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1.	Contents	1
2.	Notes	9
3.	Multidisciplinary	11
	Morphological variations of hair during the growth of mink. <i>Keiji Kondo. Original Report. Code 2-M.</i>	11
	Body water space and body water turnover in mink females. <i>Asbjørn Brandt. Original Report. Code 3-5-M.</i>	17
	Serum thyroxine and triiodothyronine radioimmunoassay values in the normal ferret. <i>B.A. Garibaldi, M.E. Pegquet Goad J.G. Fox, R. Murray. Code 3-0.</i>	20
	Element concentrations in livers and kidneys of ranch mink. <i>S.M. Stejskal, R.J. Aulerich, M.R. Slanker, W.E. Braselton, E.J. Lehning, A.C. Napolitano. Code 6-3-M.</i>	20
	A simple method for intravenous injection and blood collection in the chinchilla. <i>B. Tappa, H. Amao, K.W. Takahashi. Code 2-3-14-0.</i>	20
	Musculature of the thoracic limb of the polecat (<i>Putorius furo</i>). <i>V. Cotofan, V. Hritcu, P. Cura, A. Negrea. Code 2-0.</i>	20
	Vascularization of postdiaphragmatic digestive organs in <i>Myocastor corypus</i>. <i>V. Cotofan, O. Cotofan, I. Cozariuc. Code 2-0.</i>	21
	Study on the skull of the growing polecat (<i>Putorius furo</i>). <i>V. Cotofan, C. Timofte, F. Mares, L. Balan. Code 2-0.</i>	21
	Studies of the thoracic limb joint of the polecat (<i>Putorius furo</i>). <i>V. Cotofan, V. Hritcu, P. Cura, F. Mares. Code 2-0.</i>	21
	Studies on the pelvic limb joints of polecats (<i>Putorius furo</i>). <i>V. Cotofan, V. Hritcu, L. Balan. Code 2-0.</i>	21

- Domestication. Evolutionary change under stress.** *M.J. Kohane, P.A. Parsons. Code 11-3-4-14-M-F-O.* 22
- Changes in the activity of thryptophan hydroxylase in the brain of silver foxes and wild Norway rats selected for behavior.** *A.V. Kulikov, E.Yu. Zhanaeva, N.K. Popova. Code 3-11-4-F.* 22
- The correlation between weighing mink kits and their behavioural response to the stick test.** *S. Møller, S.W. Hansen. Code 10-11-12-M.* 23
- The effect of the run's floor area on the growth of nutria and quality of their skins.** *S. Niedzwiadek, J. Kowalski, D. Kowalska. Code 10-12-2-0.* 23
- Regulation of weight loss in male farm mink.** *H. Korhonen, M. Harri, J. Mononen. Code 6-14-5-M.* 23
- Influence of fatty acid composition in dried raw mink and blue fox skins on their storage aging and dressing properties.** *K. Rowinen, E. Mäntysalo. Code 2-6-14-M-F.* 24
- Foxes as bioindicators of the occurrence of polychlorinated biphenyls (PCB) in the environment - PM examinations in 1983 and 1987.** *H. Brunn, S. Georgii, K. Failing, V. Stojanovic, U. Eskens, D. Manz. Code 8-1-F.* 24
- Organochlorine and mercury residues in wild mink and otter: comparison with fish.** *R.E. Foley, S.J. Jackling. Code 8-1-M-0.* 25
- Home range utilization by pine martens.** *I. Storch. Code 1-0.* 25

Titles of other publications - not abstracted

- A simple technique for chronic jugular catheterization in ferrets.** *J.E. Mesina, T.J. Sylvina, L.C. Hotaling, M.E. Pecquet Goad, J.G. Fox. Laboratory Animal Science (USA), 1988; vol. 38(1), p. 89-90; ill. references. Available at: US (DNAL 410.9 P94); ISSN 0023-6764. Code 3-14-0.*
- Stick test reveals a minks temperament.** *S.W. Hansen, S. Møller. Dansk Pelsdyravt (Denmark), 1989; Vol. 52(1), p. 33-36; 4 ill. In DANH. Code 11-M.*
- Martens as farm animals. On the production of the pine marten.** *E. Nyholm. Deutsche Pelztierzuechter (Germany, F.R.), 1987; Vol. 61(8), p. 117-119; 2 ill. In GERM. Code 1-12-14-0.*
- The chinchilla: endangered whistler of the andes.** *E.K. Rice. Animal kingdom 1988; Vol. 91(1), p. 6-7. Code 1-14-0.*
- Diet of the red fox (*Vulpes vulpes*) in agrocoenoses in Southern Moravia.** *I. Kozená. Acta Sc. Nat. Brno, 22(7), p. 3-24. Code 1-6-10-F.*
- Directives of the "German adjudicator's association for chinchillas" (DPVC) for chinchilla comparison shows.** *G. Clemens. Deutsche Pelztierzuechter (Germany, F.R.), 1988; vol. 62(8), p. 121-122; 1 ill. In GERM. Code 14-0.*

4. Genetics

- The Chediak-Higashi Syndrome (CHS) in Mansfield Pearl Foxes (Omberg Pearl, *Vulpes vulpes*) and in Arctic Blue Foxes (*Alopex lagopus*) is caused by gene mutation in homologous loci.** *Norodd Nes, Øystein V. Sjaastad, Bjørn Liim. Preliminary Report. Code 4-9-F.* 27

Genetic polymorphism of IgG in mink. 1. Identification of 8 allotypes. <i>D.K. Belyaev, I.I. Fomicheva, A.V. Taranin, O.K. Baranov. Code 4-3-M.</i>	29
The mink proopiomelanocortin gene: Characterization of cDNA and chromosomal localization. <i>T.M. Khlebodarova, G.I. Karasik, N.M. Matveeva, O.L. Serov, S.Y. Golovin, A.A. Bondar, V.A. Karginov, I.S. Morozov, S.M. Zelenin, N.P. Mertvetsov. Code 4-3-M.</i>	29
Localization of the α_2macroglobulin gene and <i>Lpm</i> gene family on mink chromosome 9. <i>V.I. Yermolaev, G.I. Karasik, T.M. Khlebodarova, N.M. Matveeva, M.R. Mullakandov, A.M. Nayakschin, T.V. Shumny, N.B. Rubtsov, O.L. Serov, O.K. Baranov. Code 4-3-M.</i>	29
Mink-mouse hybridomas that secrete mink immunoglobulin G. <i>N.L. Galakhar, S.N. Djatchenko, I.I. Fomicheva, L.V. Mechetina, A.V. Taranin, E.S. Belousov, A.M. Nayakshin, O.K. Baranov. Code 4-3-M-0.</i>	29
Family of <i>Lpm</i> genes in chromosome 9 of American mink. <i>V.I. Ermolaev, M.R. Mullakandov, O.L. Serov, O.K. Baranov. Code 4-3-M.</i>	30
Changes in melanin granules in the fox due to coat color mutations. <i>M.W. Bradbury, J.D. Fabricant. Code 2-3-F.</i>	30
Endocrine function of gonads and adrenals in female minks of two genotypes in postnatal ontogenesis. <i>R.G. Gulevich, D.V. Klochkov. Code 3-4-5-M.</i>	31
Separation of X and Y chromosome-bearing mammalian sperm by DNA content using flow cytometric analysis and sorting. <i>L.A. Johnson. Code 4-2-3-5-M-F-0.</i>	31
The performance traits of sables in intra- and inter-line selection of mating pairs. <i>E.G. Snytko, I.F. Kirillushkin. Code 5-4-0.</i>	31
The performance of standard mink of brown and dark brown shades. <i>V.V. Ustimenko. Code 2-5-4-14-M.</i>	32
Changeability of physiological indices in hybrids of the skunk and ferret in postnatal period. 1. Medulla. <i>R. Szymeczko. Code 3-4-0.</i>	32
New colour varieties of foxes at the Fur Animal Breeding Station at Tirgu-Mures. <i>S. Sava. Code 4-F.</i>	32
Progeny testing of AI males in fox breeding. <i>Jesper Clausen. Code 4-F.</i>	32

Titles of other publications - not abstracted

The cause of tail-biting among minks - tail sucking is a recessive hereditary characteristic. *G. de Jonge. Deutsche Pelztierzuechter (Germany, F.R.), 1988; Vol. 62(3), p. 33-34; 1 ill., 2 tables. In GERM. Code 11-4-M.*

Control of the breeding performance of chinchilla. *Anonymous. Deutsche Pelztierzuechter (Germany, F.R.), 1987; Vol. 61(4), p. 55-56. In GERM. Code 4-0.*

5. Reproduction

Reproduction and fertility in the mink (*Mustela vison*). *C. Sundqvist, A.G. Amador, A. Bartke. Code 5-M.* 33

Long-term effects of Pinealectomy on Testicular Function, Luteinizing Hormone-Releasing Hormone Hypothalamic System, and Plasma Prolactin Levels in the Mink, a Short-Day Breeder. <i>L. Boissin-Agasse, J.M. Jacquet, A. Lacroix, J. Boissin. Code 5-3-M.</i>	33
Photoperiodic control of endocrine function in codands of silver foxes and change in it during domestication. <i>L.V. Osadchuk, L.N. Trut. Code 3-11-4-5-F.</i>	33
Hormonal induction of oestrus and pregnancy in anoestrous ferrets (<i>Mustela putorius furo</i>). <i>R.A. Mead, S. Neirinckx. Code 5-3-0.</i>	34
Evidence that oestrogen exerts an equivalent negative feedback action on LH secretion in male and female ferrets. <i>R.S Carroll, M.J. Baum. Code 5-3-0.</i>	34
A Comparison of sperm morphology and silver nitrate staining characteristics in the domestic ferret and the black-footed ferret. <i>P.T. Curry, T. Ziemer, G. van der Horst, W. Burgess, M. Straley, R.W. Atherton, R.M. Kitchin. Code 2-5-0.</i>	35
Semen characteristics and testosterone profiles in ferrets kept in a long-day photoperiod, and the influence of hCG timing and sperm dilution medium on pregnancy rate after laparoscopic insemination. <i>D.E. Wildt, M. Bush, C. Morton, F. Morton, J.G. Howard. Code 5-3-2-0.</i>	35
The characteristics of oestrus in polecats. <i>T.V. Barmotina. Code 5-0.</i>	35
Body condition and reproductive ability of female polecats in spring. <i>G.P. Kazakova, T.V. Barmotina. Code 5-2-0.</i>	36
Reproduction of male sables of different colours. <i>A.B. Kulichkov. Code 5-4-0.</i>	36

Titles of other publications - not abstracted

Reproductive endocrinology of the mink (<i>Mustela vison</i>). <i>C. Sundqvist, LeG. C. Ellis, A. Bartke. Endocrine Reviews, 1989; 9(2), p. 247-266; 438 ref. Code 5-3-M.</i>	<i>zuechter (Germany, R.F.), 1987; Vol. 61(4), p. 56. In GERM. Code 5-3-0.</i>
The parturition process of the silver fox. <i>F. Schmidt. Deutsche Pelztierzuechter (Germany, F.R.), 1986; Vol. 60(6), p. 95-97; 1 ill. In GERM. Code 5-F.</i>	On the reproduction behaviour of chinchilla. <i>Anonymous. Deutsche Pelztierzuechter (Germany F.R.), 1986; Vol. 60(7), p. 115-118; 1 ill., 2 tables. In GERM. Code 5-11-0.</i>
Note on the reproduction physiology of the chinchilla. <i>Anonymous. Deutsche Pelztier-</i>	Oestrus and copulation of nutria. <i>Anonymous. Deutsche Pelztierzuechter (Germany, R.F.), 1987; Vol. 61(5), p. 69. In GERM. Code 5-0.</i>

6. **Nutrition**

Effect of feeding, growing and finishing balanced rations to coypus, with and without green forages. <i>Oscar N. Di Marco, German G. Garrido. Original Report. Code 6-7-0.</i>	37
Electrolytes in minks with nursing sickness. <i>T.N. Clausen, O. Hansen. Code 3-5-9-M.</i>	39

Influence of dietary fat source on growth and fur Quality of mink and blue fox. <i>K. Rouvinen, P. Niemelä, T. Kiiskinen. Code 6-2-M-F.</i>	39	2
Influence of dietary fat source on the body fat composition of mink (<i>Mustela vison</i>) and blue fox (<i>Alopecurus lagopus</i>). <i>K. Rouvinen, T. Kiiskinen. Code 6-2-M-F.</i>	39	2
Digestibility of different fats in mink and blue fox kits - influence of emulsifying agents. <i>K. Rouvinen. Code 6-7-3-M-F.</i>	40	
Digestibility of different fats and fatty acids in the mink (<i>Mustela vison</i>). <i>K. Rouvinen. Code 6-3-M.</i>	40	es er I),
The effect of heat treatment on the digestibility of starch from barley and wheat for minks. <i>K. Østergaard, H. Mejborn. Code 6-7-M.</i>	40	
Industrial fish can replace large amounts of fish waste in the breeding period. <i>G. Hillemann. Code 7-5-M.</i>	41	err ric V
Composition, nutritive value and variation in Danish feed pellets for chinchilla. <i>G. Jørgensen, H. Mejborn, J. Nordholm. Code 6-0.</i>	41	
Dietary β-carotene absorption and metabolism in ferrets and rats. <i>J.D. Ribaya-Mercado, S.C. Holmgren, J.G. Fox, R.M. Russell. Code 6-3-0.</i>	41	
Bile salt stimulated lipase: the enzyme is present in non primate milk. <i>L.M. Freed, C.M. York, M. Hamosh, N.R. Mehta, J.A. Sturman, O.T. Oftedal, P. Hamosh. Code 3-5-0.</i>	42	al ati 0.
Diagnostic significance of estimating the activity of transketolase and thiamin diphosphate effect in blood of fur-bearing animals during covert thiamin deficiency. <i>S.P. Izotova, G.G. Petrova, E.Yu. Cherkashina. Code 6-3-M-F.0.</i>	42	
Effect of nutrition on whelping results in mink. <i>I. Polonen. Code 6-5-M.</i>	42	3
The influence of feed intake on incidence of "greasy mink kits". <i>R.S. Lund. Code 6-9-M.</i>	43	4

Titles of other publications - not abstracted

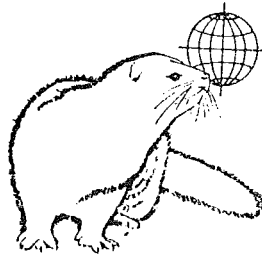
Extruded maize as feed for fur animals.
A. Skrede, Aa. Eldegaard. Norsk Pelsdyrblad (Norway), 1989; Vol. 63(4), p. 12-13, 32; 4 tables, 2 ref.; ISSN 0369-5255. In NORG. Code 7-6-M-F-0.

