, five animals per dietary group were sampled. Dietary levels of cetoleic (C22:1ω11), eicosapentaenoic (EPA, C20:5ω3), and docosahexaenoic (DHA, C22:6ω3) acids were 0.4, 0.3, and 0.5% in the fat of the LA diet, and 7.6, 4.2 and 4.3% in the FO diet, respectively. In the FO diet, EPA and DHA accumulated especially in the liver and heart, while cetoleic acid showed the highest affinity to the heart muscle and subcutaneous fat. The highest levels of EPA were found in raccoon dogs and polecats fed the FO diet. The mean EPA levels ranged from 6.7-9.3% in the liver fat and 7.2-8.0% in the heart muscle fat. In the mink, the corresponding values were 2.7% and 3.9%, respectively. DHA levels were the highest in the liver fat of the polecats, being 18.5% in the FO diet. In addition, the liver in raccoon dogs fed the FO diet (13.8%) differed significantly from the mink (9.4%). The differences in the accumulation of these long-chained marine fatty acids were apparently caused by species differences in the efficiency of their peroxisomal β-oxidation.

Agric. Sci. Finl. 1, 483-489, 1992. 4 tables, 21 refs. Authors' summary.

Short term effects of different water contents in feed on blue fox (*Alopex lagopus*) and silver fox (*Vulpes vulpes*)

Kjetil Aarstrand

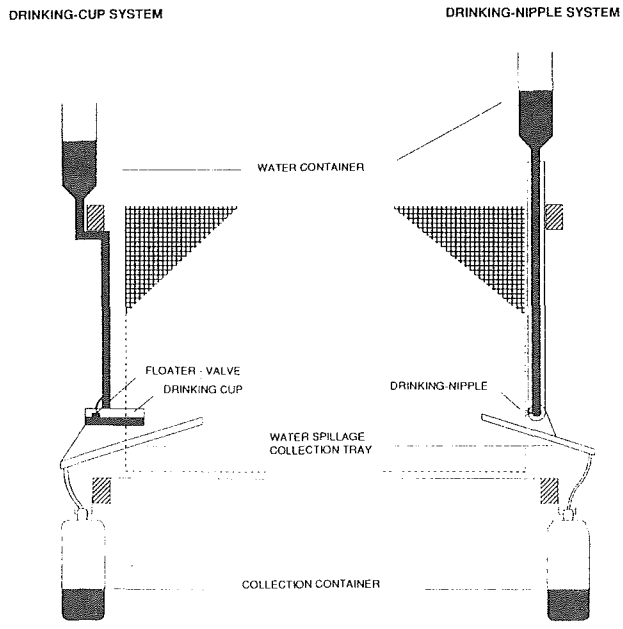

Fig. 2. Drinking water- and collection systems used in the experiment

Twelve blue fox vixens and twelve silver fox vixens, both species supplied with two different watering systems, were given a pelleted commercial feed, either dry containing 94% dry matter (DM) or soaked, containing 45% DM. Total water intake was 3.0 g/g DM for silver fox and 4.0 g/g DM for blue fox. The difference between species was significant. The lower wa-

ter content in the dry diet was fully compensated by a higher intake of drinking water in both species. Apparent protein digestibility and DM digestibility was 79 and 80% respectively for blue fox and 85 and 87% for silver fox. The difference between species was significant. There was no effect of water content in the diet. Water spillage from the drinking nipple system was significantly higher than that from the open drinking cup system. The volume of water spillage was 80% higher than the urine volume. The content of N, P and K in the manure DM was 13.6%, 2.5% and 2.3% for blue foxes and 18.2%, 3.1% and 2.9% for silver foxes. Differences between species were significant.

Norwegian Journal of Agricultural Sciences 6: 419-433. ISSN 0801-5341. 7 tables, 2 figs., 26 refs. Author's summary.

Efficacy of hydrated sodium calcium aluminosilicate in reducing the toxicity of dietary zearalenone to mink

S.J. Bursian, R.J. Aulerich, J.K. Cameron, N.K. Ames, B.a. Steficek

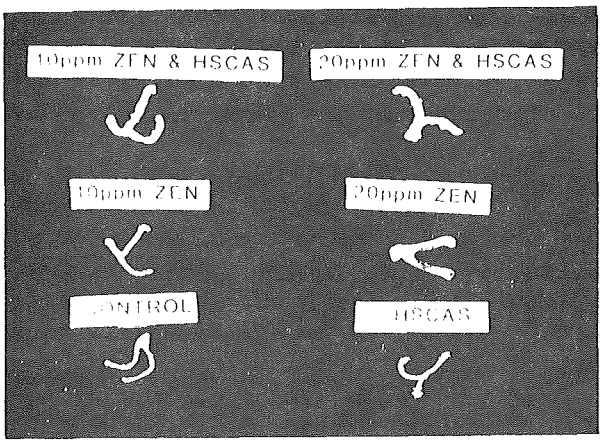

Fig. 1. Uteri from ovariectomized mink fed 0 (control), 10 or 20 ppm ZEN or 0.5% HSCAS alone or in combination with 10 and 20 ppm ZEN.

Ovariectomized mink were fed diets containing zearalenone (ZEN) at concentrations of 0, 10 or 20 ppm with or without 0.5% hydrated sodium calcium aluminosilicate (HSCAS) for 24 days. Zearalenone at 10 and 20 ppm caused a significant increase in uterine weights, while 20 ppm ZEN resulted in significantly higher vulva swelling scores when compared to controls. The presence of HSCAS in the diet did not alter these hyperestrogenic effects of ZEN. In a second experiment, female mink were provided diets containing 20 ppm ZEN, 20 ppm ZEN plus 0.5% HSCAS or a control diet from 1 January 1989 through whelping (25 April to 15 May, 1989). The females were given an opportunity to mate with untreated proven breeder males beginning on 1 March (day 59 of exposure). ZEN did not have an effect on the number of females whelping but there was a significant increase in gestation length, a decrease in litter size and an increase in kit mortality from birth to 3 weeks of age when compared to the control group and the group receiving the combination of ZEN and HSCAS. These results suggest that HSCAS can alleviate some of the reproductive effects of ZEN which are not related to its estrogenic action.

Journal of Applied Toxicology, Vol. 12 (2), 85-90, 1992. 2 tables, 1 fig., 36 refs. Authors' summary.

Studies on the appropriate protein levels in the diet of growing and furring male blue foxes

Yin Qingqiang, Ma Zhenkai

Forty five young male blue foxes were randomly assigned to 5 groups, 9 for each. The feeding experiments were conducted in two periods - the growing and furring periods. In the first period, the crude protein contents were 26.36%, 31.24%, 36.33%, 41.41% and 46.16% by dry matter, respectively; but in the furring period, with a crude protein content varying from 28.73% to 50.26%. The experimental results showed that the best protein level was 31.24% in the growing period and 28.73% in the furring one. The re-

sults of digestive and metabolic trials indicated that crude protein levels do not affect the apparent protein digestibilities significantly thoughout the growing and furring periods, but affected the energy, dry matter digestibility, retention rate and biological value for nitrogen significantly.

Bulletin of Veterinary College of PLA (China), Vol. (4), 387-391, 1990. In CHIN, Su. ENGL. 3 tables, 11 refs. Authors' summary.

Studies on the appropriate protein and energy levels in the diets of growing and furring raccoon dogs

Han Jiju, Ma Zhenkai

Sixty three young male raccoon dogs were selected and randomly divided into 7 groups, 9 for each. Two periods (growing and furring periods) were included in the experiments. In groups 1, 2, 3 and 4, the crude protein levels in the diet were 31.54%, 36.39%, 40.37% and 43.53% and gross energy levels in groups 5, 6, 7 were 19,589.78 kJ/kg, 21,860.94 kJ/kg and 22,600.04 kJ/kg, respectively. The experimental results during the growing period showed that 36.39% was appropriate for getting the optimal body weight and length and economic profit. But it did not significantly affected the body weight and body length with crude protein levels varying from 31.54% to 43.53% during the furring period. It also indicated that the appropriate energy levls were 21,860.94 to 22,500.04 kJ/kg during the growing and furring periods, and that the optimal protein energy ratio was from 16.1 to 16.6 during the growing period and from 14.0 to 14.4 during the furring period.

Bulletin of Veterinary College of PLA (China), Vol. 10 (3), 289-293, 1990. In CHIN, Su. ENGL. 3 tables, 9 refs. Authors' abstract.

Feed consumption and feed transit time in northern river otters (*Lutra canadensis*)

Harry G. Davis, Richard J. Aulerich, Steven J. Bursian, James G. Sikarskie, John N. Stuht

The amount of feed consumed per day and the rate of food passage were measured in captive male northern river otters (*Lutra canadensis*). Daily feed consumption averaged 33.9 g dry matter/kg body weight. Using ferric oxide as a feed marker, the mean food transit time was determined to be 202 min.

Journal of Zoo and Wildlife Medicine 23 (2), 241-244, 1992. 1 table, 20 refs. Authors' abstract.