7. Veterinary

The possible influence of recent vaccination on the serological reactions in mink against Aleutian Disease Virus Antigen. <i>Christian Munck. Original Report. Code 9-M.</i>	45	9 10 1
An approach to embryo-phoetal mortality pathogenesis in the Aleutian Disease in minks. <i>Nicolae Pastirnac. Original Report. Code 5-9-M.</i>	49	2
A novel replicative form DNA of Aleutian disease virus: the covalently closed linear DNA of the parvoviruses. <i>M. Löchelt, H. Delius, O.R. Kaaden. Code 9-4-M-F-0.</i>	56	3

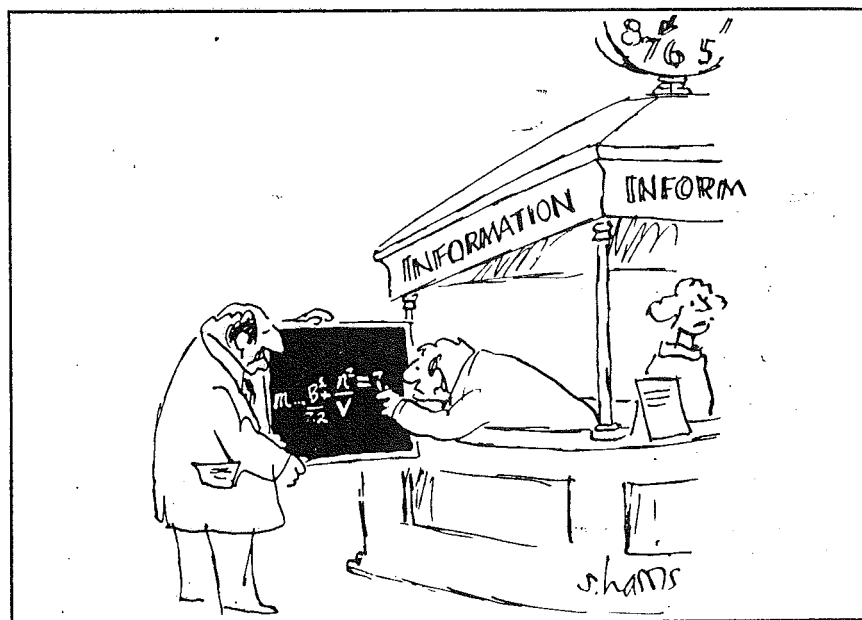
New Books Cont

Veterinary Preparations for Fur Animals. <i>J. Konrad. Code 9-12-14-M-F-0.</i>	74
Rabbits. <i>U.D. Wenzel. Code 14-12-M-F-0.</i>	75
Old Book	
Silver fox farming in eastern North America. <i>N. Dearborn. Code 14-12-F.</i>	76
List of addresses	77



Scientifur

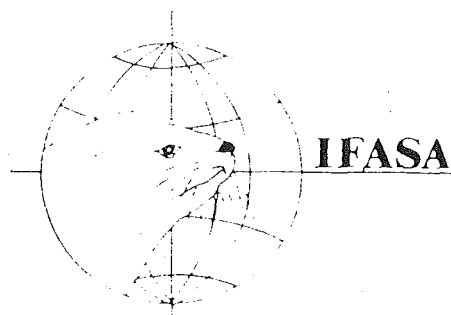
SCIENTIFIC INFORMATION IN FUR ANIMAL PRODUCTION





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NOTES

SCIENTIFUR

**Vol. 14, No. 1
February 1990**

As announced in *SCIENTIFUR* Vol. 13, No. 4 this issue of *SCIENTIFUR* is the first of hopefully many under the management of the International Fur Animal Scientific Association (IFASA).

Please note our new address!

Surely many readers have been waiting for a new international journal with a professional and attractive look. We are sorry to disappoint you, but Rome was not built in one day, and the same goes for fulfilment of the dream of IFASA - to produce a journal which subscribers, contributors and advertisers find to be the most attractive in the world.

Everybody involved has been very busy with the establishment of the new office of IFASA and *SCIENTIFUR*, not to mention this first issue of the journal. Without any knowledge of the actual systems and without money it is difficult to build up the whole system. It takes time, but eventually it will work, and the basis for the speed with which things can happen is the support IFASA and *SCIENTIFUR* gets from members, subscribers, organizations and companies related to the fur producing industry.

As you will see from the text on the inside cover, the board of IFASA is not complete. A member from the Fur Breeders' Associations has still not been appointed. The editorial board of *SCIENTIFUR* has not yet been established, but it will possibly happen in connection with the IFASA board meeting planned to take place in Poland in April this year.

If any readers should have suggestions for candidates for the editorial board as well as for the council of IFASA (1 representative from each country) we should be obliged to receive a letter from you.

We thank you for all the letters regarding renewal of subscriptions for *SCIENTIFUR* and IFASA. We are in the process of sending out invoices for the subscription and request forms for the membership to all former subscribers. At the same time we are also sending information about IFASA and *SCIENTIFUR* to potentially interested persons, institutions, and companies. We would be very grateful, if our readers would send us lists with names and addresses of persons, institutions and companies that might be interested in IFASA and *SCIENTIFUR*.

We know from our budgets that the future will depend on the number of members, subscribers and advertisers, and we know from the past 13 years of *SCIENTIFUR* that the future can only be ensured if all interested parties are supporting us.

In this issue of *SCIENTIFUR* we have three advertisements from serious international companies who want to support the journal. At the same time as we thank for this support, we ask our readers to reciprocate the support by using our advertisers' products. The same can be said about the books produced and advertised by *SCIENTIFUR*.

This first issue of *SCIENTIFUR* under the management of IFASA has almost the same layout as former issues and feels a little thinner. Looking over the contents and reading the text, you will, however, find that the amount of information has increased. The typing is smaller which increases the amount of information per page by approx. 25%. Hopefully this change will be satisfactory to you, as it will allow us to increase the information value of *SCIENTIFUR* within the economic limits given. It will be possible for us to bring a larger number of original reports (scientific and technical) and ad-

vertisements which together will help bring SCIENTIFUR closer to the final goal - to become the international fur animal journal for everybody involved in fur animal production.

To those who have not already received a special request form for membership of IFASA, please fill in and return the form appearing on page ? to us.

We know these are hard times for the fur producing industry - but we also know that the future is for those who invest in it - and one of the important investments for the future is investment in IFASA and SCIENTIFUR.

WE COUNT ON THE FUTURE - WE COUNT ON YOU.

Have a good time,
Your editor



Gunnar Jørgensen

ERRATUM to SCIENTIFUR Vol. 13, No. 4 p. 305.
Weight Gain and Fur Length in Nutria Fed three
Balanced Diets of 16, 21 and 27 % of Crude
Protein without Green Forage.

Oscar N. Di Marco & German Garrido.

We regret that the following figure was left out of the original report. Please insert it on page 307 in Vol. 13 No. 4.

The very sorry editor

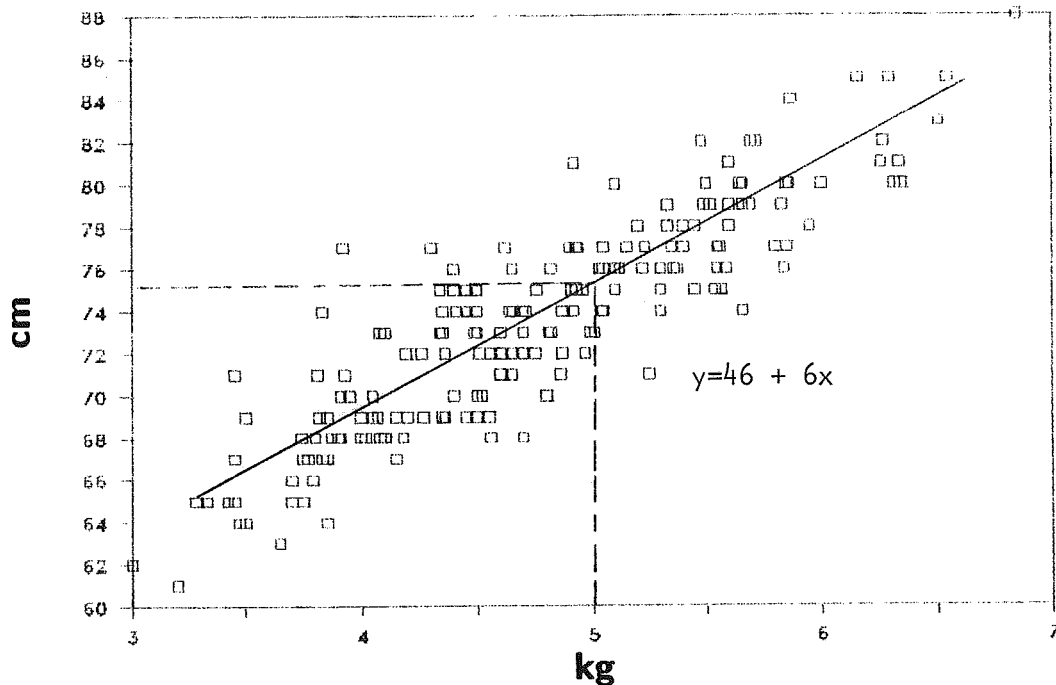


Figure 1. Relationship between body weight and fur length.

Original Report

Morphological variations of hair during the growth of mink

Keiji Kondo, Akemi Inoue, Fumio Nakamura and Tugio Ohsugi
Faculty of Agriculture, Hokkaido University, 060 Sapporo, Japan.

Summary

In this study the morphological changes of the hair that occur during the growth of sapphire mink were observed.

The results obtained are summarized as follows:

1. The hair of sapphire mink that were between two to six weeks old was different from that of mink that were eight weeks old or older, and it did not show the two layer structure of guard hair and underfur and no distinction could be found between guard hair and underfur. So the hair of the two to six week old mink was regarded as "whelp hair".

2. Although the diameter of whelp hair was about 25 μm and different from that of guard hair (125 μm) and underfur (14 μm), the ratio of the medulla to the whole hair thickness of whelp hair was similar to that of underfur (0.45) and different from that of guard hair (0.70).

3. The appearance of the medulla of whelp hair in the center portion of the shaft was lattice like, similar to that of guard hair, but at the tip region it had a ladder-like appearance, similar to underfur.

4. The shape of the scales of three hair types were all basically the same at the root and the tip region, but they were different at the middle region.

Introduction

Generally the hair of mammals is repeatedly molted in order for the animal to adapt itself to the environment while protecting its body. The study of hair has been limited to a few types such as human hair and wool, and there has been little research on other types of animal hair.

In this study morphological variations of sapphire mink hair during growth were observed by means of a light microscope and a scanning electron microscope.

Materials and Methods

The hairs of male sapphire mink were taken every other weeks from birth to pelting. The hair samples of dorsal region were cut around the root by a razor blade.

The specimens were mounted with *Entellan New* (MERCK) for a light microscopic observation. As a morphological parameter, the ratio of the medulla to the whole hair thickness (diameter of medulla/diameter of the whole hair) was measured. This measurement of ratio was done on 25 hairs each of guard hair and underfur. However, it was impossible to distinguish guard hair and underfur at the age of six weeks so only whelp hair which was distinguished from an adult hair was measured at this stage.

Measurements were done at the following locations as shown in Fig. 1.

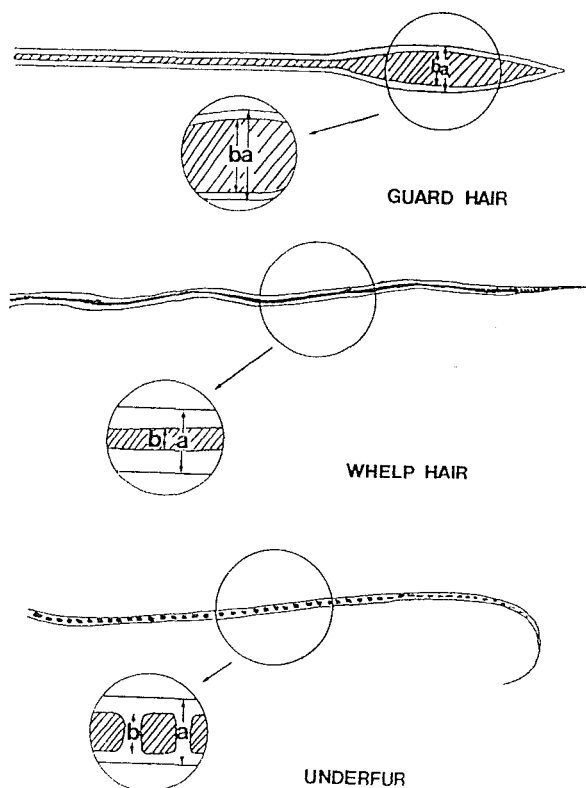


Fig. 1. Measurement position of medulla/whole fiber (b/a).

Observations of hairs using a scanning electron microscope (SEM) were done by the methods described in a previous paper (Kondo *et al.*, 1985). Observations were made by a JSM-T20 SEM at 19Kv.

Results and discussion

The thickness of hair and the ratio of medulla to whole hair thickness are shown in Table 1.

Guard hair ... a and b of the thickest part of the lanceolate were measured and b/a was calculated.

Whelp hair and underfur ... as the thickness of the hair of both of those is uniform along most of the shaft any location near the center of the hair fiber was chosen at random for measurement and b/a was calculated.

The diameter of whelp hair in six week old mink averaged 25 μm. The guard hair taken at later stages of the experiment averaged a diameter of about 125 μm, and this values about five times that of whelp hair. The average diameter of underfur was about 13 μm or about one half that

Table 1. Thickness of hair and medulla, and ratio of medulla to whole hair thickness in mink.

Weeks old	whole hair (μm) x ± SE	Medulla (μm) x ± SE	Medulla/Whole hair
(Guard hair)			
6	25.0±2.3	11.2±1.6	0.44
10	97.2±5.0	62.5±4.2	0.64
12	119.5±1.8	83.0±1.5	0.69
14	127.3±2.9	92.3±3.0	0.73
16	121.3±2.0	86.8±1.6	0.72
20	126.9±2.9	92.7±2.4	0.73
24	130.5±1.7	91.1±1.4	0.70
26	132.1±1.2	92.1±1.4	0.70
(Underfur)			
6	25.0±2.3	11.2±1.6	0.44
10	16.3±0.6	7.3±0.4	0.45
12	13.4±0.5	5.9±0.3	0.44
14	14.0±0.4	6.3±0.3	0.45
16	13.9±0.4	6.6±0.2	0.48
20	15.4±0.5	7.3±0.3	0.47
24	12.7±0.4	6.3±0.3	0.50
26	13.3±0.3	6.1±0.3	0.46

6 week: whole fur (whelp coat).

of whelp hair. The diameter of whelp hair was different from both guard hair and underfur.

The ratio of medulla to whole hair thickness was about 0.7 for guard hair, about 0.45 for underfur and about 0.44 for whelp hair. The ratios of whelp hair and underfur are similar to each other, but the ratio of guard hair showed higher values.

Though the thickness of the whelp hair was different from both that of the underfur and the guard hair, the medulla/whole hair ratio of the whelp hair was close to that of underfur.

By the observation of medullae through a light microscope, it was found that the medullae of guard hair are lattice type in appearance (Fig. 2A) and those of underfur have a ladder-like appearance (Fig. 2B). However, the tip region of the whelp hair has a ladder-like appearance similar to the medulla of the underfur (Fig. 2C-a). On the other hand, the medulla in the middle region of the whelp hair was lattice-like in appearance and is therefore similar to guard hair (Fig. 2C-b).

Generally there are some differences between the shape of the guard hair and that of the underfur.

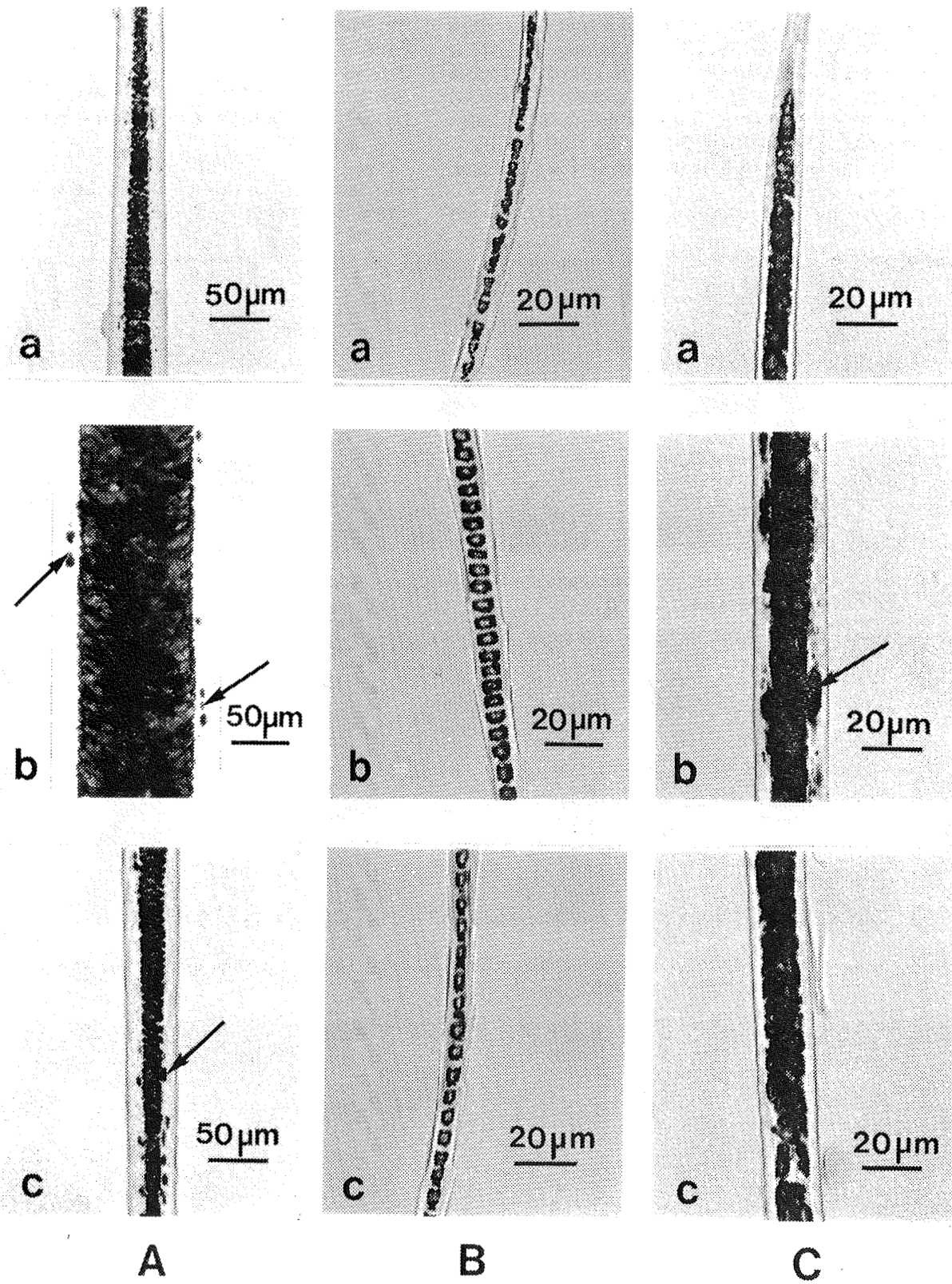


Fig. 2. Light micrographs of mink hair; guard hair (A), underfur (B), whelp hair (C); tip region (a), middle region (b), and root region (c).
 ← : Melanin granules in clumps.

The thickness of underfur is more or less uniform from root to tip but the guard hair has a lance-

like shape, that is thinner near the root and broader near the tip.

When guard hair, whelp hair and underfur were carefully examined under a light microscope, it was observed that whelp hair and guard hair have melanin granules in clumps (arrows in fig. 2) while underfur do not. The clumping of melanin granules in whelp hair (arrow in Fig. 2C-b) is larger than in guard hair (arrows in Fig 2B-b,c).

Shakelford (1948) and Nes et al. (1988) reported

the clumping of melanin granules in the hair from some kinds of minks and foxes with a Chediak-Higashi Syndrome. The clumping of melanin granules observed in this experiment shows similar morphology to that noted by Shakelford and Nes et al.

The scales of the three types of hairs were observed with SEM (Fig. 3, 4, 5).

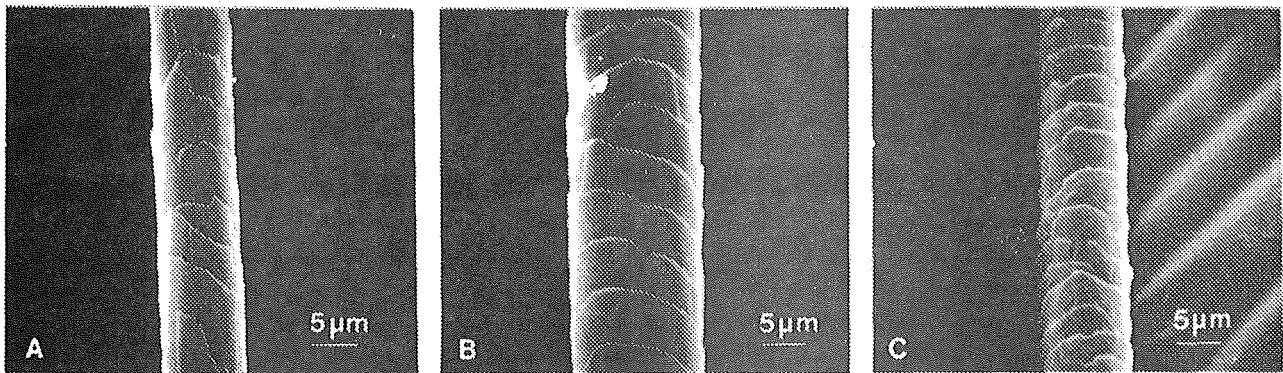


Fig. 3. Scanning electron micrographs of tip region of mink hair; guard hair (A), underfur (B), and whelp hair (C).

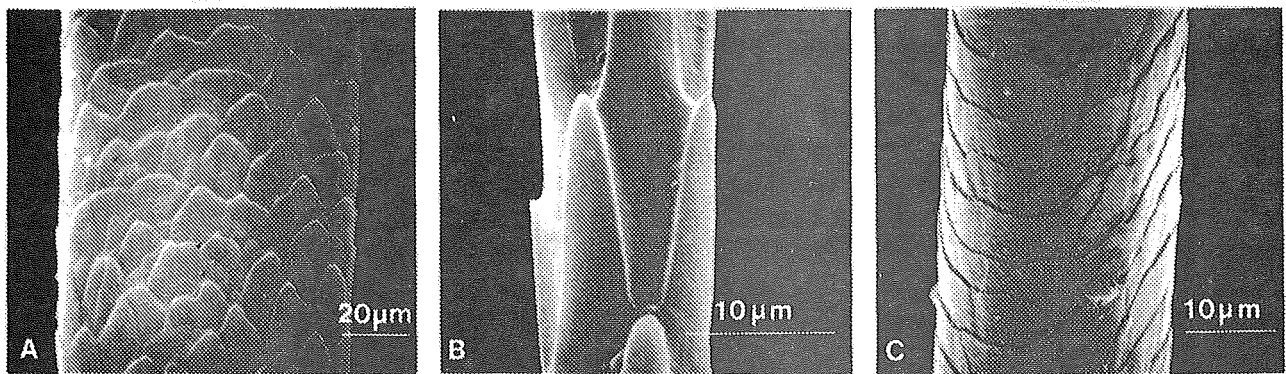


Fig. 4. Scanning electron micrographs of middle region of mink hair; guard hair (A), underfur (B), and whelp hair (C).

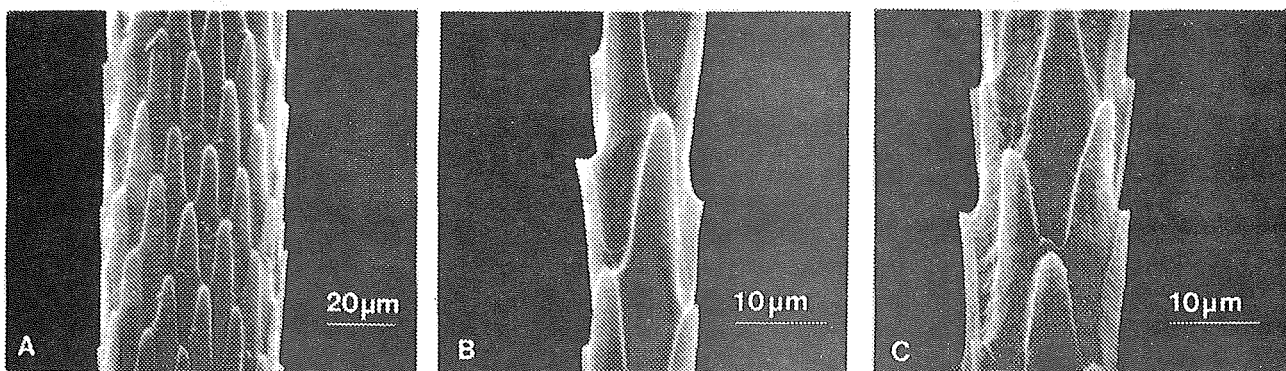


Fig. 5. Scanning electron micrographs of root region of mink hair; guard hair (A), underfur (B), and whelp hair (C).

It was found that the structure of the scales is basically the same at the root region in all three types of hair. At the root region of the hair, the

upper portion of the scales have a thorn-like appearance, termed "Diamond petal" or "Pectinate" by Wildman, Appleyard and Brunner (Wildman,

1953; Appleyard, 1960; Brunner and Coman, 1974), but these thorn-shaped scales gradually broaden toward the middle of the shaft. It is the number of thorn-shaped scales that presents the only significant difference in the scales near the root of the three types of hair (Fig. 3). It seems that the number of the thorn shaped scales depends on the hair thickness (Table 1). On the other hand, the scale pattern at the middle part is different in the three types of hair; an irregular petal for the guard hair, a thorn shape for the underfur and an irregular wave mosaic for the whelp hair (Fig. 4). But the scale pattern at the tip region shows a similar shape for all three types of hair (Fig. 5).

When the whelp hair was cut longitudinally the scanning electron micrograph was shown in Fig. 6.

The interior of the hair shaft is divided into numerous cavities, indicating the insulation effect is high. Granular materials of various sizes and shapes like melanin granules were found in clumps and seemed to be embedded in the walls of the medulla (arrow in Fig. 6B).

It is considered that the clumping of granular materials found by a scanning electron microscopic observations corresponds to that (arrows in Fig 2) observed under a light microscope.

The results obtained from above observations using a SEM and a light microscope show that whelp hair is different morphologically from guard hair and underfur.

Acknowledgements.

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

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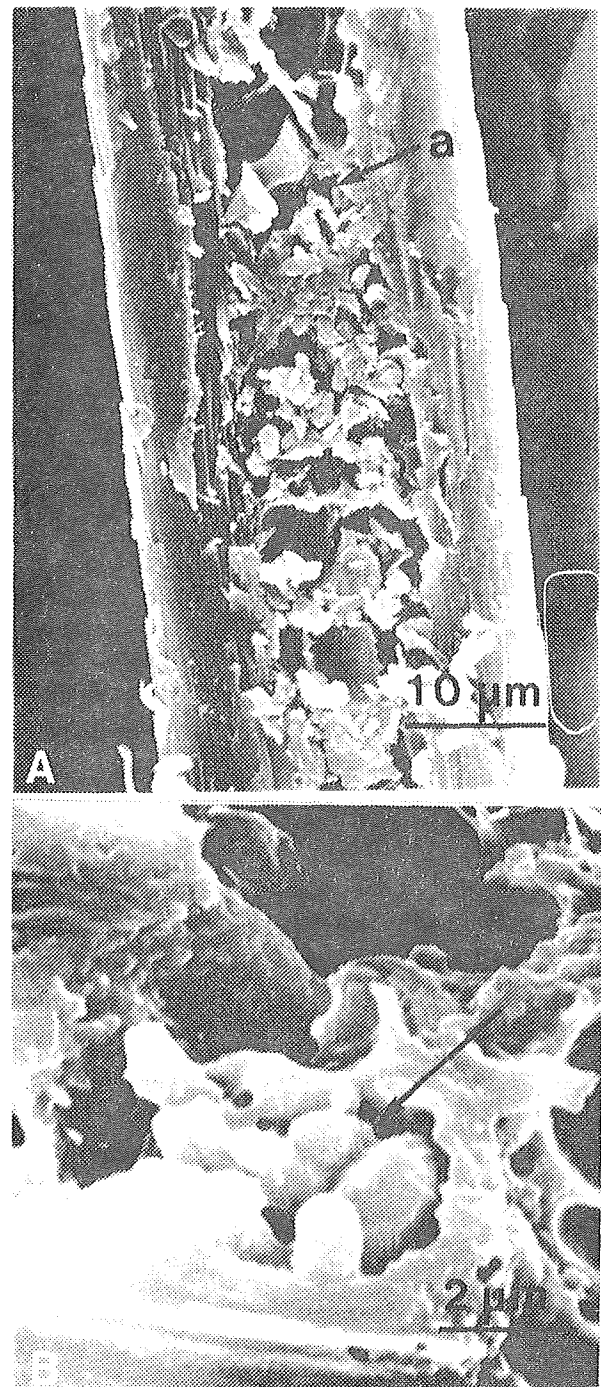


Fig. 6. Scanning electron micrographs of thick longitudinal section of whelp hair in mink.
B: Magnification of (a); melanosome embedded in medulla.

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Beautiful Fur Animals – and their colour genetics

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

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

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*Original Report***Body water space and body water turnover
in mink females***Asbjørn Brandt**National Institute of Animal Science
Foulum, P.O.Box 39, DK-8830 Tjele***Abstract**

The applicability of the isotope tracer dilution technique applying tritium labelled water for the determination of total body water space, total body water turnover rate and estimating total body fat and fat-free wet body weight in mink females of different states of hydration was investigated.

The results demonstrated that the technique gave values comparable to those of other larger mammalian species and that it was manageable as an *in vivo* method in mink. Thus female mink with nursing sickness symptoms were extremely dehydrated and the amount of estimated fat was negligible, both states being in agreement with the patho-physiological state of nursing sickness and the necropsy.

Introduction

The use of isotope tracer dilution technique is a recognized *in vivo* method for the determination of the different body components (Ried, 1967). The method is also applicable for the determination of total body water space (TBWS) and total body water turnover rate (TBWR) in larger animals (>100g), where the coefficient of variation is less than 5%.

The water content of the adult animal is in general constant and constitutes a fixed proportion of the fat free body weight which means that the animal is in water balance.

Pregnant or growing animals are in general in a positive water balance as a result of the high metabolism.

A number of normal physiological and pathological conditions result in a negative water balance. Water loss exceeding 15-20% of the total water volume will be fatal.

When considering the water balance in mink females, the interesting point is the lactation period during which the development of nursing sickness is common among high yielding females. The disease is characterized by anorexia, somnolensia, dehydration, and cachexia (Brandt, 1983; Brandt, 1984; Brandt & Henriksen, 1987).