Evolutionary comparison of energy economy between Finnish and Japanese raccoon dogs

Hannu Korhonen, Jaakko Mononen, Mikko Harri

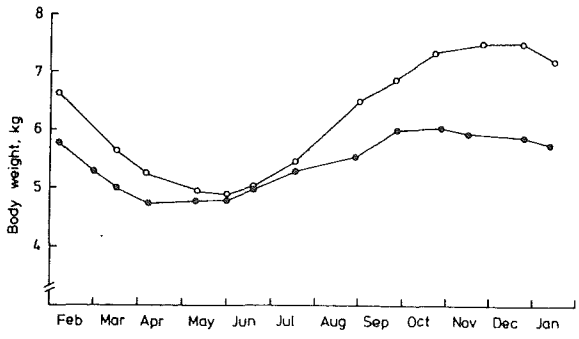

Fig. 1. Body weights of Finnish (open circles) and Japanese (closed circles) raccoon dogs during a year

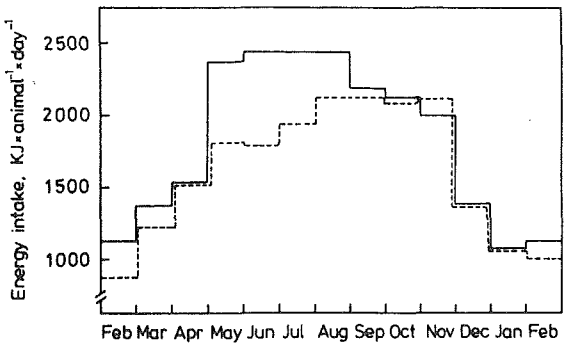

Fig. 2. Seasonal changes in energy intake between Finnish (solid line) and Japanese (broken line) raccoon dogs

1. The paper describes evolutionary differences in energetics between the raccoon dogs originating from islands (Japan) and mainlands (eastern Asia).
2. The Japanese raccoon dog is specialized to live in a temperate marine climate; it has a

stomach of small volume, thin fur coat with low insulation, specialized diet and a poor ability to alter its body energy reserves seasonally.
3. The raccoon dog living on the mainland is more generalized, and thus also well-adapted to survive the extreme climate of northern latitudes.
4. The results confirm the previous conclusions made from chromosomal analyses that the Japanese raccoon dog has evolved from the mainland form.

Comp. Biochem. Physiol., Vol. 100A, No. 2, pp. 293-295, 1991. 1 table, 2 figs., 20 refs. Authors' abstract.

The feeding value of the meat of nutria

N.Y. Medvedeva

The effect of heat treatment on the composition and nutritive value of nutria meat was studied. Loss of weight after boiling was 26% and after frying 28%. There were also losses in the amino acid content of 3.8 to 13.6 and 4.4 to 9.1% after boiling and frying, respectively. Losses were greatest for cysteine after boiling and for cystine and methionine after frying. Concentration of triglycerides fell by 14.0 and 13.1% after boiling and frying, those of phospholipids, increased by 70.0 and 58.2% of cholesterol 8.7 and 16.6, and of fatty acids 18.4 and 26.1%. There were also 43.5 and 53.6% losses in thiamin, 16.6 and 23.7% in niacin and 35.5 and 31.5% in riboflavin. In addition, there were large losses in potassium, calcium, magnesium, sodium, phosphorus, iron and ash. To preserve the food quality nutria meat should be prepared by boiling, steaming or stewing using electrophysical methods.

Krolikovodstvo i Zverovodstvo; no. 4, 10-11, 1989. In RUSS. 3 tables. CAB-abstract.

Spongy degeneration of white matter in silver foxes: genetic and clinical aspects

Gunnar Hagen, Inge Bjerkås

Spongy degeneration of white matter in silver foxes is a recently recognized neurologic disease, characterized by vacuolation of oligodendrocyte cytoplasm, vacuolation of myelin sheaths and demyelination. This paper reports on the genetic and clinical aspects of this disease. Thirty-six live silver fox cubs were born in controlled breeding studies and 18 cubs developed signs of spongy degeneration. The distribution of affected offspring is consistent with an autosomal recessive mode of transmission. Affected cubs developed normally until 9 to 15 weeks of age. The initial sign was pelvic limb weakness, which progressed to severe pelvic limb ataxia, hypermetria or severe paraparesis within 4 weeks of onset. Eight foxes were allowed to live beyond the period of maximal disability, and they showed marked clinical improvement after 5 to 6 months of age. Abnormalities were not detected in routine hematologic and serologic examinations. The underlying metabolic defect remains obscure.

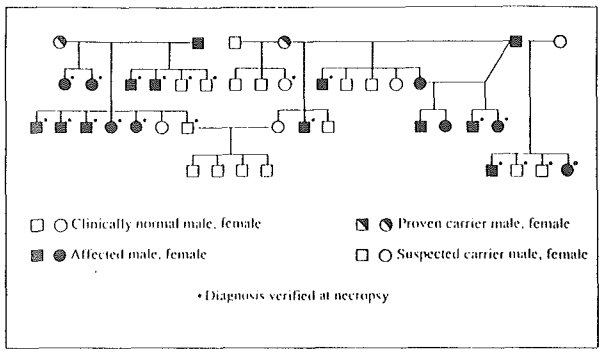

Fig. 1. Pedigree of the breeding study

Progress in Veterinary Neurology 2; 1, 15-20, 1991. 2 tables, 3 figs., 22 refs. Authors' summary.

Bacteriological aspect on perinatal mortality of mink

P.E. Martino, J.J. Martino, E. Brandetti, N.A. Menendez

The results of bacteriological examination samples from dead kits, are reported. The most frequent agents of the so-called Septicaemia, were *Staphylococcus aureus, Escherichia coli* and *Porteus spp.* The greatest percentage of isolates were found in the liver. Some considerations about contributory factors to perinatal mortality were also reported.

Acta Med. Vet. 36, 21-26, 1990. In ITAL, Su. ENGL. 1 table, 11 refs. Authors' abstract.

Pathomorphological study of experimental mink parvovirus enteritis

Chen Hua, Ni Ruxuan

Seven healthy mink were used, three as control, the others were inoculated orally with parvovirus from feces. The inoculated ones showed typical symptoms of mink parvovirus enteritis. The pathological changes were observed under an optical microscope, and the ultrastructural changes of the mucous membrane of the intestine were observed with scanning and transmission electron microscopy.

Bulletin of Veterinary College of PLA (China), vol. 10 (4), 363-367, 1990. In CHIN, Su. ENGL. 6 figs. Authors' abstract.

Sandwich ELISA for detecting antigen of coronaviral enteritis in mink

Liu Weuquan, Han Huimin, Yin Zhen

Sandwich ELISA was established for detecting coronaviral antigen in feces of mink. Viral antigen extracted from fecal samples of infected mink by PEG (MW6000) precipitation was used to immunize guinea pigs and the sera obtained were purified and further labelled with horseradish peroxidase. The specificity was demonstrated by block teats and the sensitivity ranged from 0.625 to 1.25 μgVp per mL. Results can be reported within 4 hours. The results showed that sandwich ELISA is a method of high sensitivity and specificity and may be used as a diagnostic method of coronaviral enteritis in mink.

Bulletin of Veterinary College of PLA (China), Vol. 10 (3), 229-233, 1990. In CHIN, Su. ENGL. 3 tables, 1 fig. Authors' abstract.

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Plasmacytosis (*Aleutian Disease*) infection in feral mink in Iceland

Karl Skirnisson, Eggert Gunnarsson, Sigridur Hjartatdottir

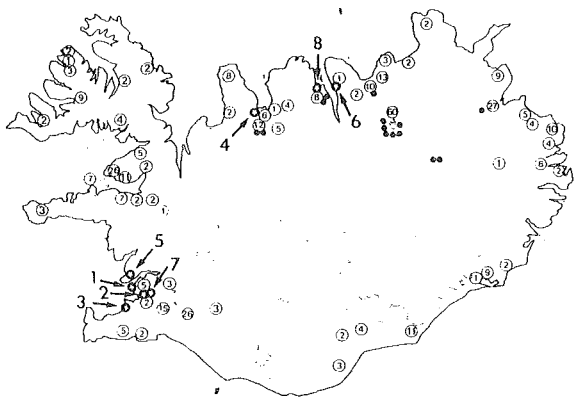


Fig. 1. Distribution of plasmacytosis in feral mink in Iceland in 1986 and 1987. Legends: capture site of seropositive mink, location of 8 mink farms operated in Iceland during the period from 1970-1980 (see table 1), total number of mink tested in each community

In an effort to eradicate feral mink in Iceland, all farming of mink was prohibited by law in 1951. The ban was lifted in 1969 and in 1970 mink were again imported from Norway for fur farming purposes. These later turned out to have been infected with the Aleutian Diseae (AD) virus. This contagious disease caused high economic losses on Icelandic mink farms until 1983 when the disease was eradicated by pelting all animals on farms operating with infected mink and re-stocking them with healthy animals. To investigate whether the virus had spread to the feral mink population in Iceland, blood samples from a total of 394 feral mink were tested for the presence of antibodies to the AD virus. A total of 14 seropositive feral mink were detected. (13 adults and one juvenile). All of these animals were captured in the north and the north-east of Iceland. It is suggested that Aleutian Disease virus spread to the feral mink population from infected farmed mink, which escaped from farms in North-Iceland sometime during the period 1970 to 1983.

Buvisindi Icel. Agr. Sci. 3, 113-122, 1990. In ISLA, Su. + subtitles in ENGL. 3 tables, 1 fig., 19 refs. Auhtors' summary.

Host-parasite relationship during toxascaridosis of arctic foxes

L.V. Anikieva, V.S. Anikanova, V.V. Ostashkova

The effect of host infection dose (10, 100, 1000 eggs) and developmental stages of helminths (larvae, adult nematodes) on the relationships in the system "*Toxascaris leonina - Alopex lagopus*" was studied experimentally. It has been established that 100 eggs are the threshold dose for helminths and 1000 eggs for the host. More distinct changes in the indices are characteristic of the parasite. Dynamics of host-parasite relationships in the development of the parasitic process correspond to helminth developmental stage. arvae of *T. leonina* are most pathogenic for the host.

Parazitologiya, 24;3, 225-231, 1990. In RUSS, Su. ENGL. 4 tables, 2 figs., 18 refs. Authors' summary.

What is your diagnosis?

L.M. Ryland

Osteoma of the parietal bone was diagnosed by radiography and PM examination in a ferret (6-7 years old) examined because of lethargy and progressive loss of right forelimb function.

Journal of the American Veterinary Medical Association, 197; 8, 1065-1966, 1990. CAB-abstract.

Parasitic diseases in nutria

Anonymous

In Yugoslavia, Demodex mites were introduced by a newly acquired female into a farm of 135 nutria (*Myocastor coypus*). Within one year, 90% of the stock was infested. Infestations were transmitted by contact between animals and by contact with water that contained infested hairs. Baths of 1% malathion 40EC in water every 10 days, and quarantine of new stock are recommended control measures. Also found on the nutria were Myocoptes myocastori, Pitrufquenia coypus and Listrophorus gibbus (*Leporacarus gibbus*). Baths of 4% Neguvon (trichlorfon) were used to control *L. gibbus*.