In the present report, the applicability of the isotope tracer dilution technique applying tritium labelled water (TOH) for the determination of total body water space, total body water turnover rate and estimating total body fat and fat-free wet body weight (FFWW) in mink females was evaluated.

The results were compared to those of larger mammalian species and mink females of different states of hydration and with nursing sickness symptoms.

Materials and methods

On May the 18th 1986, eight Pastel mink females with different physiological characteristics were selected for the investigation and submitted to different treatments as shown in Table 1.

Table 1. Total body water space (TBWS), total body water turnover rate (TBWR) and total body fat (TBF) of mink females determined by TOH-dilution method.

Female no.	1	2	3	4	5	6	7	8
Number of kits	0	0	6	6	6	6	6	6
Body weight (BW) (g)	871	933	791	724	531	584	946	642
Nursing sickness symptoms	-	-	-	-	+	+	-	-
Emaciation	-	-	+	+	+	+	-	-
Weaned			+	+	+	+	-	-
Treated with 40 ml isotonic saline i.p.	-	+	-	+	-	+	-	+
<hr/>								
TBWS (ml)	556	653	518	549	398	402	614	456
% of body weight	64	70	66	75	75	69	65	71
<hr/>								
TBWR (day ⁻¹)								
6 h.*	.20	.34	.21	.40	.10	.23	.18	.36
24 h.	.24	.30	.28	.43	-	-	.17	.35
48 h.	.20	-	.30	.46	-	-	.18	-
<hr/>								
TBF (g)	111	40	83	0	0	34	107	19
% of body weight	13	5	10	0	0	6	11	3
<hr/>								

* Determined 6, 24 and 48 hours after equilibrium.

One hour after the intra peritoneal injection of isotonic saline solution the females were weighed. The animals were then anaesthetized (2.5 ml Althesin/kg b.w., i.p.), and 2 ml isotonic saline solution added 100 μ Ci TOH was injected intra peritoneally.

The state of total labelling (equilibrium) was presumed to have taken place within a few minutes after the injection.

Blood samples of 1 ml were taken by v. jugularis puncture 0.5, 6, 24, 48 and 72 hours after the injection of the isotope and submitted to the following treatment:

Two hundred μ l blood and 200 μ l trichloroacetic acid (1.2 mol/l) were pipetted into a 2.5 ml test tube. The tube was corked, shaken vigorously for 1 min. using a vortex mixer and centrifuged (6000 x G in 10 min.).

The supernatant (200 μ l) was transferred to a 10 ml scintillation vial containing 10 ml Agua Luma prior to vigorous mixing in shaker and counted in a LKB cooling scintillation counter with external standard.

The results were the means of complete double determinations of each sample.

The animals were euthanized by an overdose of Mebumal-Na.

The total body water space (TBWS) was calculated using the formula: $TBWS = (SD \times VD / SE) - VD$ where SD = the specific concentration of the dose, VD = volume of the dose, SE = the equilibrium specific concentration of isotope water.

The total body water turnover rate (TBWR) was calculated using the formula: $TBWR = (\ln(S1/S2))/(t2-t1)$ where $S1$ and $S2$ = the initial and final specific TOH concentration, $t2-t1$ = the time laps from the initial and terminal sample taken and \ln = the natural logarithm.

As the proportions between water, protein and minerals are constant in the mature animal, Pace and Ratburn have suggested 0.732 as an average inter species value for the proportion between total body water space (TBWS) and fat-free wet body weight (FFWW): $FFWW = TBWS/0.732$.

Therefore the amount of total body fat (TBF) could be calculated: $TBF = BW - FFWW$, where BW is the body weight.

Results

The results are shown in Table 1. As a result of the animals' performance it was not possible to

take all samples, and as a consequence females no. 5 and 6 were euthanized due to severe nursing sickness. The autopsy revealed severe emaciation, lack of body fat and dehydration.

Discussion

Due to the nature of the pilot investigation the number of observations were not relevant for statistical analysis and the following discussion was based on simple comparison between the animals.

Applying the dilution principle using tritium labelled water (TOH) for the determination of the total body water space (TBWS) is based on the assumption, that TOH will dilute in the same manner as water (HOH) in the body water compartments.

In general, the method results in higher TBWS values compared to measuring TBWS by desiccation.

The error is due to evaporation from the skin, the mucous membranes, expiration and the incorporation of TOH in non-aqueous substances (Holleman & Dieterich, 1975).

The total water space can be divided into the extra and intra cellular compartments. The size of these compartments is not constant, but dependent on the prevailing osmotic pressure.

The effect of injecting isotonic saline solution was an expansion of the extra cellular compartment with a concomitant raise in the TBWS. The dynamic is reflected in the results when comparing the pairs in each treatment group.

The injection of the isotonic saline solution also causes an enhanced water turnover measured as total body water turnover rate (TBWR).

As mentioned the total body fat (TBF) can be estimated on the assumption that the TBW:FFWW of mature female mink is constant, where FFWW is the fat-free wet body weight.

This estimation can only be correct if the variation (the value) of FFWW is known for normal Pastel mink females and assuming that the animal is in a neutral water balance. The latter should in general be the case if the animal drinks ad libitum without being exposed to environmental circumstances that may alter the water balance. As previous investigations on TBWS, TBWR, FFWW and TBF in mink were lacking, it was not

possible to compare the values to e.g. direct methods. The magnitude of the values were comparable to those estimated in other larger mammals (Ried, 1967).

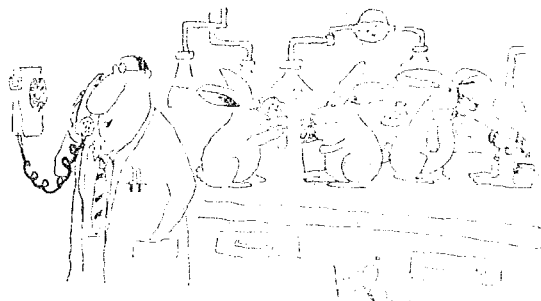
As could be anticipated the mink females with nursing sickness symptoms were extremely dehydrated - about 20% lower depending on the fat-free dry weight. In general, a water loss exceeding 15-20% of the total water volume is considered fatal. Also the amount of estimated fat was negligible, both states being in agreement with the patho-physiological state of nursing sickness and the necropsy.

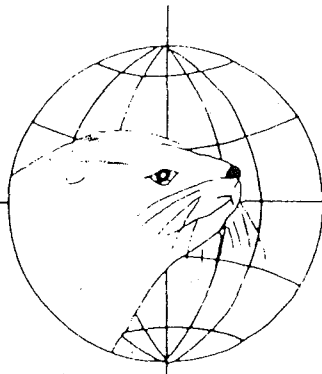
The reason for the lactating females not showing a larger TBWR than the non-lactating can be explained by the relative low milk yield was a result of the manipulations and the terminal stage of the lactation.

In conclusion the investigation demonstrated the applicability of the isotope tracer dilution technique applying tritium labelled water for the determination of total body water space, total body water turnover rate and estimating the total body fat and the fat-free body weight in mink females of different states of hydration.

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Preliminary Report

The Chediak-Higashi Syndrome (CHS) in Mansfield Pearl Foxes (Omberg Pearl, Vulpes vulpes) and in Arctic Blue Foxes (Alopex lagopus) is caused by gene mutation in homologous loci

*Norodd Nes, Department of Animal Husbandry and Genetics,
Øystein V. Sjaastad, Department of Physiology and Nutrition,
Norwegian College of Veterinary Medicine, Oslo, Norway
Bjørn Liium, Department of Pathology, National Veterinary Institute/
Norwegian College of Veterinary Medicine, Oslo, Norway*

The Chediak-Higashi syndrome (CHS) has been demonstrated in humans, mink, cattle, mice, killer whales, cats (*see Padgett, 1979*), in the silver fox mutant Omberg Pearl (=Mansfield pearl, Vulpes vulpes, *Nes et al., 1985*) and also in the blue fox mutant called Arctic blue (Alopex lagopus, *Nes et al., 1983, Sjaastad et al., 1989*).

In all species in which CHS has been demonstrated, except the killer whale where genetic data are unavailable, the disorder is known to be inherited as an autosomal recessive trait.

The disease was first reported in humans by *Beguez-Cesar* in 1943. He described abnormally large granules in the leucocytes of some children in a Cuban family. CHS-individuals have pale-coloured eyes and hairs caused by a clumping of melanin in big, irregular granules.

Prominent features of this anomalous condition is a bleeding tendency and a low resistance to bacterial and viral diseases. Most of the children having CHS die before the age of 10 years. The bleeding tendency has been shown to be due to a platelet storage defect. The content of serotonin, ADP (adenosine-diphosphate) and ATP (adenosine-triphosphate) in the platelets is greatly reduced.

Both the Omberg pearl/Mansfield pearl and the Arctic blue fox exhibit the clinical signs and the changes in melanin distribution and platelet content characteristic of CHS.

As to the genetics of CHS, the conformity of the manifestations of the disease in different species

indicates mutations in homologous loci. This hypothesis could be tested by an inter-species crossing between Arctic blue (gg) and Omberg pearl (Mansfield pearl, ss). The gene symbols g and s are according to the Scandinavian gene symbol system (*Nes et al., 1983*).

Results to be expected:

1. If the genes which have mutated are placed in homologous loci in the two species: All cubs should have a light fur colour, other CHS traits and be sterile.
2. If the mutated genes were present in different loci: All cubs should be Blue frost, which means a nearly black fur colour, no signs of CHS and be sterile.

Four Arctic blue females were inseminated with semen from an Omberg pearl male. One of the females gave birth to a litter of 3 inter-species hybrid cubs, one of which was stillborn. The others were apparently viable, but both died after 1-2 days from lack of milk.

The cubs, the stillborn one included, had a light yellow-grey fur colour. The melanin in the hairs was unevenly distributed and to a large extent agglomerated into irregular granules. Such a melanin agglomeration was also found in the pigmented retinal cells of the eyes.

We may thus tentatively conclude that the inter-species hybrid cubs were affected by CHS. In this

crossing experiment the gene from Omberg pearl (*Vulpes vulpes*) and the gene from Arctic blue (*Alopex lagopus*) have acted as a homozygous pair of genes resulting in the Chediak-Higashi syndrome in the hybrid cubs.

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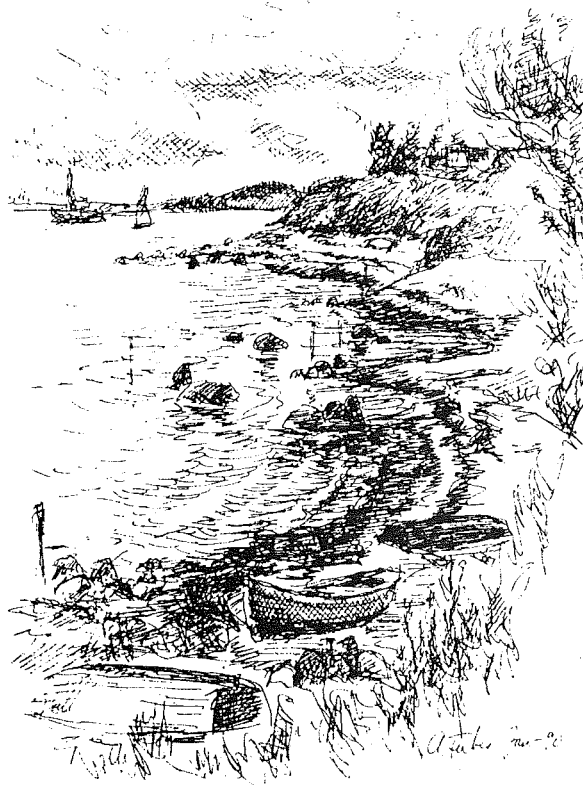
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Sjaastad, Ø.V., Blom, A.K., Stormorken, H. and Nes, N. 1989. Adenine Nucleotides, Serotonin and Aggregation Properties of Platelets of Blue Foxes (*Alopex lagopus*) with the Chediak-Higashi Syndrome. *American Journal of Medical Genetics* (In press).



Genetic polymorphism of IgG in mink. 1. Identification of 8 allotypes.

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

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

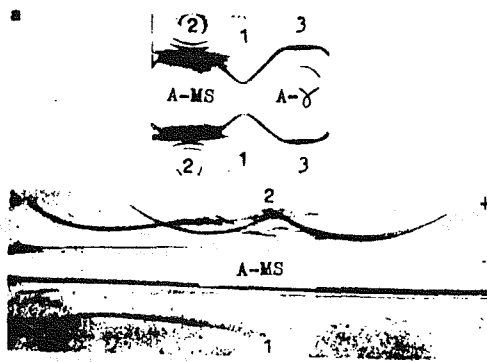


Fig. 1. Double immunodiffusion (a) and immunoelectrophoretic (b) analysis of purified preparations of mink IgG. Wells contain: A-MS, rabbit antiserum against whole mink serum; A- γ , rabbit antiserum against mink IgG; 1, mink IgG preparation analyzed; 2, mink serum; 3, control IgG.

Expl clin. Immunogenet. 3, 10-19, 1986. 1 table, 7 figs., 34 references. Authors' abstract.

The mink proopiomelanocortin gene: characterization of cDNA and chromosomal localization.

T.M. Khlebodarova, G.I. Karasik, N.M. Matveeva, O.L. Serov, S.Y. Golovin, A.A. Bondar, V.A. Karaginov, I.S. Morozov, S.M. Zelenin, N.P. Mertvetsov.

A cDNA library from the mink pituitary was screened using as probe a synthetic oligodeoxyribonucleotide, 5'-TTCATGACCTCCGA-3', corresponding to the endorphin region of bovine proopiomelanocortin (POMC) cDNA. As a result, several clones containing inserts complementary to POMC mRNA were identified. The sequence of one of the fragments (585 bp, 65% of the total

length of mRNA) was determined. A high degree of homology (over 80%) among the primary structures of sequences from mink, man, and bovine cDNA POMC was established. With the cloned mink cDNA fragment as probe, the DNAs from mink-Chinese hamster hybrid clones were studied. The results of segregation analysis of mink POMC sequences and mink chromosomes in the mink-Chinese hamster panel allowed us to assign the POMC gene to mink chromosome 11.

Genomics 2, 185-188, 1988. 1 table, 2 figs., 28 references. Authors' summary.

Localization of the α_2 -macroglobulin gene and *Lpm* gene family on mink chromosome 9.

V.I. Yermolaev, G.I. Karasik, T.M. Khlebodarova, N.M. Matveeva, M.R. Mullakandov, A.M. Nayakshin, T.V. Shumny, N.B. Rubtsov, O.L. Serov, O.K. Baranov.

Using cloned cDNA for human α_2 -macroglobulin (*A2M*) as a probe, mink-Chinese hamster hybrid cells were analysed. The results allowed us to assign a gene for *A2M* to mink chromosome 9. Breeding tests demonstrated that the *Lpm*-locus coding for other related α -macroglobulin protein and the gene for peptidase B (*PEPB*) are linked 11 ± 3 cm apart. The *PEPB* gene is located on mink chromosome 9, and hence, the *Lpm*-locus is on the same mink chromosome. The relationship of the genetic systems controlling the isotypically different α -macroglobulins in mink serum are discussed.

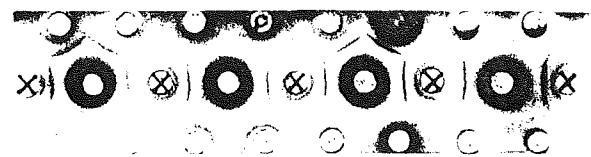


Fig. 1. Allotyping of *Lpm1* in mink sera by Ouchterlony double diffusion. \times - a well with control mink serum; the other wells in the middle row contain antiserum against allotype *Lpm1*; the bottom and top wells are with the tested serum sample

Theor Appl Genet 78, 93-96, 1989. 2 figs., 2 tables, 18 references. Authors' summary.

Mink-mouse hybridomas that secrete mink immunoglobulin G.

N.L. Galakhar, S.N. Djatchenko, I.I. Fomicheva, L.V. Mechetina, A.V. Taranin, E.S. Belousov, A.M. Nayakshin, O.K. Baranov.

Optimum conditions were established to obtain

mink-mouse interspecific hybridomas secreting mink IgG in fusions of mouse myelomas with mink immune spleen cells. Minks were immunized with allogeneic IgG, and the spleen cells were fused with three mouse myeloma lines. P3-X63-Ag8.653, NSO and Sp2/0-Ag14. Of these, P3-X63-Ag8.653 and NSO were found to be the best fusion partners giving the highest yield of hybrid clones and number of IgG secreting clones. Cloning of mink-mouse hybridomas was efficient when BALB/c *nu/nu* peritoneal and spleen cells were used as feeders. The ten clonal lines produced secreted intact mink IgG molecules as shown by SDS-PAGE and subsequent immunoblotting. The secretion level of IgG ranged from 5 to 200 ng/ml in the clonal lines.

Journal of Immunological Methods, 115, 39-43, 1988. 1 table, 2 figs., 14 references. Authors' abstract.

Changes in melanin granules in the fox due to coat color mutations.

M.W. Bradbury, J.D. Fabricant.

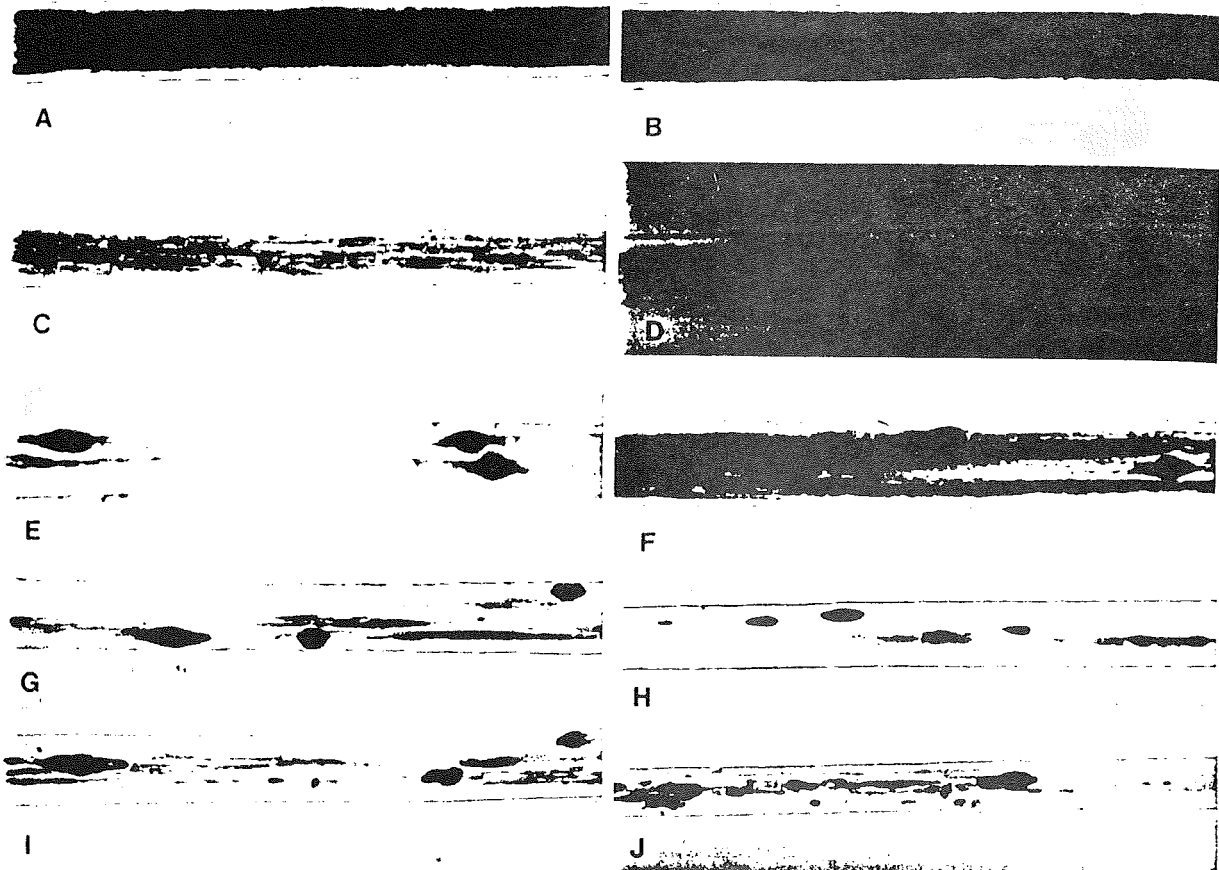


Figure 1. Hair samples from several coat color phenotypes in the fox. All photographs were taken of apical regions of guard hairs in which medullary air spaces are reduced to a minimum. Final magnification, 400x. (A) Red hair, the wild-type, showing an even distribution of small pheomelanosomes. (B) Standard silver (*b/b*) hair with larger granules containing eumelanin. (C) Fromm brown (*b/b bf/bf*) hair with brown melanin granules that are rounder and smaller than in silver. (D) Collicott brown (*b/b cb/cb*) hair with granules similar to Fromm brown, but the brown color is darker and the granules are slightly larger. (E) Eastern Pearl (*b/b pe/pe*) hair demonstrating clumping of most of the melanin granules, leaving a few free granules scattered throughout the hair. (F) Mansfield Pearl (*b/b pm/pm*) hair also showing clumping of granules, but many more individual granules are present. (G) This Amber (*b/b pe/pe bf/bf*) hair shows a clumped distribution of brown melanin granules that would be expected from the action of independent genes. (H) Fawnglo (*b/b pe/pe cb/cb*) hair showing a clumped distribution of dark brown granules. (I) This Autumn Gold (*B/b pe/pe bf/bf*) hair shows the results of the interaction of three loci, with the clumped distribution of red-brown melanin granules. (J) A Red Amber (*B/B pe/pe bf/bf*) hair comparable with that in I, but somewhat redder in color because of homozygosity for *B*.

Family of Lpm genes in chromosome 9 of american mink.

V.I. Ermolaev, M.R. Mullakandov, O.L. Serov O.K. Baranov.

Results of a test mating between males heterozygous at the Lpm (lipoprotein) and peptidase B loci and females homozygous at both loci indicated that the 2 loci were linked. The peptidase B locus had previously been mapped to chromosome 9.

Translated from Doklady Akademii Nauk SSSR, 294, 5, 1232-1234, 1987. 1 table, 15 references. (0012-4966/87/0506-0315 (\$12.50)). Plenum Corporation, 1987. CAB-abstract.

Hair samples from 11 coat colour phenotypes of the fox were examined microscopically to determine the effects of several mutations on melanin granule colour and distribution. Standard silver

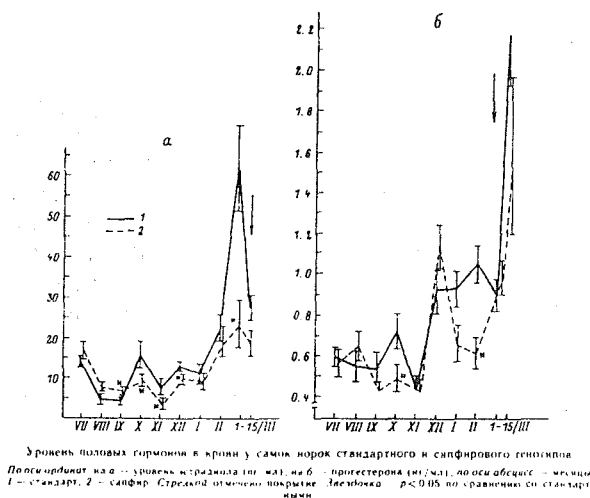
(b/b) causes the production of eumelanin rather than the pheomelanin produced in the wild-type red fox. Fromm brown (bf/bf) and Collicott brown (cb/cb) change the shape of the granules, and convert eumelanin to brown and dark brown resp. The colour dilution of Eastern Pearl (pe/pe) and Mansfield Pearl (pm/pm) is caused by clumping of granules in specific manners. Hairs from animals expressing more than 1 mutant gene, such as Amber (b/b pe/pe bf/bf), show the colour and distribution of granules expected from interactions of independent loci.

Journal of Heredity, 79, 2, 133-136, 1988. 2 figs., 9 references. CAB-abstract.

Endocrine function of gonads and adrenals in female minks of two genotypes in postnatal ontogenesis.

R.G. Gulevich, D.V. Klochkov.

Radioimmune assay has been made of the content of estradiol and progesteron in the blood (from July to March including the 7th day after mating), as well as on the level of estradiol and progesteron production in young females of the standard and mutant sapphire minks in November. It was shown that within certain periods, estradiol and progesteron content of the blood was significantly higher in the standard animals. Gonadal production of estradiol, as well as progesteron production both by the gonads and adrenals in November, were similar in females of both genotypes. It is suggested that sapphire minks have another pattern of correlation between estradiol content of the blood and gonadal production of estradiol as compared to that in standard animals.



Zh. Evolyuts. Biokhim. i Fiziol., 24, 3, 445-450, 1988. 1 fig., 2 tables, 8 references. In RUSS, Su. Engl. Authors' summary.

Separation of X and Y chromosome-bearing mammalian sperm by DNA content using flow cytometric analysis and sorting.

L.A. Johnson.

The ability to influence the sex ratio of animal progeny would have a significant impact on the animal industry. Isolation of nearly pure populations of X- og Y-bearing sperm is needed in order to investigate potential markers of X or Y sperm. DNA analysis, based on the only established X and Y sperm difference (DNA mass), was used to separate sperm populations for the bovine, ovine, *Chinchilla laniger* and the vole *Microtus oregoni*. Ejaculated or epididymal sperm from each species were washed, fixed with ethanol or sonicated slightly, stained with Hoechst 33342, analyzed and sorted (80 sperm/sec) based on relative DNA content using a Modified EPICS V flow cytometer/cell sorter (Cytometry 7:268, 1986). Sorted populations (150,000 each) of X- and Y-bearing sperm nuclei were reanalyzed to verify their DNA content. Mean X-Y (%) DNA difference based on flow analysis was: bull, 3.9; ram, 4.2; chinchilla, 7.5; vole, 12.5. Purities of the populations for X and Y sorts, respectively, were: bull, 93 and 92%; ram, 94 and 97%; chinchilla, 96 and 95%; vole, 92 and 96%; (N = 4 to 10). Separated sperm nuclei from the chinchilla and vole have produced pronuclei after microinjection into hamster eggs. Sorting of bull and ram sperm into X and Y populations is the first verifiable separation of X and Y sperm of domestic animals.

Biology of reproduction, 36, 1, 80, 1987. Only abstract recieved. Author's abstract.

The performance traits of sables in intra- and inter-line selection of mating pairs.

E.G. Snytko, I.F. Kirillushkin.

For 1650 females from 5 lines, the percentage not conceiving was 21.2, 40.0, 0.0, 0.0 and 20.0 resp., and litter size averaged 3.93, 3.04, 3.43, 4.25 and 3.25 at birth and 3.69, 2.72, 3.14, 3.25 and 2.75 at weaning, the difference between the first 2 lines being significant. For matings of males from 6 lines with females from 9 lines, litter size ranged from 1.0 to 4.67 at birth and from 0.67 to 4.50 at weaning. For males and females from 8 lines, linebred and crossed in all possible combinations, line differences in male fertility were more apparent than those in female fertility. For linebred animals, points evaluation ranged from 4.09 to 4.38 for body size, from 4.07 to 4.25 for fur density, and from 3.91 to 4.23 for colour.

The corresponding ranges for linecross animals were 4.07-4.44, 3.93-4.16 and 3.68-4.04.

Krolikovodstva, 32, 49-54, 1985. 4 tables. In *RUSS. CAB-abstract*.

The performance of standard mink of brown and dark brown shades.

V.V. Ustimenko.

In 1983 and 1984 for 819 and 1140 young brown females and 681 and 1820 adult brown females resp., and for 2310, 1872, 3160 and 3081 dark-brown females in similar groups, the percentage of females that did not conceive was 19.2, 24.0, 12.9, 20.9, 12.5, 18.9, 10.8 and 14.6, and litter size averaged 6.57, 6.33, 6.97, 6.32, 6.65, 6.47, 6.75 and 6.60 at birth and 4.64, 4.40, 5.56, 4.78, 5.11, 4.64, 5.39 and 5.14 at weaning. For 105 males and 105 females resp., body weight averaged 1060 and 770 g on 1 July and 2890 and 1520 g on 1 Nov. for brown animals, and 1040, 760, 2560 and 1400 g resp. for dark-brown animals. For 298 brown males and 115 brown females and 117 dark-brown males and 111 dark-brown females, the percentage of extra-large pelts was 99.3, 0.9, 90.6 and 1.9 resp., the percentage of large pelts 0.7, 91.3, 9.4 and 83.8, and the percentage of medium pelts 0, 7.8, 0 and 14.4; the percentage of faultless pelts was 50.7, 57.4, 53.9 and 64.9 in the 4 groups.

Krolikovodstva, 32, 44-49, 1985. 3 tables, 1 fig., 2 references. In *RUSS. CAB-abstract*.

Changeability of physiological indices in hybrids of the skunk and ferret in postnatal period.

1. Medulla.

R. Szymeczko.

Biooptical examination of medulla of 82 hybrids skunk and ferret has shown high dynamics of growth changes which depended first of all on the behaviour of nuclear cells belonging to three systems: erythroblastic, Mieloblastic and lymphatic ones. It has been found out that the medulla of 3-30 days old skunk and ferret shows decided superiority of erythroblastic cells over the number of cells of other systems. At older animals lower homogenous activity of erythroblastic system and the percent increase of granuloblasts and lymphocytes have been observed.

Panstwowe Wydawnictwo Naukowe; Warszawa-Poznan, 33, 137-148, 1986. 6 figs., 20 references. In *POLH, Su. ENGL, RUSS. Author's summary*.

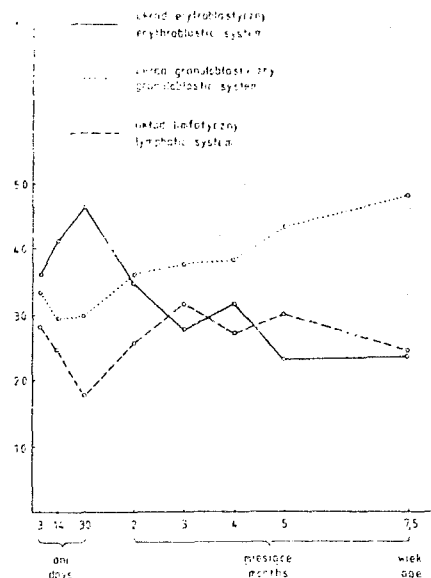


Fig. 1. Curves of erythroblastic, granuloblastic and lymphatic system development in hybrids of the skunk and ferret in postnatal period

New colour varieties of foxes at the Fur Animal Breeding Station at Tirgu-Mures.