Krolikovodstvo i Zverovodstvo, No. 5, 20-21, 1989. In RUSS. CAB-abstract.

Distemper virus infections. Virological and immunological diagnosis and vaccination

Merete Blixenkrone-Møller

The properties of the canine distemper virus (CDV) particle and its taxonomic status are reviewed in the introduction together with the present knowledge of host range, transmission, pathogenesis, clinical symptoms, immunity and epizootiology of CDV infections.
The review on laboratory diagnosis of CDV infections is based on relevant literature and concentrate on specific virological and immunological diagnosis. The diagnostic aspects of CDV-IgM-antibody detection is discussed.
In the experimental section an indirect immunofluorescence (IF) technique for detection of intracellular CDV antigen in dog and mink is presented. Using this technique, the distribution of viral antigen in various tissues and blood mononuclear leukocytes was studied in mink, either vaccinated with an attenuated vaccine strain of CDV or experimentally infected with a virulent strain of CDV. Viral antigen was detected in cells of the lymphoid system in vaccinated mink. In mink inoculated with a virulent CDV strain viral antigen was not only detected in the cells of the lymphoid system but in a wide variety of tissues including epithelial cells of the skin, mucous membranes, lung, kidney, and cells of the CNS. The diagnostic importance of CDV antigen detection is discussed on the basis of these findings.
An IgM- and an Ig-ELISA technique for the detection of antibodies against CDV in dog and mink sera are presented. The ELISA techniques are compared to a virus neutralisation test conducted in Vero cell cultures. The diagnostic perspectives of CDV-IgM-antibody detection are discussed on the basis of the presented results.
The third part of the thesis accounts for a canine distemper outbreak that was recognized in a highly susceptible sled dog population of Northern Greenland in the beginning of January 1988. The actual canine distemper virus infection was identified by isolated of the virus and demonstration of viral antigens by immunofluorescence and also by demonstration of conventional inclusion bodies. Virus specific IgM-antibodies were demonstrated in affected dogs. In places where vaccination was carried out too late to be effective, the losses were up to 80 per cent. In a settlement, which was under rabies quarantine four weeks before the distemper outbreak started in other settlements, no cases occurred before or after vaccination. The spread of canine distemper seems connected with a Canadian outbreak and was most likely communicated by foxes. Suitable future prophylactic measures are discussed.
The final discussion and conclusion on vaccination against canine distemper and on virological and immunological diagnosis of CDV infections are based on the experimental results presented. The importance of virus isolation is illustrated in the present search for clues concerning the origin and spread of the distemper-like virus infections that caused extensive epizootics among seals in Northern Europe and in Lake Baikal in Siberia in 1987-1988.

In DANH, Su. ENGL. Monograph, Ph.D. thesis. 128 pages, many tables and figures, 182 refs. Author's summary.

Mink lymphocytes in vitro

Ruth Buemann Simesen

Chapter 1. In the introduction the history behind the discovery of the first lectins is reviewed. The reasons why, in the beginning, the lectins were considered to be non-specific cell agglutinins, as well as Nowel's discovery of the mitogenic properties of phytohemagglutinin, are accounted for.
Next is mentioned the capabilities of lectins to bind sugar molecules, which make it possible for them to stimulate cells. The differences and similarities between lectin cell stimulation and antigenic cell stimulation is described.
After that follows a thorough review of the three lectins, Concanavalin A, Phytohaemagglutin and Poke weed mitogen. The origins of the three lectins are described. Their chemical structures are given, their way of acting and on which cells they have a mitogenic effect is accounted for.

In the sections "materials and results", the practical performance of the in vitro test is described, including bleeding of mink, separation of cells, medium composition, cell pulsing with tritiated thymidin and reading of results.
In the "results" section the concentrations of the three lectins which give the strongest proliferation of cells, in both black and brown animals, are established. At the same time the relation between lectin concentration and the temporal stimulation optimum is examined.
In the Concanavalin A (Con A) system three different batches of foetal calf serum were tested.
It was examined whether addition of heterologous mink serum had any effect on stimulation.
The smallest number of cells upon which a lectin effect was recorded, was determined in microtiter plates with both flat and round bottoms.
In the discussion the results are compared with results obtained in other animal species.
It is concluded that the in vitro test is suitable to investigate immunological reactions in mink.

Chapter 2. In the introduction the discovery of Morgan, Ruscetti and Gallo concerning long term cultivation of T cells from bone marrow by addition of medium from lectin-stimulated lymphocytes is reviewed.
After that follows a description of the chemical structure of the IL 2 molecule. Some of the secondary functions of IL 2 are described. At the end of the introduction the IL 2 receptor is mentioned including its chemical structure.
In the section "materials and methods", the procedure for multiplication and long term cultivation of mink lymphocytes is described.
In the discussion an attempt is made to explain why most cells apparently stop responding to IL 2 after approx. 30 days.

Chapter 3. In the introduction the first outbreak of plasmacytosis is reveiwed. After that the Chediak-Higashi syndrome is accounted for.
The virus etiology of the disease is described, including size of virus, morphology and special requirements for replication.
Next the pathogenesis including ways of contagion, symptoms and cause of deaths are described. Treatment with cyclophosphamide and vaccination is briefly mentioned.
The effect of the Aleutian virus on the cellular immune system is described. The massive antibody production and the cellular changes are accounted for.
Some of the latest publications dealing with the different susceptibilities of mink to plasmacytosis are reported. It concerns measurements of interferon in different mink genotypes after stimulation with poly I, poly C and Newcastle disease virus and measurements of interferon production after inoculation with ADV.
At the end of the introduction a brief account is made of the new manifestation of ADV infection, which suddenly appeared in Denmark in 1982, i.e. the interstitial pneumonia in mink kittens.
The section "materials and methods" is, as is traditional, a cookbook for the experiments described in the chapter.
In the "results" section all results are illustrated with the help of figures. The experiments are divided in equal groups. Within the group the experiments can be compared directly. In the figures the histograms are always similar. Pr. day the succesion is: mitogen wells, control wells and virus wells.
At the start of the discussion the relevant literature is reviewed. It concerns three publications in which the authors report investigations on the capacity of cells from ADV infected animals to react to lectin and antigen stimulation.
After that the present results are presented, being summed up so to speak crosswise. This means that all Con A and field virus stimulations have been combiend. The same goes for all Con A and cell adapted trypsinised virus stimulations and so forth.
Based on the results two theories are advanced; 1. Field virus in combination with the mitogens Con A or Pha has a mitogenic effect. 2. The cell culture adapted virus has a CPM lowering effect.
In an attempt to discuss the results, based on published literature, the human and murine parallel of systemic lupus erythematosus is included. A thorough review of this disease is given, including symptoms, etiology, changes in the immune system, genetic aspects and the IL 2 complex of problems.
By combining knowledge from these three disease parallels it is attempted to explain what happens in the wells.

In DANH, Su. ENGL. Monograph, Ph.D. thesis, 104 pages, many figures and references. Author's summary.

Evolutionary-genetic and genetic-physiological aspects of fur animals domestication.

Inst. of Cytology & Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.

The actual compilation deals with a wide range of problems considered in the course of experiments in domestication of valuable fur animals, such as foxes and American mink. An integrated phenotype of domestic behaviour is analysed; correlated changes in the hormonal regulation are presented; possible practical value of selection vectors for behaviour is illustrated. For geneticists, evolutionist-morphologists, physiologists, practical animal breeders and biology students.

Editors-in-Chief: L.N. Trut, D.Sci., L.V. Osadchuk, PhD., P.M. Borodin, PhD.
Editorial board: A.A. Rodina, L.Ja. Neganova, A.A.. Onchukova, N.S. Glazkova.
Illustrated by E.O. Shestakova.

In Russ. Su. Engl. 248 pp. 4 chapters, 14 reports.

Once again on the evolutionary-genetic consequences of long-term selection of silver foxes (*Vulpes vulpes*) under domestication.

L.N. Trut

This article is a review of experimental results obtained in the course of long-term selection of silver foxes for domestic behaviour. Data are presented indicating that strict selection for tame behaviour not only produced a genetic reorganization of behaviour, but also gave rise to some phenotypic novelties and has destabilized the morphophysiological organization established by stabilizing selection. These experimental results served as a basis for Belyaev's concepts of destabilizing selection. According to this concept, the vector of selection for properties of behaviour may have great evolutionary potentials, since they are closely correlated with the ontogenetic regulatory mechanisms of higher level.

In RUSS, Su. ENGL. 3 figs, 36 refs.
Author's summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 5-21. Code 4-11-F.

Part 1. A correlated response of ethologic-physiological traits of silver foxes to selection

Maternal influences on duration of the sensitive period of primary socialization in silver foxes.

I.Z. Plyusnina

The physiological boundaries of the sensitive period of primary socialization were studied in offspring obtained from reciprocal crosses between domestic (tame) and aggressive foxes. In tame pups, irrespective of type of crossing, just like in those from homogeneous crosses between domestic parents, the duration of the socialization period was not limited by the age of 60 days. However, in tame offspring from crosses between aggressive females and domestic males, there was a significant decrease in motor activity characteristic of aggressive pups. In aggressive pups obtained from the same type of crossing,

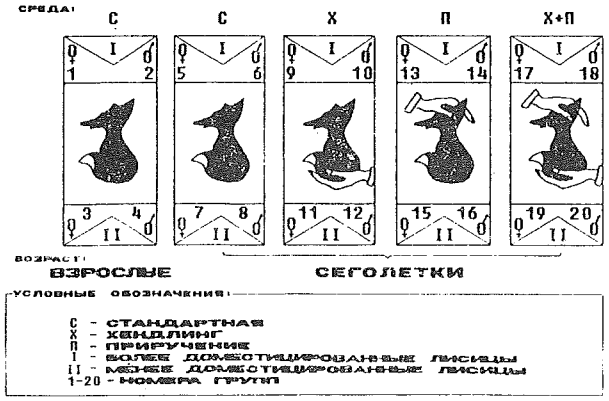
the sensitive period was limited by the age of 40 days, just like in offspring obtained from aggressive parents. In aggressive offspring of domestic females and aggressive males there was a significant decrease in motor activity only at the age of 50 days. The results obtained point to an interaction between the maternal effect and the offspring's genotype, and to a contribution of this interaction to formation of boundaries of the sensitive period of primary socialization.