S. Sava.

Silver fox males were mated with red fox females, and red fox males with silver fox females. Of 251 cubs, 50.6% were red and 49.4% were silver. When hybrids were mated inter se, 33.3% of the progeny were silver and 66.7% were red.

Revista de Cresterea Animalelor, 36, 3, 16-20, 1986. 14 references. In *ROMN. CAB-abstract*.

Progeny testing of AI males in fox breeding.

Jesper Clausen.

The article comments on how the progeny testing of fox males accepted for artificial insemination takes place in Denmark. Then different calculation methods concerning the breeding value of the males are discussed. One of these calculation methods, which are likely to be used in Denmark in the future, implies a correction for the farm effect by means of the skin sale of the past year and the SAS procedure LSMEANS.

NJF Seminar 70, 1989. 3 tables, 2 figs., 7 pp. In *DANH. Author's abstract*.



Reproduction and fertility in the mink (*Mustela vison*).

C. Sundquist, A.G. Amador, A. Bartke.

A review of work on reproduction in male and female mink, including the role of the hypothalamic-pituitary axis, oogenesis, ovulation, testis development and spermatogenesis, implantation, fertilization and parturition.

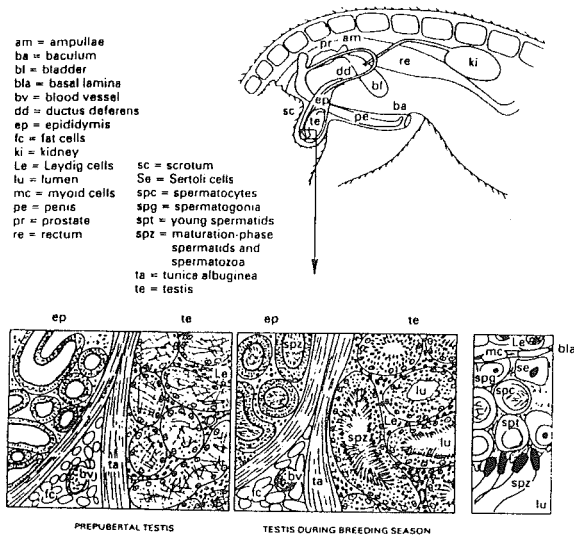


Fig. 5. The mink is characterized by profound seasonal changes in testicular activity. The schematic drawing shows typical features of a testis during regression (May–October) and during the mating season (March).

Journal of Reproduction and Fertility, 85, 2, 413–441, 1989. 5 figs., 10 pp of references. CAB-abstract.

Long-term effects of pinealectomy on testicular function, luteinizing hormone-releasing hormone hypothalamic system, and plasma prolactin levels in the mink, a short-day breeder.

L. Boissin-Agasse, J.M. Jacquet, A. Lacroix, J. Boissin.

Experiments in minks, as in a number of other seasonal breeders, clearly demonstrate that the pineal gland is essential for the photoperiodic control of reproduction. While maintenance of pineal-intact minks under natural photoperiods results in a set of seasonally appropriate changes in testicular activity, pinealectomized minks undergo none of these changes but rather remain sexually inactive as under long-day conditions. Thus, the consequences of pinealectomy differ from one photoperiodic species to another, but the unifying feature is the organism's need for the pineal gland to respond appropriately to changes in day length. Although the precise mechanism by which the pineal regulates hypothala-

mic-pituitary gonadal function remains unknown, the results of the present study indicate that, in the mink, luteinizing hormone-releasing hormone axonal transport is affected by pinealectomy. Furthermore, our results suggest that the pineal does not act exclusively upon the neuroendocrine-gonadal system but also acts on other functions that are influenced by photoperiod. Pinealectomized minks left in natural conditions cannot adjust their prolactin secretion in response to either long or short photoperiods. Operated animals continued to have plasma prolactin variations but at irregular intervals and with no apparent relation to the time of the year. The data strengthen the hypothesis that melatonin may act at some point on the hypothalamic neuroendocrine systems, which regulate the two functions differently, and that melatonin is not an anti- or progonadal substance but rather a seasonal transducer.

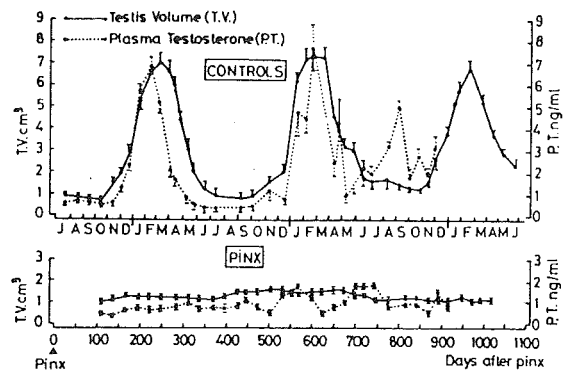


Fig. 1. Annual variations in testicular volume and plasma testosterone levels in pineal-intact minks (CONTROLS) and effect of pinealectomy on testicular activity (PINX).

Journal of Pineal Research 5, 385–396, 1988. 4 figs., 41 references. Authors' summary.

Photoperiodic control of endocrine function in gonads of silver foxes and change in it during domestication.

L.V. Osadchuk, L.N. Trut.

Levels of sex hormones (estradiol and progesterone) were investigated in domesticated and undomesticated female silver foxes maintained in different photoperiodic conditions. Length of the light-dark cycle constituted 24 h. Total length of the light part of the cycle was 9.5 h, of which 7 h consisted of natural illumination and 2.5 of artificial light presented to animals during the dark part of the day in the morning, evening, or night. It was shown that additional illumination influences the level of hormones and sexual activity depending on what time of day it was presented to animals. Nighttime exposure to light exerted a substantial stimulating effect on con-

tent of sex hormones in blood and domesticated foxes proved to be more sensitive to it than undomesticated.

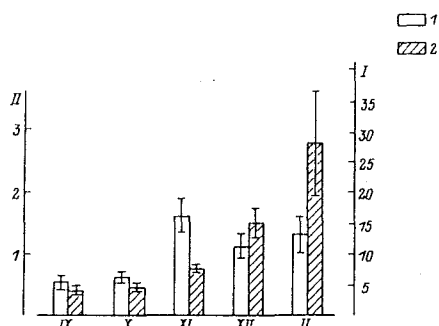


Fig. 5. Level of sex hormones in relatively wild silver fox females maintained in conditions of photoregime B and not showing signs of activation of the reproductive system. Along the ordinate: 1) estradiol (pg/ml); II) progesterone (ng/ml); 1, 2) as in Fig. 2.

Journal of evolutionary biochemistry and physiology, 2, 123-128, 1988. 5 figs., 10 references. In ENGL, RUSS. Authors' abstract.

Hormonal induction of oestrus and pregnancy in anoestrous ferrets (*Mustela putorius furo*).

R.A. Mead, S. Neirinckx.

Three doses of FSH were tested for their ability to induce oestrus in ferrets. A dose of 0-25 mg, administered twice daily, induced oestrus and breeding in most females within 6-13 days. Addition of 5 i.u. hCG during the final stages of follicular development enhanced the percentage of females with implantation sites (85%), and 23% of the ferrets so treated gave birth to kits, none of which survived for more than 3 days. This may have been due to insufficient prolactin secretion and thus inadequate luteal maintenance and milk production, as these females were maintained on a short-day photoperiod.

J. Reprod. Fert. 86, 309-314, 1989. 1 table, 18 references. Authors' summary.

Evidence that oestrogen exerts an equivalent negative feedback action on LH secretion in male and female ferrets.

R.S. Carroll, M.J. Baum.

Gonadally intact male ferrets in breeding condition, which received an aromatase inhibitor, 1,4,6-androstatriene-3,17-dione (ATD) s.c. in

Silastic capsules, had significantly more LH pulses and higher mean LH concentrations in plasma than did control males implanted with empty capsules. Aromatase activity in the hypothalamus + preoptic area and temporal lobe was strongly suppressed by ATD treatment whereas circulating concentrations of testosterone and oestradiol were not affected. These results suggest that oestradiol, formed via neural aromatization of circulating testosterone, contributes to the feedback regulation of LH secretion in breeding male ferrets just as oestradiol of ovarian origin controls LH secretion in females. No sex difference was observed in the rate at which mean plasma LH concentrations rose after the removal from gonadectomized ferrets of s.c. Silastic capsules containing oestradiol. Daily s.c. injections of oestradiol in oil caused an equivalent, dose-dependent inhibition of LH pulse frequency and mean LH concentrations in plasma of male and female ferrets. These findings suggest that the negative feedback control of pulsatile LH secretion by oestrogen is not sexually differentiated in this reflexly ovulating species. The ferret appears to differ from spontaneously ovulating mammalian species in which the female is generally more sensitive than the male to the inhibitory feedback action of oestradiol on LH secretion.

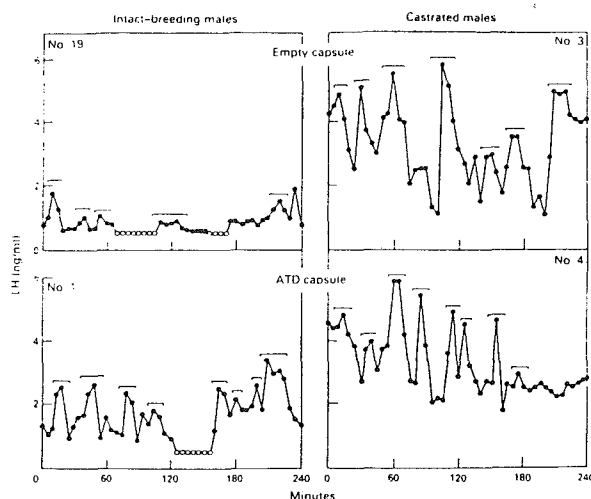


Fig. 1. Effect of s.c. administration of Silastic capsules containing the aromatase inhibitor, ATD, on plasma LH concentrations in representative male ferrets which were either gonadally intact and in breeding condition or castrated. Plasma samples were collected every 5 min via an indwelling jugular catheter. Brackets designate LH pulses as identified by the Pulsar program. Open circles (O) designate LH values below the sensitivity of the assay (0.5 ng/ml).

J. Reprod. Fert. 86, 235-245, 1989. 2 tables, 5 figs., 41 references. Authors summary.



A comparison of sperm morphology and silver nitrate staining characteristics in the domestic ferret and the black-footed ferret.

Patrick T. Curry, Terry Ziemer, Gerhard Van der Horst, Warren Burgess, Monte Straley, Robert W. Atherton, Robert M. Kitchin.

Ejaculated sperm from the domestic ferret (*Mustela putorius furo*) and the black-footed ferret (*Mustela nigripes*) were compared for differences in abnormalities and argentophilic protein distribution. Thawed domestic ferret sperm was also compared to fresh sperm to determine whether there were any effects on cell morphology due to cryopreservation. There were statistically significant differences between the two species of ferret in two of the categories scored. The domestic ferret had a higher frequency of cells that were bent in the midpiece and in the principal piece, and a higher frequency of headless and tailless cells when compared to the black-footed ferret. There were no statistically significant differences in cell morphology between the fresh and cryopreserved ejaculates of the domestic ferret employing a standard egg yolk cryoextender. Silver nitrate staining distribution was different between the two species in both the head and tail region.

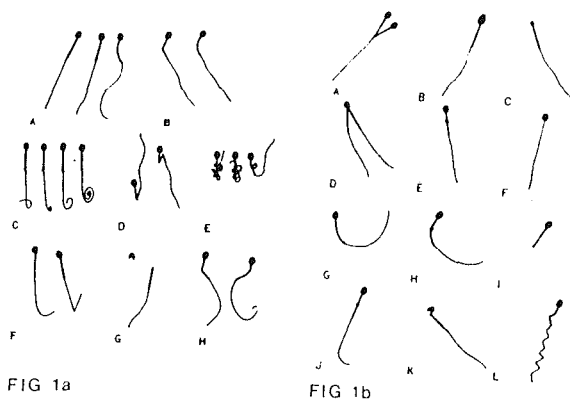


Fig 1 a: Sperm morphology categories commonly represented: A. Straight/sinusoidal (considered normal), B. bent in midpiece (single bend less than 90°), C. looped tail, D. folded in midpiece (one or two bends of 90° to 180°), E. coiled/knotted, F. bent behind midpiece, G. tail-less/head-less, H. bent in principal piece. b: Sperm morphology categories rarely represented (analyzed collectively as the category Other): A. bicephalic; B. macrocephalic; C. microcephalic; D. biflagellate; E. cytoplasmic droplet; F. missing mitochondrial sheath; G. circular tail; H. circular tail with cytoplasmic droplet; I. missing tailpiece (probably artifact); J. bent behind midpiece with cytoplasmic droplet; K. bent at neck region; L. kinked tail (probably artifact).

Gamete Research 22, 27-36, 1989. 2 tables, 3 figs., 24 references. Authors' summary.

Semen characteristics and testosterone profiles in ferrets kept in a long-day photoperiod, and the influence of hCG timing and sperm dilution medium on pregnancy rate after laparoscopic insemination.

D.E. Wildt, M. Bush, C. Morton, F. Morton, J.G. Howard.

Five domestic ferrets previously maintained for

12 weeks under a 16L:8D photoperiod were electroejaculated weekly for 15-65 weeks while continuing to be exposed to the prolonged light cycle. Two ferrets sustained spermatogenesis for 20 and 26 weeks, while sperm production in the remaining males either was sporadic or decreased, remained depressed and then increased to peak levels observed in other males. Regardless of the temporal spermatogenesis patterns within males, the number of electroejaculated spermatozoa with residual cytoplasmic droplets or abnormal acrosomes increased in all ferrets over time. Diluted ejaculates meeting artificial insemination criteria were deposited intravaginally or by transabdominal laparoscopy into the uterine horns of females treated 0 or 24 h earlier with 90 i.u. hCG. Vaginal insemination was ineffective (0 pregnancies in 10 attempts), but 17/24 ferrets (70.8%) inseminated laparoscopically became pregnant and delivered live young (mean litter size, 5.2 kits). Number of motile spermatozoa deposited *in utero* ($1.6-10.0 \times 10^6$ cells), presence of glycerol in the sperm dilution medium (0 versus 4%) and time of hCG administration (0 versus 24 h before insemination) had no effect on pregnancy results or litter size.

J. Reprod. Fert., 86, 349-358, 1989. 2 tables, 2 figs., 42 references. Authors' summary.

The characteristics of oestrus in polecats.

T.V. Barmotina.

30 females were observed every 2nd day for appearance of the genitalia and vaginal mucus was examined microscopically, from the beginning of Feb. to mating. Reddening and swelling of vulva and onset of discharge were observed within 8-24 days of the onset of mating season. For 13 females for which leukocytes were found in vaginal smears, and for 15 females without leukocytes, the percentage littering was 92.4 and 94.3 resp.; litter size averaged 8.8 and 9.9, and the number of liveborn kittens 8.4 and 8.5 per female littering and 7.8 and 7.9 per female housed. For females that had mated on the 1st, 3rd, 5th, 10th and 30th day of mating season, the percentage littering was 95.0, 93.4, 93.4, 93.1 and 80.7 resp., litter size averaged 9.3, 10.1, 9.1, 9.8, 8.8 and 7.9, and the number of liveborn kittens per female housed 8.5, 8.5, 8.1, 8.9, 8.0 and 6.1. The duration of oestrus in females that had not mated was up to 30 days in the 1st cycle, 28.2 days in the 2nd cycle, and 24.6 days in the 3rd. The interval from parturition to oestrus averaged 6.8 days, and the percentage of females that exhibited oestrus after the 2nd parturition of the

season 23.4 in Sep.-Oct. At that time, however, most females were seasonally anoestrous.

Krolikovodstva, 32, 107-111, 1985. 2 tables, 10 references. In *RUSS. CAB-abstract*.

Body condition and reproductive ability of female polecats in spring.

G.P. Kazakova, T.V. Barmotina.

Body condition of 1029 females was determined as the ratio of body length in cm to body weight in g, monthly from Jan. to weaning. For females with ratios of 18-20, 21-23, 24-26, 27-29, 30-32 and 33-35 resp., the percentage whelping was 100, 97.2, 94.2, 94.0, 97.1 and 100, and litter size per housed female averaged 9.38, 9.47, 9.57, 9.52, 9.68 and 8.55 at birth and 7.73, 7.71, 7.46, 7.03, 7.40 and 7.56 at weaning, the differences being non-significant.

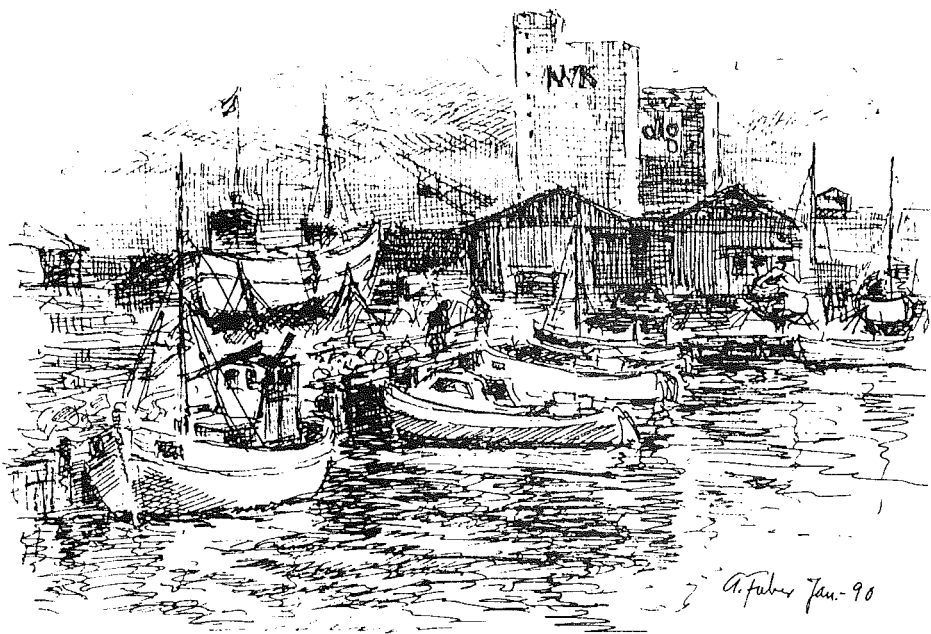
Krolikovodstva, 32, 102-106, 1985. 4 tables, 4 references. In *RUSS. CAB-abstract*.

Reproduction of male sables of different colours.

A.B. Kulichkov.

For 48 and 88 females mated with light-coloured and dark males resp., aged 5 yr, the CR was 87.5 and 87.5% and litter size at weaning averaged 2.9 and 2.7 when female:male ratio was 4:1 vs. 90 and 95% and 2.4 and 3.2 when female:male ratio was 1:5. The differences between males of different colours were non-significant. When reproductive performance of 52 sires was compared with that of their 52 sons at the same age, points for colour awarded averaged 1.9 and 2.3 resp., whelping rate of females mated was 64.0 and 69.4, and litter size averaged 3.20 and 3.19 at birth and 1.92 and 1.89 at weaning.

Krolikovodstva, 32, 61-65, 1985. 4 tables, 2 references. In *RUSS. CAB-abstract*.



Original Report

Effect of feeding growing and finishing balanced rations to coypus, with and without green forages

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Agricultural Science College, National University of Mar Del Plate
Argentina

Summary

The effect of feeding coypus with balanced rations for growing and finishing, with or without complementary green forages, was evaluated in summer and fall of 1988. For that Greenland and Silver male nutrias were fed diets of 16, 19 and 21% of crude protein (CP) for two months, and thereafter terminated with the 16% CP diet for three months. The highest rate of weight gain RWG (g/d), during the first period, was promoted by the 19 and 21% CP diet, 31.4 and 29.6 respectively, significantly higher than 27.2 promoted by the 16% CP diet. During the second period, the RWG promoted by the finishing diet was lower than the promoted by the growing rations. The RWG was not statistically improved by the addition of green forage. It was concluded that a balanced feed with 19 to 20% CP of high quality, may promote the highest RWG from weaning to killing, and the supplementary green forages might not improve the RWG in animals fed balanced rations.

Materials and methods

Rate of weight gain (RWG) was evaluated in Greenland and Silver male nutrias, fed balanced rations with and without additional green forages, in summer and fall of 1988. Animals of 1.6 to 2 kg of initial weight were placed in wired cages of 1 x 1 m, at 10 per cage, and fed 3 balanced rations with and without green forages. The diets were fed for 59 days (early growing), and thereafter all animals were finished with a 16% CP diet for 87 days, with and without corn or oat pasture, respectively. The balanced feeds were: 1) 16% CP from sunflowerseed meal, 2) 21% CP from soybean meal, and 3) a commercial feed of 19% CP from soybean and meat meal.

The animals were weighed periodically and the rate of gain was calculated by regression analysis.

Results and discussion

Diet composition is depicted in table 1. Diet F1 was formulated as a finishing feed, mainly with corn and sunflowerseed meal to achieve 16% of CP. The other two diets, had higher content of protein, and protein supplements of higher biological value such as soybean meal and or meat meal and fish meal.

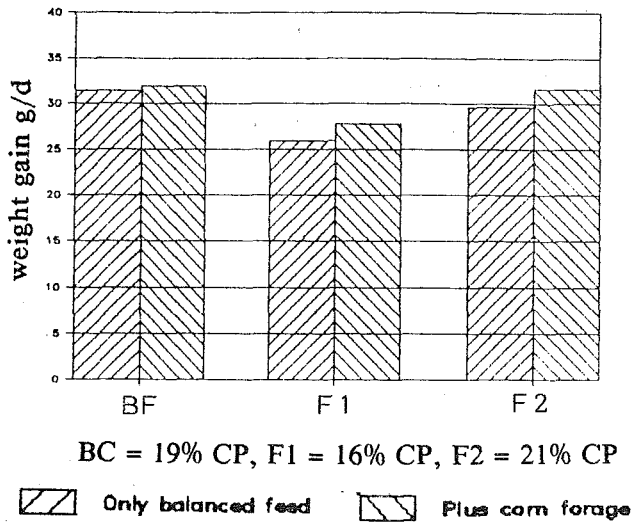
Table 1. Feed composition

Composition	Balanced feed	16% CP feed	21% CP feed
	BF	F1	F2
Protein (% CP)	19.0	16.0	21.0
Soybean meal	13.7	2.4	17.8
Sunflower seed meal	-	16.4	4.9
Meat meal	5.1	1.8	3.0
Fish meal	3.0	-	-
Peanut meal	3.0	-	-
Corn	59.7	65.5	59.3
Wheat brand	15.2	13.7	14.8
Salt	0.2	0.2	0.2

The highest RWG (g/d), during the first period, was promoted by the commercial feed and the 21% CP diet, 31.4 and 29.6 respectively, signi-

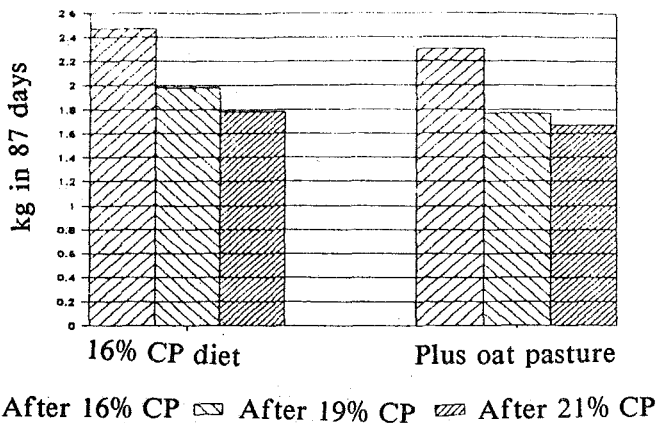
ificantly higher than 27.2 promoted by the 16% CP diet (fig. 1). Although the RWG was lower in the animals fed the F1, it is important to remark two important aspects, first the rate of 27 g/d is a good enough to terminate a male coypus in 160 days from weaning to killing; and second, this diet was of lower cost than the other two diets.

Fig. 1. Nutria weight gain in early growth.
Fed balanced diets w/o forage

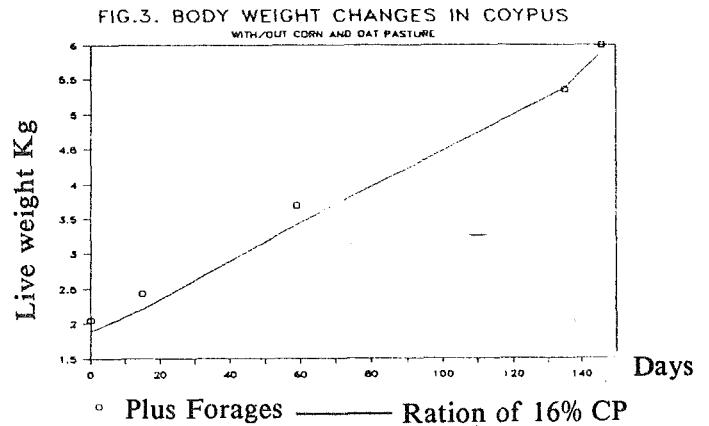


During the second period where all the animals were fed the F1, the RWG was affected by the diet previously fed (fig. 2). The animals fed previously high protein rations (BF and F2) showed a RWG (g/d) lower (20.4 and 22.7) than the animals fed the 16% CP (26.8). Consequently the animals fed high protein diets the first two months of growing and terminated with the 16% CP diet achieved similar final weight than the animals fed both periods the 16% CP diet.

Fig. 2. Weight gain in late growth.
Fed a ration or ration plus pasture



The RWG was not statistically improved by the addition of green forages. The animals fed de 16% CP diet in both periods, that received complementary green corn plant in summer and oat pasture in fall achieved the same final weight at the end of the experiment than the animals not supplemented with green forages (fig. 3). Although the complementary green forage did not improve the RWG, the animals fed supplementary corn forage had 8% higher RWG, but when fed oat pasture showed 7% lower RWG.



From these results it was concluded that a balanced feed with 19 to 20% CP of high quality, may promote the highest RWG from weaning to killing, and the supplementary green forages might not further improve the RWG of coypus fed well balanced rations.

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Electrolytes in minks with nursing sickness.

T.N. Clausen, O. Hansen.

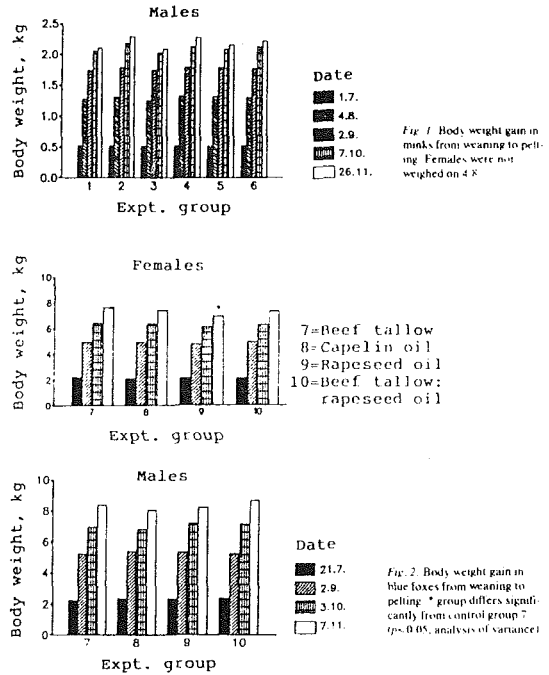
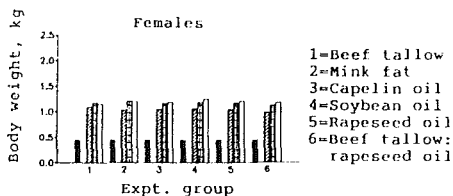
In a preliminary study the concentration of glucose in serum, and of Na⁺, K⁺ and the total osmolality of serum and urine was determined in 5 female minks with signs of nursing sickness (anorexia, adipsia, lethargy and dehydration) and in 5 apparently normal female minks. Urine data from the sick animals clearly indicated K-depletion and intracellular dehydration in contrast to serum-K which was high, probably due to acidosis and hyperglycemia (lack of insulin?). The superiority of urine analysis in determination of electrolyte balance is stressed. In addition Na-data might indicate extracellular dehydration or a migration of Na to the intracellular space. A significant increase in the glucose concentration of serum from animals with nursing sickness compared to healthy individuals seems compatible with K-depletion leading to impaired glucose tolerance. There was an osmotic gap in serum osmolality of the sick animals due to accumulation of glucose and probably also urea, lactate and ketones. Although the food does not seem to be deficient in K⁺, electrolytes + glucose/glycine containing K⁺ for oral use are recommended during the development of the disorder.

Dansk Veterinaertidsskrift, 72, 5, 266-268, 1989. 1 table, 5 references. In DANH, Su. ENGL. Authors' summary.

Influence of dietary fat source on growth and fur quality of mink and blue fox.

Kirsti Rouvinen, Paavo Niemälä, Tuomo Kiiskinen.

The influence of different dietary fat sources on growth and fur quality of the mink and the blue fox was studied. The fats used in the study were beef tallow, mink fat, capelin oil, soybean oil, rapeseed oil, and beef tallow: rapeseed oil mixture (50:50). The level of dietary fat was 20% in the dry matter of feed. All of the fat sources investigated here were of good quality guaranteeing approximately normal growth performance of the animals. No signs of fat peroxidation or vitamin E deficiency were found, and no adverse effects on feed consumption, feed palatability, growth of the animals and their fur characteristics were observed in the mink or in the blue fox.



Acta Agric. Scand., 39, 269-278, 1989. 7 tables, 2 figs. Authors' summary.

Influence of dietary fat source on the body fat composition of mink (*Mustela vison*) and blue fox (*Alopex lagopus*).

Kirsti Rouvinen, Tuomo Kiiskinen.