In RUSS, Su. ENGL. 1 table, 4 figs., 12 refs. Author's summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 23-35. Code 11-F.

Changes in some behavioral traits of silver foxes (*Vulpes vulpes*) as a result of domestication and specific genotype-environment interactions.

L.L. Vasilyeva

Рис. 1. ЭКСПЕРИМЕНТАЛЬНЫЕ ГРУППЫ



Reliable differences were found between more and less domesticated animals (n=378) in the traits contactability, critical distance, and for traits detectable by open field test: number of defecations, number of crossed squares, number of earings, number of vocalizations, and the locomotion latency. Contacts with man in early ontogenesis, handling and/or further domestication improve the contribution of characters to domestic types of behaviour: contactability, critical distance and other indices of domestication (index of the level of domestication). The early influence of man (handling) has a greater effect on behaviour of females, whereas the later one, (taming) affects more the behaviour of males, irrespective of the degree of domestication. However, more domesticated females are more responsive to handling than less domesticated ones. On the whole, the effect of man on animals at the early stages of ontogenesis and that at later stages have the same direction.

In RUSS, Su. ENGL. 2 tables, 6 figs., 33 refs. Author's summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 36-56. Code 11-4-10-F.

The analysis of the effect of domestication in learning ability of silver foxes (*Vulpes vulpes*)

L.L. Vasilyeva

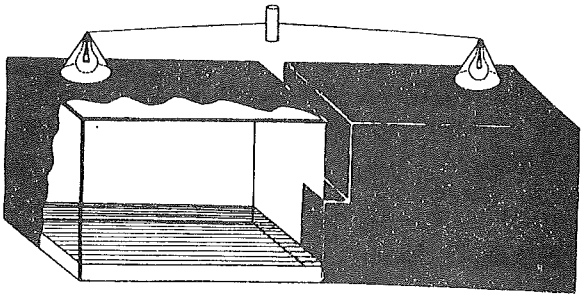


Рис. I. Челночная камера.
Используемая аппаратура: источник питания, [illegible], ламп, амперметр, регулирующее устройство.

Changes in learning ability which can occur under domestication were studied in silver foxes. It has been shown that more domesticated animals (yearling males and females) were more capable of learning in respect to sensitization, i.e. getting more accustomed to man, who is regarded as an environmental factor. Besides this, domesticated animals (two-year-old females) were more capable of forming the conditioned reflex of active avoidance (compared with nondomesticated two-year-old females) in a "shuttle" box.

In RUSS, Su. ENGL. 1 table, 2 figs., 24 refs. Author's summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 57-68. Code 4-11-F.

Part II. Effects of domestication of silver foxes on adaptive seasonal biological functions and hormonal mechanisms of their regulation

Peculiarities of the pineal structure and function in silver foxes. Its changes under domestication.

L.A. Kolesnikova

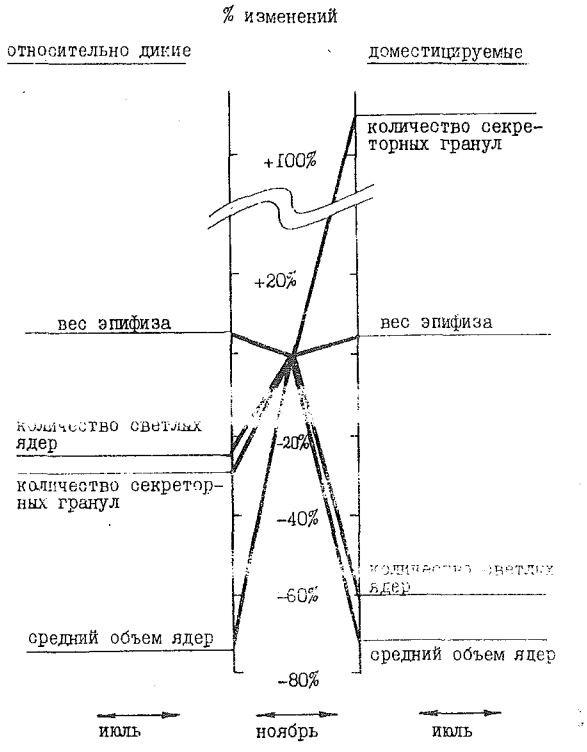


Рис. 3. Изменение показателей активности эпифиза относительно диких и доместицируемых самцов лисиц в период полового покоя в процентах от соответствующих показателей в начале подготовки к гону

Morphological and functional changes in the pineal gland of silver foxes which may occur during selection for domestic type of behaviour were analysed. The pineal gland which participates in the regulation of the sexual function, is involved in the reorganisation of strictly seasonal patterns of reproduction. It appeared that not only morphological and functional states of the pineal gland were changed in domesticated foxes (both males and females), but the dynamics of functioning as well, which depends on age, season and phase of the reproductive cycle.

In RUSS, Su. ENGL. 9 tables, 3 figs., 28 refs. Author's summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 70-96. Code 2-3-4-11-F.

Role of day rhythm photosensitivity in the dynamics of seasonal moulting and hair growth in silver foxes selected and unselected for domestic behaviour.

L.A. Prasolova

Studies were conducted over a year to examine the dynamics of seasonal molting, hair growth and maturation in silver foxes selected and unselected for tame behaviour and kept from 20 September until mating in January under different light conditions. Three experimental groups were kept at 9.5 hours of daylight (7 h. of natural and 2.5 h. of artificial light conditions), which were provided at different periods of the day - in the morning, in the evening and at night. Additional illumination at night was found to influence most favourably the initiation of molting and hair maturation. Very early initiation of molting (a month earlier, compared with the norm) and hair maturation was especially noticeable in domesticated females. Only in conditions of additional illumination at night some females experienced two molts which corresponded to two cycles of reproductive activity during one year. This may be connected with the existence of common mechanisms of hormonal regulation of reproduction and molting. It is supposed that in conditions of illumination at night the hormone of epiphysis, melatonin, plays an essential role in the change of dynamics of molting in tame foxes.

In RUSS, Su. ENGL. 1 table, 2 figs., 15 refs. Author's summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 97-109. Code 10-4-11-3-F.

The endocrine function of gonads and role of brain serotonin in estrous cycle of silver foxes.

L.V. Osadchuk, N.N. Voitenko

Sexual hormone level in blood, their secretion by ovaries, and serotonin content in the hypothalamus and midbrain during oestrus were simultaneously studied in the farm-bred population of silver foxes and in the population specially selected for domestic type of behaviour. Synch-

ronous fluctuation was observed in the levels of oestradiol in blood and serotonin in the hypothalamus of nondomesticated silver foxes with maximal increase in prooestrus. An increase in the progesterone level during oestrus was correlated with a decrease in the serotonin level in the hypothalamus. Behavioural selection sped up the synthesis of progesterone by the ovaries during oestrus, lengthened the late stage of prooestrus and changed the serotonin content during oestrus, compared with farm-bred (relatively wild) foxes.

In RUSS, Su. ENGL. 4 tables, 19 refs. Authors' summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 110-123. Code 3-4-5-11-F.

Peculiarities of the functional state of the pituitary-adrenal system during postnatal development of domesticated silver foxes.

I.N. Oskina

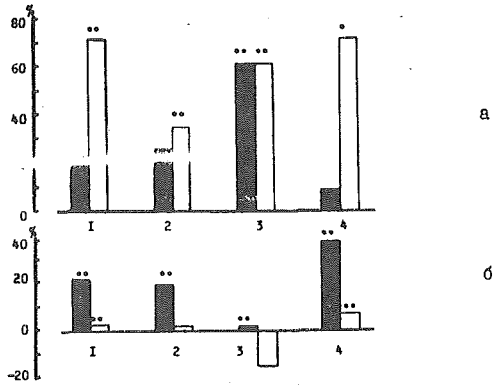


Рис. 7. Изменчивость продукции П - ОКС надпочечниками и балла поведения у лисиц: а - аддитивная варианса, б - варианса за счет среды, общей для помета
I - продукция II-ОКС при действии организменной стимуляции, 2 - базальная продукция II-ОКС, 3 - продукция II-ОКС при действии экзогенного АКТГ, 4 - балл поведения.
■ - недоместицируемые, □ - доместицируемые лисицы
* - P<0,05; ** - P<0,01

Studies have been made on the activity of the pituitary-adrenocortical system and the contribution of genetic and environmental components to phenotypic variation in the corticosteroid adrenal function of domesticated and undomesticated silver foxes at different stages of postnatal life. It was shown that selection of animals for domestic type of behaviour results in changes of postnatal development of this system. At the onset of puberty deep functional differences among selected and unselected animals were noted. Significant genotype-dependent variability was noted in undomesticated foxes only under stress stimulation conditions. This phenomenon manifests itself from the fourth month of life. In domesticated foxes, however, significant genotype-dependent variability was revealed under basal conditions already in the initial stages of postnatal life. Peculiarities of genetic variation in the adrenocortical function of foxes selected and unselected for domestication effect on behaviour are discussed.

In RUSS, Su. ENGL. 7 figs., 19 refs. Author's summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 124-141. Code 3-5-11-F.

Investigation of endocrine function of gonads and adrenals in silver foxes embryogenesis. The effects of domestication.

T.A. Schurkalova, L.V. Osadchuk

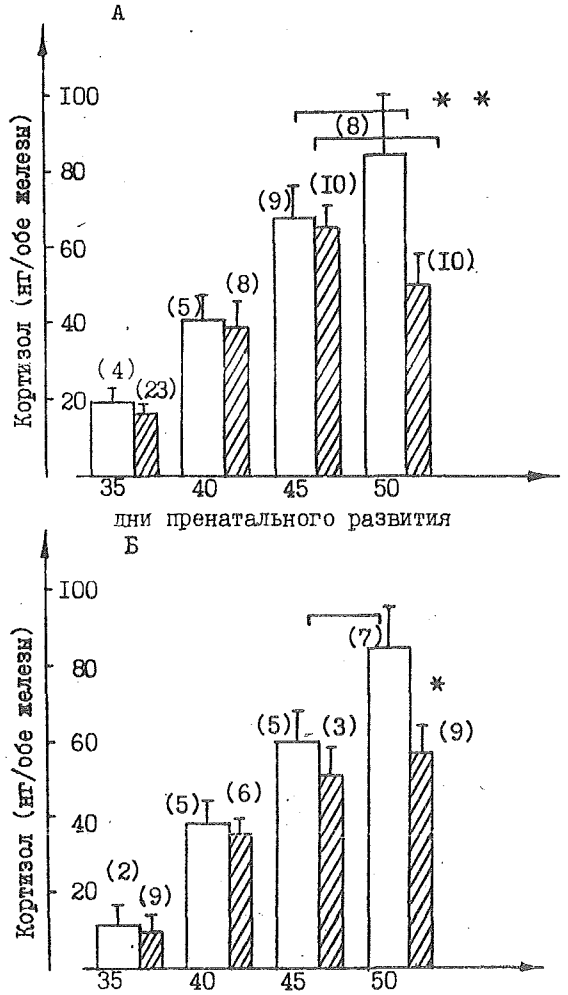


Рис. 3. Содержание кортизола в эмбриональных надпочечниках серебристо-черных лисиц в период пренатального развития.

The content of sexual steroid hormones (testosterone and progesterone) in homogenates of gonads and the content of cortisol in homogenates of adrenals were studied at different stages of embryogenesis of silver foxes with different behaviour. The content of testosterone in fetal gonads of domesticated animals did not differ from the control population. This shows that there are equal possibilities of steroid biosynthesis by fetal gonads in domestic and farm (relatively wild) animals. The content of cortisol in fetal adrenals was decreased at the end of the prenatal period in domesticated animals, compared with the control. Thus, differences in the glucocorticoid secretion by fetal adrenals in domesticated and undomesticated populations of silver foxes appear already in the prenatal life.

In RUSS, Su. ENGL. 3 figs., 32 refs. Authors' summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 142-154. Code 3-4-5-11-F.

Part III. Some aspects of phenogenetic analysis of some fur colour mutations in silver foxes arising during selection for behaviour

Hair morphology in "brown mottlings" mutation. Analysis of connection between its expression and expression of "star marking" mutation in a domesticated population of foxes.

L.A. Prasolova, L.N. Trut, E.V. Vsevolodov

The relationships between the phenogenetic expression of genetically conditioned changes of fur colour ("star marking" and "brown mottlings") which appeared during domestication of silver foxes has been analysed. The size of a "star" area in the group with yellowish brown mottlings was twice that in the group where brown mottlings were slightly lighter. The polychoric index of relationship among these two characters was +0.39, assuming that it is highly valid for x^2 criterion. The qualitative and quantitative analysis of brown mottlings showed that their pigmentation (both like standard silvery-black colour phase) are generally attributed to the pigment eumelanin. The relative content of eumelanin was found to be different in brown mottlings with different denseness of pigmentation. The lowest content of eumelanin was observed in hairs from bright and yellowish brown mottlings. In hairs from brown mottlings granules appeared to be loosely arranged throughout their length and normally pigmented parts alternated with poorly pigmented ones both in the cortex and in the medulla. This coat colour mutation is supposed to be a result of disturbances which may occur in the pigment cell structure or a result of migration of melanocyte precursors from the neural crest.

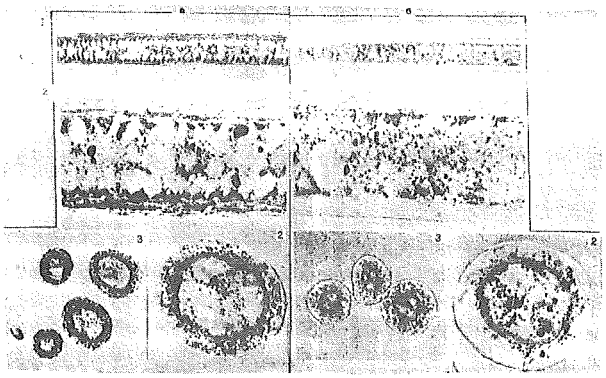
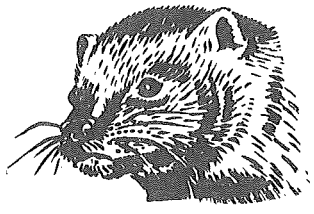


Рис. 4. Распределение пигментных гранул в корковом и в сердцевинном слоях волос с места нормальной пигментации (а), и с желтых подпалов (б). Увеличение: 300(1), 900(2), 500(3)

In RUSS, Su. ENGL. 4 tables, 5 figs., 14 refs. Authors' summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 156-170. Code 2-4.

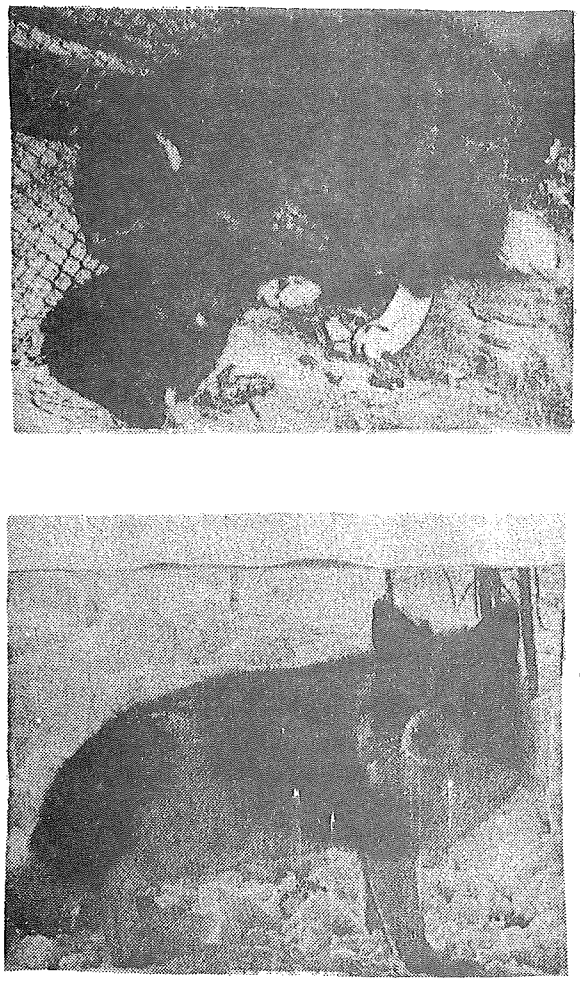


Influence of the star gene on potential fertility and embryonal death of silver foxes.

A.I. Zhelesova

A comparative analysis was made of the level of potential fertility and embryonic death in the pre- and postimplantation period in vixens hetero- and homozygous for the star gene, compared with silver foxes which did not carry this gene. Insignificant differences were noted in potential fertility in favour of silver foxes of the oldest age group (3 years old and more) - 7.76 ± 0.19, compared with 5.50 ± 0.22 in domesticated vixens. The major contribution to differentiation in factual fertility between silver foxes and those with "stars" was made by differences in the level of embryonic death both in the pre- and postimplantation peri-ods. However, the embryonic death has no selective value, which depends on the embryonic genotype, and is probably measured by the hormonal status of females (progesterone level in blood) during pregnancy. During the post-implantation period, the highest mortality in vixens hetero- and homozygous for the star gene falls in the period of placentation and early organogenesis (18-25 days of pregnancy), i.e. in the period when successful embryo development requires a sufficiently high level of progesterone.

In RUSS, Su. ENGL. 4 tables, 2 figs., 17 refs. Author's summary. Evolutionary-genetic and genetic-physiological aspects of fur animals, pp 171-183. Code 4-5-3-F.



а

б

Рис. I. Лисица гетерозиготная (а) и гомозиготная (б) по гену star

Part IV. Selection for behaviour in the American mink: the consequences on increasing variability

Arisal of new colour phases in American mink (*Mustela vison*).

O.V. Trapesov

The consequences of transformation of behaviour during selection for fur colour character variability were analysed in American mink. It was shown that during selection for behavioral traits there was a noticeable increase in the amount of variants of piebald spotting. The offspring with domestic type of behaviour had the highest variation in piebald spotting. As a result of transformations of behaviour occurring under domestication, a considerable increase in the variation of piebald spotting was noted among domestic and aggressive mink. On the basis of new semi-dominant fur colour mutations in mink ("silvery", "black crystal"), 6 new colour phases have arisen, which were appreciated at the All Union exhibitions and the International fur auctions.

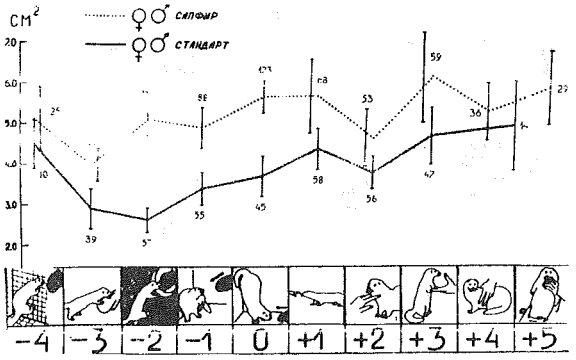


Рис. 4. Связь между оборонительной реакцией на человека и экспрессивностью негостей у стандартных и дирецессивных сапфировых норок

In RUSS, Su. ENGL. 11 tables, 12 figs., 51 refs. Author's summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 185-218. Code 2-4-11-M.

Peculiarities of emotional behaviour and adrenal function in American mink (*Mustela vison Schreb.*) during selection for behaviour.

A.V. Kharlamova, R.G. Gulevitch

Open field behaviour, endocrine function of adrenals and their reaction to stress were investigated in mink pups born to mothers with different genotype-dependent types of defensive behaviour (tame, aggressive, unselected for behavioural traits). Already at 2.5-3 months of age pups from the tame group (both intact animals and those tested for open field behaviour) showed a reduction in critical distance when contacting with man, as well as a decrease in the level of cortisol in peripheral blood. The dynamics of motor activity was changed both in tame and aggressive animals subjected to open field testing, compared with control populations. This is evidenced from the fact that during selection for behavioral traits no sharp fall in motor activity occured at the end of the test and an insignificant increase was marked only at the last minute. In the group that was not selected for behavioral traits, the fall in motor activity was sharp and irreversible.

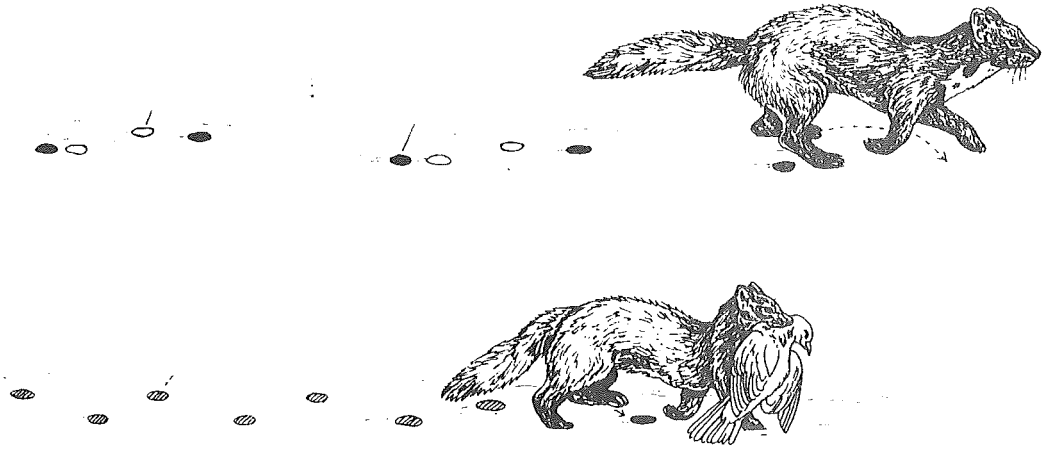
In RUSS, Su. ENGL. 3 tables, 1 fig., 18 refs. Authors' summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 219-231. Code 3-4-11-M.

Effects of domestication on variation in the reproductive function in mink.

D.V. Klotchkov, O.V. Trapesov

Selection of mink for domesticated and aggressive behaviour has brought about significant changes in the functioning of the sexual system. Mink with domesticated behaviour had earlier onset of oestrus and higher fertility during the reproductive season, compared with aggressive mink. A relationship was found between the terms of puberty and fertility in domesticated mink. Mink of this type with earlier onset of oestrus had higher fertility. Such a relationship has not been found in aggressive mink. Oestrus in mink was positively correlated with the development of antral follicles. The photoperiodic imitation of early autumn stimulated folliculogenesis, especially in mink with aggressive type of behaviour and increased the percentage of mink with manifestation of oestrus.

In RUSS, Su. ENGL. 3 tables, 1 fig., 11 refs. Authors' summary. Evolutionary-genetic and genetic-physiological aspects of fur animals domestication, pp 232-244. Code 4-5-11-M.



Endocrinology of reproduction of fur bearing animals.

Institute of Cytology and Genetics, Siberian Division of the Russian Academy of Sciences, 1992

This compilation has to do with the problems of hormonal regulation of the reproductive function in some fur bearers: silver foxes, blue foxes and mink and offers the latest experimental results. This field of reproductive endocrinology, being very important for clearing out certain laws of regulation of reproduction, presents at the same time great interest for practical breeding. This first volume in the periodic series is intended to meet needs of scientific workeres dealing with the problems of reproduction in fur bearers, practicians in the field of animal breeding and of agricultural students.

Book, 125 pp. In RUSS. English abstracts of the individual reports are given in the following.

ЭНДОКРИНОЛОГИЯ РАЗМНОЖЕНИЯ ПУШНЫХ ЗВЕРЕЙ

With best regards! Л.В. Осадчук

Выпуск I

Новосибирск 1992

Sexual steroid hormones in the reproductive cycle of silver foxes.

L.V. Osadchuk

The level of sexual steroid hormones in peripheral plasma, production of these hormones by gonads and adrenals in vitro have been analysed in adult silver foxes of both sexes. In females, maximal content of oestradiol in plasma was found during pro-oestrus, on the eve of oestrus and ovulation and correlated with maximal production of oestradiol by ovaries in vitro. The level of progesterone in females starts to rise during pro-oestrus and reaches a maximum before the implantation of embryos at 10-15 days of pregnancy. In males, maximal level of testosterone in blood coincides with the mating season. It was shown that silver fox adrenals are an additional source of progesterone secreted into the general circulation which may participate in regulation of the reproductive function.

In RUSS, Su. ENGL. 1 table, 5 figs., 57 refs. Author's summary. Endocrinology of reproduction of fur bearing animals, pp 5-36. Code 5-3-F.

Prenatal development of silver foxes. Communication I. Morphochronological analysis of post-implantation stages of development.

A.I. Zhelezova

Morphochronological analysis of silver fox embryo development rates was carried out during the postimplantation period. Significant variation in the stages of embryo development at early post-implantation stages was not noted in females at the same stages of gestation, nor within litters. This variation is supposed to be a result of inaccurate timing of pregnancy which might be due to different hormonal status of females at the moment of copulation.

In RUSS, Su. ENGL. 1 table, 14 figs., 16 refs. Author's summary. Endocrinology of reproduction of fur bearing animals, pp 37-53. See figure. Code 5-2-3-F.

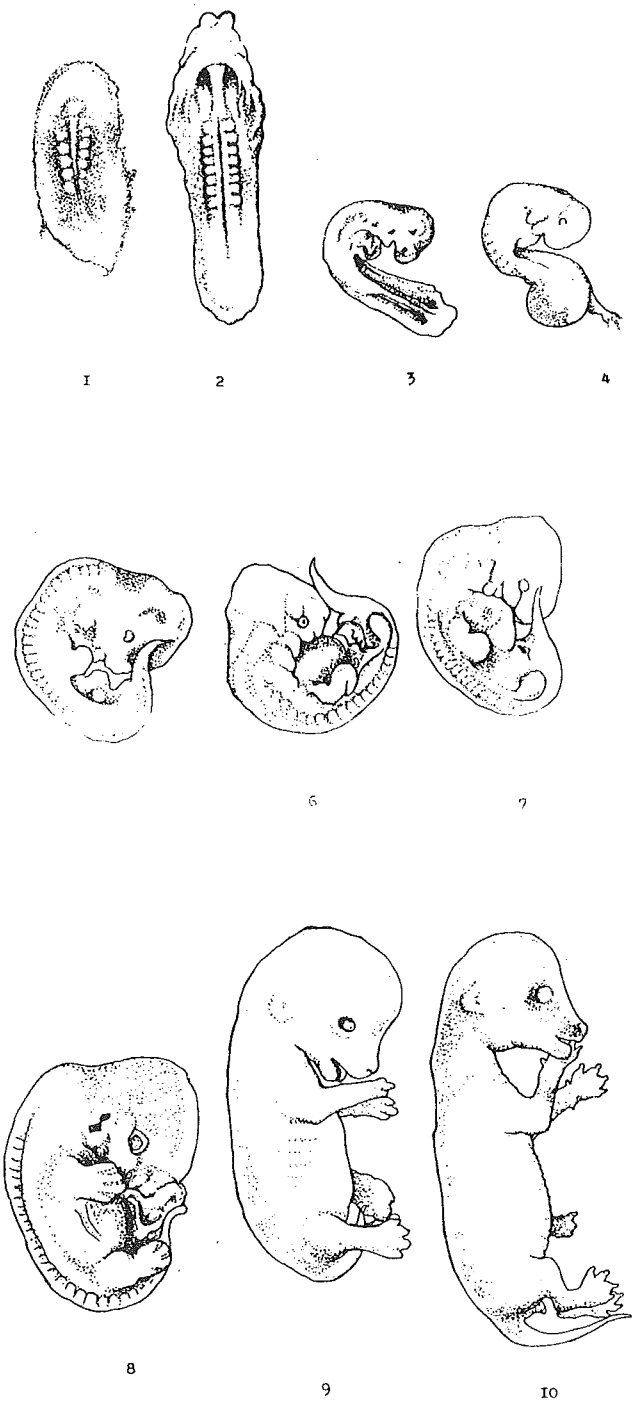


Рис. I-IO. Стадии нормального развития серебристо-черных лисиц

Genotypic peculiarities of the endocrine function of gonads in mink.

R.G. Gulevitch, D.V. Klotchkov

The hormonal function of gonads in standard and mutant (Sapphire) mink of both sexes has been studied during postnatal ontogenesis. Genotypic peculiarities in the dynamics of changes in the level of testosterone in peripheral blood were observed. It was noted that in mutant males the increase in the hor-mone content in blood, which is connected with the onset of puberty, occurred later than in standard males. In standard males, testosterone production by gonads and its level in blood at this period was reliably higher than in Sapphire ones. Standard females had higher peripheral levels of oestradiol and progesterone in the blood serum at the onset of puberty and on the eve of mating, compared with Sapphire mink.

In RUSS, Su. ENGL. 5 tables. 4 figs., 47 refs. Authors' summary. Endocrinology of reproduction of fur bearing animals, pp 54-77. Code 4-2-5-M.

Seasonal changes in hormonal function of gonads in the mink and blue fox.

L.N. Sirotkina

The hormonal function of gonads in standard mink and blue foxes of both sexes was assayed during anoestrus, the mating season, pregnancy and lactation. It was established that, during sexual quiescence and at the onset of the mating period (February), the level of progesterone present in the blood of female mink and blue foxes was low. Activation of oestradiol secretion in blue foxes was low. Activation of oestradiol secretion in blue foxes occurred later than in mink. It was mid-March before mating that the level of oestradiol in foxes increased 3.7 fold, while in mink the oestrogen activity of female gonads was high throughout February and early March. In blue foxes, a rapid increase in progesterone level (40 fold) began two days after mating, whereas in mink progesterone content was increasing markedly from day 15 of pregnancy. A decrease in the hormonal level of gonads in sterile females was observed only during the mating season. The seasonal character of breeding in male mink and blue foxes was confirmed by changing limits of androgen activity of gonads - the highest increase in testosterone concentration during the mating period, its decrease at the active phase of mating and low level of testosterone in blood in summer and autumn.

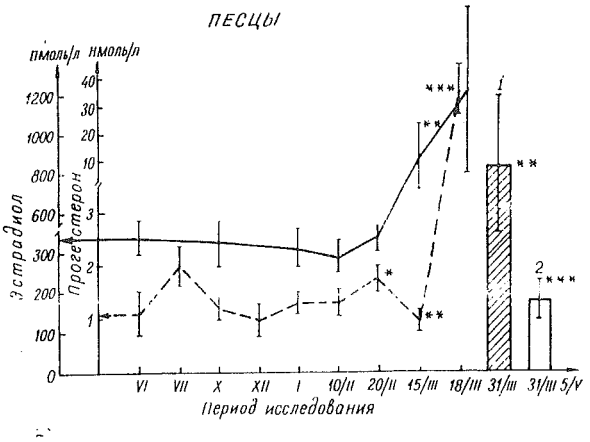


Рис. 4. Динамика эстрадиола и прогестерона в сыворотке крови песцов в анэструсе и репродуктивном периоде
I - уровень прогестерона у непокрытых самок;
2 - эстрадиол у непокрытых самок.
Достоверность различий по сравнению с предыдущим исследованием: * - P<0,05; ** - P<0,01; *** - P<0,001

In RUSS, Su. ENGL. 5 figs., 19 refs. Author's summary. Endocrinology of reproduction of fur bearing animals, pp 78-91. Code 3-5-10-M-F.

Stages in photoperiodic regulation of spermatogenesis in mink.

D.V. Klotchkov, P.M. Torgun

Photoperiodic regulation of spermatogenesis in standard and Sapphire mink was investigated in conditions of continuous illumination (CL) and short daylight (SD) regimes in different seasons. It was noted that from 1 October to 15 November CL inhibited spermatogenesis, whereas from 1 February to 17 March the same light regime stimulated it. A month CL or SD exposition during the period from July to September revealed a transition period from the stage of long day to the stage of short day in the photoperiodic regulation of gonadal function. It was noted that CL stimulates spermatogenesis in July and inhibits it in September. On the contrary, SD (8 hours) inhibits spermatogenesis in July and stimulates it in September. Genotypic variation in reactivity of mink to photoperiodic conditions

was also noted. The process of spermatogenesis in Sapphire mink lagged behind that in standard ones. Analysis of differentiation of spermatogenic epithelium has revealed that in standard mink the period of reactivity to CL was longer than in Sapphire ones. When considering the stages in reactivity to photoperiodic conditions, it was possible to modulate a complex light regime (CL + SD) which is more efficacious in stimulating spermatogenesis, compared with each experimental regime separately.

In RUSS, Su. ENGL. 6 tables, 19 refs. Authors' summary. Endocrinology of reproduction of fur bearing animals, pp 92-111. Code 5-3-10-M.

Influence of photoperiodic conditions on folliculogenesis at early postnatal ontogenesis of mink.

D.V. Klotchkov

Different types of follicles (premordial, growing, ripening antral, atretic) were calculated monthly (June-November) in two groups of young standard mink (3 months of age) maintained at different photoperiods, namely, 1st group - 1.1 month-long permanent illumination from 20 June until 20 July + 8 hours of short daylight from 21 July until 10 October, 2nd group - 2.8 hours of daylight from 21 July to 10 October. On the background of general decrease in the number of follicles in September, activation of folliculogenesis was noted in the experimental group, expressed by an increase in number of antral follicles, in particular in mink of the 1st group.

In RUSS, Su. ENGL. 2 tables, 2 figs., 6 refs. Author's summary. Endocrinology of reproduction of fur bearing animals, pp 112-124. Code 5-2-3-10-M.

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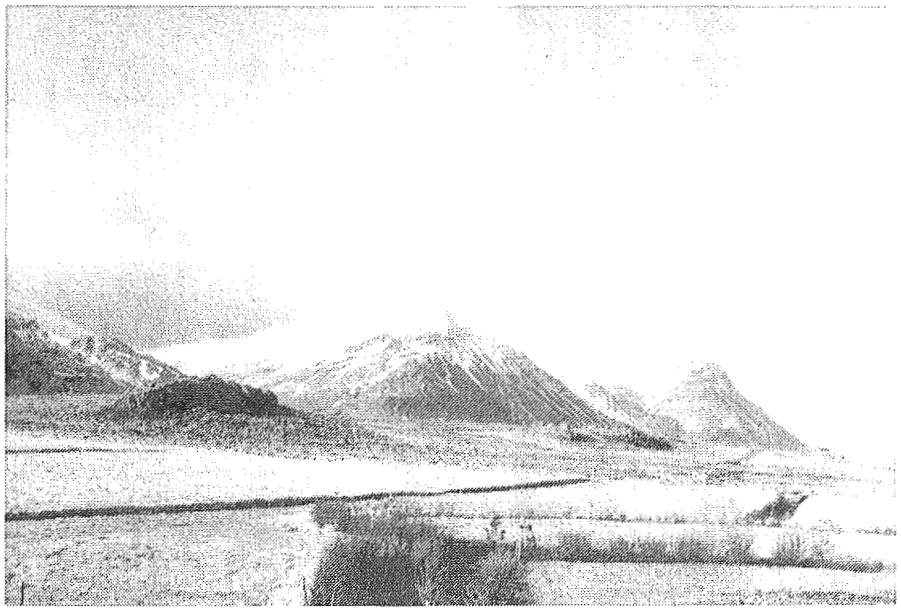
REPRODUCTION IN CARNIVOROUS FUR BEARING ANIMALS



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Address: Jordbrugsforlaget,
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Phone: +45 38 88 98 88
Fax: +45 38 88 66 11

Preface

The present book is based on material from a Nordic post-graduate course held at Hvanneyri Agricultural College, Iceland in April 1991. The aim of the course was to present current knowledge regarding reproduction in carnivorous fur bearing animals. No comprehensive textbook on the reproductive processes in these species exists, and therefore the intention was also to publish the manuscripts on which the lectures were based. This has been achieved thanks to the cooperation of all the lecturers who have provided high standard manuscripts. It is editors' hope that this book will prove useful in the deucation of graduate and post-graduate students and also for scientists who wish to update their knowledge of the reproductive processes in carnivores.

The course and the publishing of this book could only be carried out thanks to the efforts of several persons and financial support. The editors wish to express their sincere gratitude to all the persons who have made the project possible, among whom only a few can be mentioned here.

The site of the course, Hvanneyri Agricultural College, Borgarnes, Iceland, provided a dramatic landscape, peaceful surroundings, excellent lecture room and laboratory, group rooms and a fur farm, facilities which made hard work possible and enjoyable. It also provided good accomodation, a swimming pool and a hot pot, making our sparse leisure time the more pleasant. The dean of the college, Sweinn Hallgrimsson, is heartily thanked for furnishing these facilities and engaging staff of the collge in the course, and for always being willing to discuss and solve practical problems. The main part of the practical arrangements was carried out by associate professor Magnus B. Jonsson, who in his friendly manner, with his gift of always arriving when most needed, and his skilfullness in arranging almost anything - also at very short notice, made the course run smoothly, for which he is warmly thanked.

The teachers all put in a great amount of work, before, during and also after the course, efforts which resulted in interesting lecures, good practical exercises and complete manuscripts, for which we are very grateful. The course turned out to be a success, to which also very active and interested participants contributed. By discussing, working hard in the laboratory and by using the small hours of the night for preparing group work they all made the efforts fo the teachers worthwhile.

The Nordic Council of Ministers (Nordisk Ministerråd) financed the course, and the publishing of this book was financially supported by Nordisk Kulturfond, funds which are gratefully acknowledged.

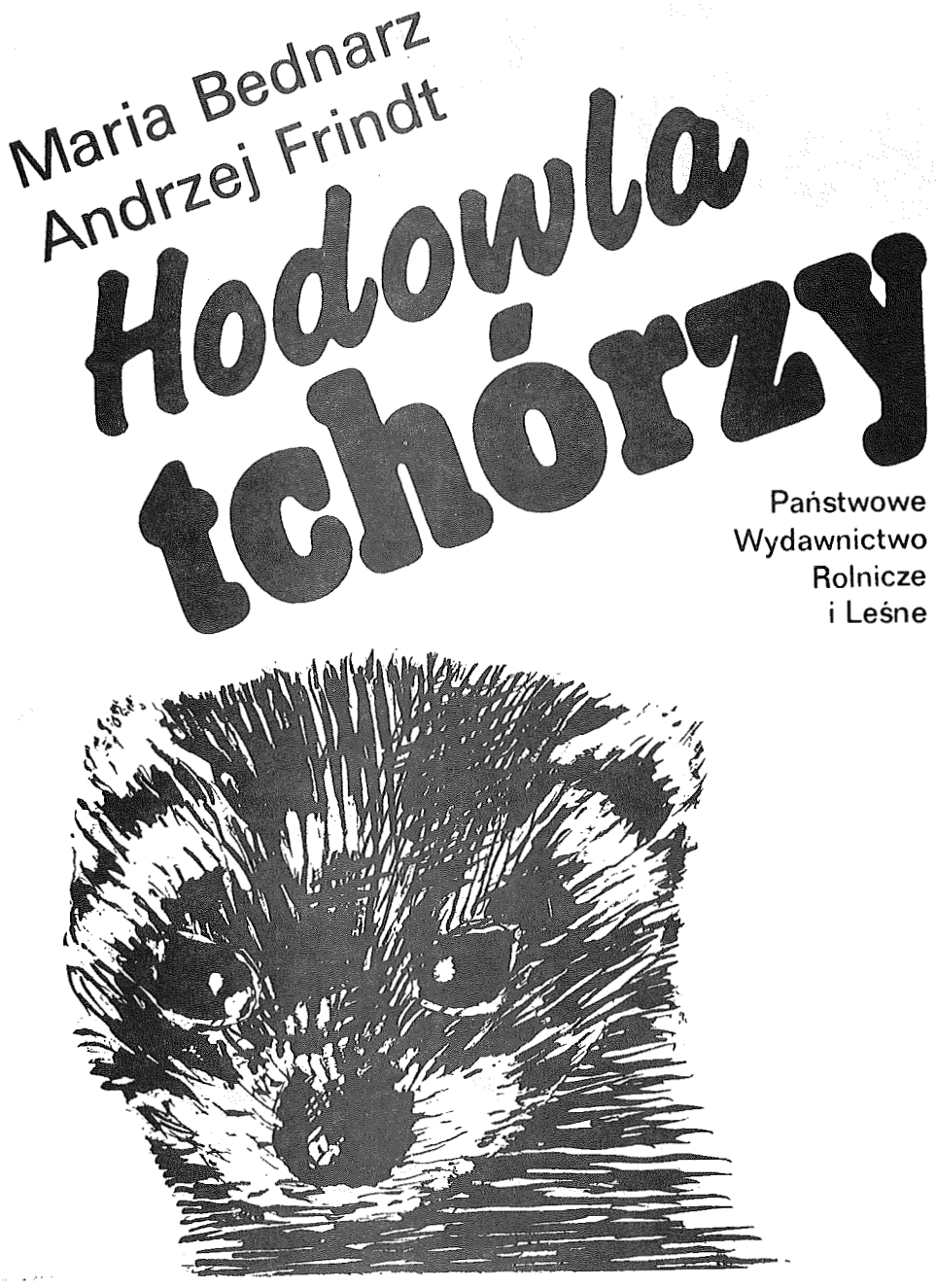
Frederiksberg and Kuopio in August 1992

Anne-Helene Tauson and Maija Valtonen

CONTENTS

172 pp, 13 tables, 42 ill., 473 refs. ISBN 87 7432 357 1, DSR 5831.

Polecat's breeding



In POLH. 183 pages, 52 tables, 29 figs., 102 references

Guidelines for nutria feeding

In Spanish. 80 pages. Many tables, figures and references

If anybody is interested to order the book, please write directly to the author:

Dr. Oscar N. DiMarco
Dto Prod. Animal
CC 276. 7620 Balcarce
Argentina

List of addresses

Anikieva, L.V. Biological Institute, Karelian Section, Academy of Sciences of the USSR, Petrozavodsk, USSR.
Aulerich, Richard J. Department of Animal Science, Anthony Hall, Michigan State University, East Lansing, MI 48824-1225. USA.
Awad, A. Zagazig University, Faculty of Veterinary Medicine, Dept. Anat., Histol., Egypt.
Barabasz, Boguslaw. Zeszyty Naukowe, Akademii Rolniczej im. H. Kollataja, W Krakowie, Poland.
Bednarz, Maria. Instytut Hodowli Zwierzat i Technologii Produkcji Zwierzecej SGGW-AR, Zaklad Hodowli i Uzytkowa nia Zwierzat Futerkowych i Drobnego Inwintara, Poland.
Blixenkrone-Møller, Merete. Institut for Veterinær Virologi og Immunologi, Den Kgl. Veterinær- og Landbohøjskole, Bülowsvej 13,
Brzezinski, Marcin. Department of Ecology, University of Warsaw, Krakowskie Przedmiescie 26/28, 00-927 Warsaw, Poland.
Bursian, S.J. Department of Animal Science and Institute for Environmental Toxicology, Michigan State University, East Lansing, MI 48824, USA.
Damgaard, Birthe M. National Institute of Animal Science, Research Centre Foulum, Dept. of Fur Animals, P.O. Box 39, DK-8830 Tjele, Denmark.
Davis, Harry G. Dept. of Animal Science, Michigan State University, East Lansing, Michigan 48824, USA.
Deng, X.Y. China.
DiMarco, Oscar N. Dto Prod. Animal, CC 276. 7620 Balcarce, Argentina.
Ericsson, Lotta. Statens Veterinærmedicinska Anstalt, Uppsala, Sweden.
Fan, M.P. China.
Feng, C.L. China.
Feng, H.L. China.
Fukunaga, Shigeharu. Faculty of Agriculture, Hokkaido University, Kita-ku, Sapporo-shi 060, Japan.
Garcia, X. Departamento de Produccion Animal, Universidad de Chile, Casilla 1004, Santiago, Chile.
Guangsen, Wei. Bayi Univ. of Acclamation, Mishan, Heilongjiang, Dept. of Animal Husbandry and Veterinary Medicine, China.
Gulevitch, R.G. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.
Hagen, Gunnar. Department of Pathology, Norwegian College of Veterinary Medicine, P.O. Box 8146, N-0033 Oslo 1, Norway.
Hongye, Yuan. Bayi Univ. of Acclamation, Mishan, Heilongjiang. Teaching and Research Section of Animal Anatomy, China.
Hua, Chen. Veterinary Coll. of PLA, Changchun, Inst. of Military Veterinary Medicine, China.
Ilukha, V.A. Institute of Biology, Karelian Research Centre, Russian Academy of Sciences, Petrozavodsk, Pushkinskaya 11, Russia.
Jiju, Han. Veterinary Coll. of PLA, Changchun, Inst. of Military Veterinary Medicine, China.
Kaleta, Tadeusz. Zaklad Ogolnej Hodowli Zwierzat, Katedra Genetyki i Oglnej Hodowli Zwierzat, SGGW, Brwinow, ul. Przejazd 4.
Karpov, V.M. Russia.
Kenttämies, Hilkka. University of Helsinki, Department of Animal Breeding, SF-00710 Helsinki, Finland.
Kharlamova, A.V. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.
Klotchkov, D.V. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosi birsk 630090, Russia.
Kolesnikova, L.A. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.
Korhonen, Hannu. Agricultural Research Centre of Finland, Fur Farming Research Station, SF-69100 Kannus, Finland.
Kubo, Hitoshi. Division of Dermatology, Fukagawa City Hospital, Fukagawa 074, Japan.
Kuoshi, Jin. The PLA Veterinary Univ., Changchun, China.
Li, X.L. China.
Lijun, Cao. Yaohe County Bureau of Animal Husbandry, Heilongjiang, China.
Lin, X.M. China.
Martino, P.E. Instituto de Patologia, Faculdad de Ciencias Veterinarias, Universidad, CC 296, 1900 La Plata, Argentina.
Medvedeva, N.Y. Sverdlovskii Institut Narodnogo Khozyaistva, Sverdlov, USSR.
Nayakshin, A.M. Institute of Cytology and Genetics, Academy of Sciences of the USSR, Siberian Division, Novosibirsk, Russia.
Neira, R. Departamento de Reproduccion Animal, Universidad de Chile, Casilla 1004, Santiago, Chile.
Nesterova, T.B. Russia.
Niedzwiadek, Stanislaw. National Research Institute of Animal Production, Balice nr Cracow, Poland.
Osadchuk, L.V. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosi birsk 630090, Russia.
Oskina, I.N. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.

Pak, S.D. Russia.
Parkanyi, Vladimir. Research Institute of Animal Production, Hlohovska 2, 949 92 Nitra, Czechoslovakia.
Plyusnina, I.Z. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.
Prasolova, L.A. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.
Pölönen, Ilpo. Finnish Fur Breeders Association, Vantaa, Finland.
Qingqiang, Yin. Veterinary Coll. og PLA, Changchun, Inst. of Military Veterinary Medicine, China.
Rasmussen, Palle V. National Institute of Animal Science, Research Centre Foulum, Dept. of Fur Animals, P.O. Box 39, DK-8830 Tjele, Denmark.
Rouvinen, Kirsti. Agricultural Reseach Centre of Finland, Fur Farming Research Station, SF-69100 Kannus, Finland.
Ryland, L.M. Salmon Bay Veterinary Hospital, Seattle, WA 98107, USA.
Schurkalova, T.A. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.
Simesen, Ruth Buemann. Inst. for Veterinær virologi og immunologi, Den Kgl. Veterinær- og Landbohøjskole, Bülowsvej 13, DK-1870 Frederiksberg C.
Sirotkina, L.N. Institute of Biology of Karelian Scientific Center, Russian Academy of Sciences, Petrosavodsk, Russia.
Skirnisson, Karl. Institute for experimental pathology, University of Iceland, Keldur, P.O.Box 8540, IS-128 Reykjavik.
Skjøth, Flemming. Dept. of Biometrics and Informatics, Research Centre Foulum, P.O. Box 23, DK-8830 Tjele, Denmark.
Smeds, Kerstin. Finnish Fur Breeders' Association, Box 5, SF-06101 Vantaa, Finland.
Taranin, Alexander V. Institute of Cytology and Genetics, Siberian Department of the Russian Academy of Sciences, Novosibirsk 630090, Russia.
Tauson, Anne-Helene. Department of Animal Nutrition and Management, Funbo-Lövsta Research Station, Uppsala, Sweden.
Trapesov, O.V. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.
Trut, L.N. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.
Urlings, Bert. Roesterd 11, 5371 MS Ravenstein, 08867 - 2519.
Valberg, N.M. Department of Animal Science, Agricultural University of Norway, P.O. Box 25, N-1432 Ås, Norway.
Vasilyeva, L.L. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.
Wang. Y.L. China.
Weiquan, Liu. Veterinary Coll. of PLA, Changchun, Inst. of Military Veterinary Medicine, China.
Yongjun, Xiao. Chinese Academy of Agricultural Sciences, Yongji, Jilin. Inst. of Special Plants and Wildlives Utilisation. China.
Zhang, Yun. Jiangsu Provincial Academy of Agricultural Sciences, Nanjing, Inst. of Agricultural Modernisation, China.
Zhang, S.M. China.
Zhelesova, A.I. Inst. of Cytology and Genetics, Siberian Branch of the Acad. of Sciences, Lavrentyev Ave. 10, Novosibirsk 630090, Russia.
Aarstrand, Kjetil. Department of Agricultural Engineering, Agricultural University of Norway, P.O. Box 5065, N-1432, Norway.