The influence of dietary fat source on the fatty acid composition of mink and blue fox fat in different parts of the body was studied. In addition, seasonal changes in the fatty acid composition of the skin and subcutaneous fat were determined. The dietary fat sources used in the experiments were beef tallow, mink fat, capelin oil, soybean oil and rapeseed oil. The fat level supplied by the diets was 20% in the dry matter of feed. Skin and subcutaneous fat samples were taken in August and November. Body fat samples were collected from the groin, around the kidneys and from the liver in November. Raw skin samples were taken after skin grading in January. The fatty acid compositions of the fat samples studied all markedly reflected the fatty acid profile of the respective dietary fat source. Blue fox fat was found to be more saturated than the fat of minks fed the same diet. The amount of unsaturated fatty acids in the skin and subcutaneous fat increased towards winter. This increase was more notable in the mink, whose thermophysiological properties are less efficient compared to the blue fox. The degree of saturation of the body fats in all experimental groups increased from the body surface towards deeper

fat depots. The content of omega-3 fatty acids in blue fox liver was three times higher than in mink liver. Oxidation of unsaturated long-chain fatty acids in the liver of the blue fox may function insufficiently compared to mink liver.

Acta Agric. Scand. 39, 279-288, 1989. 4 tables, 18 references. Authors summary.

Digestibility of different fats in mink and blue fox kits - influence of emulsifying agents.

K. Rouvinen.

Digestibility of beef tallow, rapeseed oil and their mixture (50:50) was studied in mink and blue fox kits after weaning and at approximately three months of age. Moreover, the influence of soybean lecithin and an emulsifying agent (Bredol 696) on the digestibility of beef tallow was clarified. Digestibility experiments with minks were performed by the total collection method and those with blue foxes by the AIA-method with 0.5% silicate in feed serving as an indicator. The digestibility for beef tallow in minks at 1.5 months of age was 46%, that for rapeseed oil 83% and that for fat mixture 78%. In three-month-old minks the corresponding digestibilities were 55%, 85% and 77%. In blue foxes at 2.2 months of age the digestibility for beef tallow was 84% and for the rapeseed oil and fat mixture it was 95%. At the age of 3.5 months the digestibility of beef tallow was 73%, that of rapeseed oil 95% and that of their mixture 90%. Synergism could be found in both species in the digestibility of fat mixture. The synergistic effect was more pronounced in the case of young minks and it especially influenced the saturated fatty acids of the fat mixture. The supplementation of emulsifying agents in the beef tallow diets had no significant effect on fat digestibility, metabolizable energy or its percentage of the gross energy of the diet. In young minks, however, emulsifying agents improved the digestibility of saturated fatty acids. Species difference between the mink and the blue fox in the digestibility of saturated fat may be due to a deficiency in fat emulsification. Especially in mink feeding during lactation and early growth periods easily emulsifying oily fats should be used.

Maatalouden tutkimuskeskus tiedote, 17, 18-37, Jokioinen 1989, ISSN 0359-7652. 6 tables, 14 references. In FINH, Su. SWED, ENGL. Author's summary.

Digestibility of different fats and fatty acids in the mink (*Mustela vison*).

Kirsti Rouvinen.

This paper reports the influence of level and type of fat on the digestibilities of fat and different fatty acids in the mink (experiment A). In addition the synergistic effect of saturated and polyunsaturated fatty acids is clarified (experiment B). The fats used in experiment A were beef tallow, capelin oil and rapeseed oil and the supplemental fat levels were 15 and 25% in the dry matter of feed. In experiment B the fats employed were beef tallow, soybean oil and their mixture (50:50), and the fat level was 20%. The experiments were carried out with adult standard male minks and the digestibilities were determined by the total collection method. The number of animals was 4-6 per experimental group. The apparent digestibilities of beef tallow, capelin oil and rapeseed oil on the 15% level of supplemental fat were 74, 94 and 95, and on the 25% level 71, 93 and 90, respectively. The respective digestibilities of beef tallow, soybean oil and their mixture were 71, 93 and 86. In experiment A the digestibilities for saturated fatty acids in beef tallow, capelin oil and rapeseed oil on the 15% and on the (25%) level of supplemental fat were 70 (68); 95 (97); and 84 (88), respectively. For monounsaturated fatty acids the corresponding values were 77 (78); 93 (96); and 96 (97). The digestibility coefficients for omega-3 fatty acids were 67 (74); 98 (98); and 97 (98) and for omega-6 fatty acids 41 (55); 84 (88); and 94 (96), respectively. In experiment B the digestibilities for saturated fatty acids in beef tallow, soybean oil and their mixture were 68, 85 and 77, respectively. For monounsaturated fatty acids the corresponding figures were 76, 93 and 90. The digestibility coefficients for omega-3 and omega-6 fatty acids were 70, 95, 93 and 68, 96 and 94, respectively.

Acta Agric. Scand., 40, 93-99, 1990. 4 tables, 10 references. Author's summary.

The effect of heat treatment on the digestibility of starch from barley and wheat for minks.

K. Østergaard, H. Mejborn.

Mink do not digest carbohydrates very well due to a limited production of starch digesting enzymes, a short intestinal canal and quick passage of the food through the intestine. Through heat treatment it is, however, possible to increase digestibility of starch considerably. The effect of extrusion and drum drying on the ability of mink to digest starch from barley and wheat respectively was examined in digestibility trials with adult male pastel mink. At the heat treatment

various combinations of process parameters were used. The grain was added to mink feed in a quantity corresponding to 43% of feed DM. Starch amounted to approx. 28% of DM. The experiment showed that mink are able to digest starch from wheat as well as barley almost 100%, when the grain has been either extruded or drum dried. This is an increase of approx. 20% compared to untreated grain. In order to obtain the highest possible digestibility it is important that the grain has been finely ground.

Meddelelse, Statens Husdyrbrugsforsøg, 734, 1-4, 1989. In DANH. Authors' summary translated by Hanne Artved.

Industrial fish can replace large amounts of fish waste in the breeding period.

G. Hillemann.

During the breeding period groups of 60 female Standard and Pastel mink had diets containing 0, 15, 25, 35 or 65% processed fish at the expense of cod waste. Appetite, behaviour and faeces were normal. Mating, parturition and breeding results were not impaired and average body weight of young at 28 and 42 days was on the whole higher in Standard mink given diets containing processed fish. Death rate of females was highest in females given diets containing 65% processed fish.

Dansk Pelsdyravl, 51, 11, 844-845, 1988. 4 tables. In DANH. CAB-abstract.

Composition, nutritive value and variation in Danish feed pellets for chinchilla.

G. Jørgensen, H. Mejborn, J. Nordholm.

At the request of the research committee of the Danish Chinchilla Association, chemical and microbiological analyses of 5 different lots of chinchilla pellets from each of the 4 largest suppliers of feed mixtures for chinchilla in Denmark have been performed. The investigations have shown large variations from supplier to supplier with respect to raw materials used, and they have also indicated that the mixtures analysed have not always met the declarations, neither with respect to composition nor nutritive value. Variations in nutritive value as well as hygienic quality within the individual brands are generally too large, especially as the same kind of feed constitutes the main nutrition of the animals for comparatively long periods. The positive side has been that the investigation also indicate that it is possible to produce a chinchilla pellet living up to the declarations and with variations in nutritive value as well as quality which are kept

within justifiable and reasonable limits. Based on the results of the present investigation it is suggested that Danish chinchilla breeders in cooperation with the feed producers establish a feed control to secure that the declarations, qualities and limits of variation are met. If you evaluate the importance of a good and constant feed in relation to production results and production value, there is no doubt that possible higher feed prices on account of control requirements will be repaid in ample measure. The fact is, as you know, that a number of other measures will have little or no importance if the feed is not in order.

Beretning fra Statens Husdyrbrugsforsøg, 665, 22 pp, 9 tables. In DANH, Su. ENGL. Authors' summary.

Chinchilla



Chatter

Dietary β -carotene absorption and metabolism in ferrets and rats.

Judy D. Ribaya-Mercado, Sophia C. Holmgren, James G. Fox, Robert M. Russell.

The ability of the ferret (*Mustela putorius furo*) to absorb dietary β -carotene was studied to determine its appropriateness as a laboratory animal model for studies on β -carotene metabolism. At baseline, the mean serum β -carotene level in ferrets was 0.6 $\mu\text{g}/\text{dl}$ and no β -carotene was present in liver or adipose tissue. After the ferrets were fed 4 or 20 mg of β -carotene/kg body wt daily for 2 wk, serum levels were 15.3 and 41.5 $\mu\text{g}/\text{dl}$, liver values were 0.9 and 4.1 $\mu\text{g}/\text{g}$ and adipose tissue values were 0.1 and 0.2 $\mu\text{g}/\text{g}$ of β -carotene, respectively. Thus, like humans, ferrets are able to absorb dietary β -carotene intact. Further, these animals can store quantifiable amounts of dietary β -carotene in their liver and, to a lesser extent, in adipose tissue. In contrast, serum β -carotene levels in rats fed the two levels of β -carotene were very low (0.5 to 0.6 $\mu\text{g}/\text{dl}$) and no β -carotene was found in liver or adipose tissue. Thus, the ferret is a more appropriate animal model for studying the intestinal absorption of β -carotene and its storage and metabolism in body tissues.

J. Nutr. 119, 665-668, 1989. 2 tables, 15 references. Authors' abstract.

Bile salt stimulated lipase: the enzyme is present in non primate milk.

Lois M. Freed, Carla M. York, Margit Hamosh, N.R. Mehta, John A. Sturman, Olav T. Oftedal, Paul Hamosh.

Bile salt-stimulated lipase (BSSL) activity was detected in milk collected from 2 common cats, 2 Beagle dogs and 2 women. Activity was lower in cats' milk and higher in dogs' milk than in human milk. BSSL activity was highest during early lactation in the cat, but increased from colostrum to mature milk in the human and dog. Lipoprotein lipase activity was 1-2 orders of magnitude lower than BSSL activity. BSSL from the 3 spp. had pH optima 7.3-8.5, an absolute requirement for bile salts, was stable for at least 60 min in the pH range 3.0 to 8.0 and was completely inactivated by eserine (physostigmine) at 0.4 mM. When various other spp. were studied, only bears' milk and seals milk contained BSSL, gorillas' milk containing very low BSSL activity. Results indicated a relationship between milk BSSL and milk fat composition, and suggest a role for BSSL indigestion of milk long-chain triglycerides by the neonate.

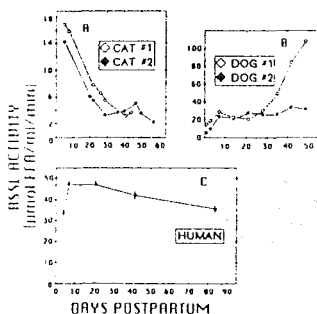


Figure 1 Bile salt stimulated lipase activity throughout lactation in cat (A) and dog (B) milk (lactation period is 8 wks in the cat and 5-7 wks in the dog) and throughout the first 3 months of lactation in human (C) milk. Note differences in scale of abscissas and ordinates for the three species.

Human lactation. 2. Maternal and environmental factors (edited by M. Hamosh, A.S. Goldman) 595-601, 1986. 1 table, 3 figs., 25 references. In ENGL. CAB-abstract.

Diagnostic significance of estimating the activity of transketolase and thiamin diphosphate effect in blood of fur bearing animals during covert thiamin deficiency.

S.P. Izotova, G.G. Petrova, E.Yu Cherkashina.

Removal of thiamin from the diet, and increasing the amount of thiaminase-containing fish in the diet decreased the activity of transketolase in blood by 14 to 41% and 16 to 18% in mink and

arctic fox, respectively. Thiamin diphosphate effect (TDP effect) was increased from 15% to 40-48%. TDP-effect of up to 15% signified adequate availability of thiamin, whereas above 15% it indicated varying degrees of thiamin deficiency. In mink and arctic foxes during growth, breeding and pregnancy the TDP-effect value depended also on the amount of thiaminase-containing fish in the diet. At the same time the basal value of transketolase depended on the type of animal and on its physiological state. During the first 1 to 3 months of life activity of the enzyme increased, in the 4th month decreased and then levelled off at the adult value.

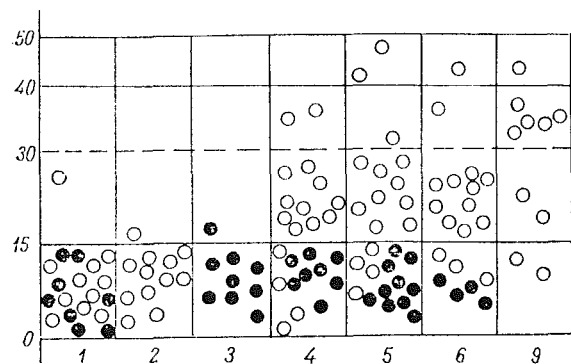


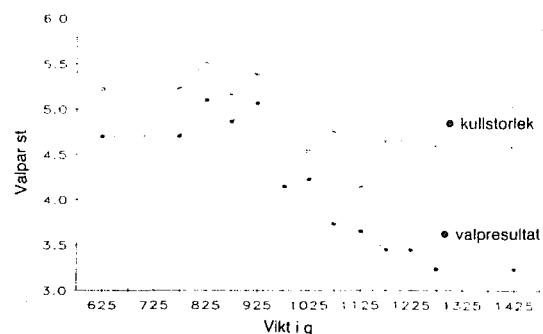
Рис. 3. Величина ТДФ-эффекта в крови у норки в онтогенезе в зависимости от тиаминазосодержащей рыбы в рационах. По оси абсцисс — возраст, месяц; по оси ординат — величина ТДФ-эффекта, %

Metodicheskie podkhody k izucheniyu fiziologii pushnykh zverei, 72-86, 1987. 7 tables, 4 figs., 18 references. In RUSS. CAB-abstract.

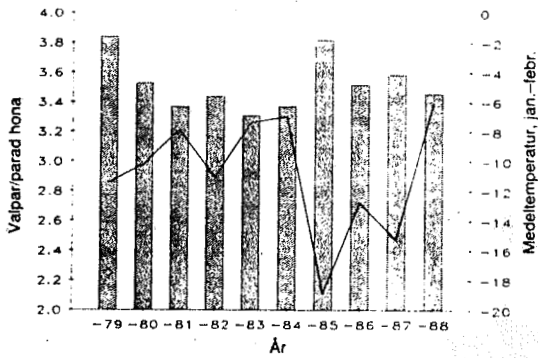
Effect of nutrition on whelping results in mink.

T. Polonen.

An account is given of the effects of air temp. on body condition in mink, the effect of body weight on reproductive performance of males and females, and the effect of flushing and feed quality on conception rate and litter size. Data are presented in 2 tables and 3 graphs.



Figur 1. Honans parringsvikts inverkan på avelsresultatet hos mink Maxmo 1988, N=384. Kullstorlek = valpar/valpande hona 31.5. Valpresultat = varlpar/parad hona 31.5.



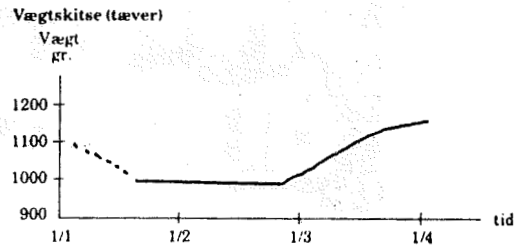
Figur 3. Medeltemperatur under januari-februari uppmätt på väderobservationsstationer i Österbotten (Kronoby, Kauhava, Vasa och Etseri) åren 1979-88 (kurvan) och det genomsnittliga valpresultatet för hela landet hos Scanblackmink (staplar).

Finsk Pälstidskrift, 23, 2, 45-47, 1989. 2 tables, 3 figs. In SWED. CAB-abstract.

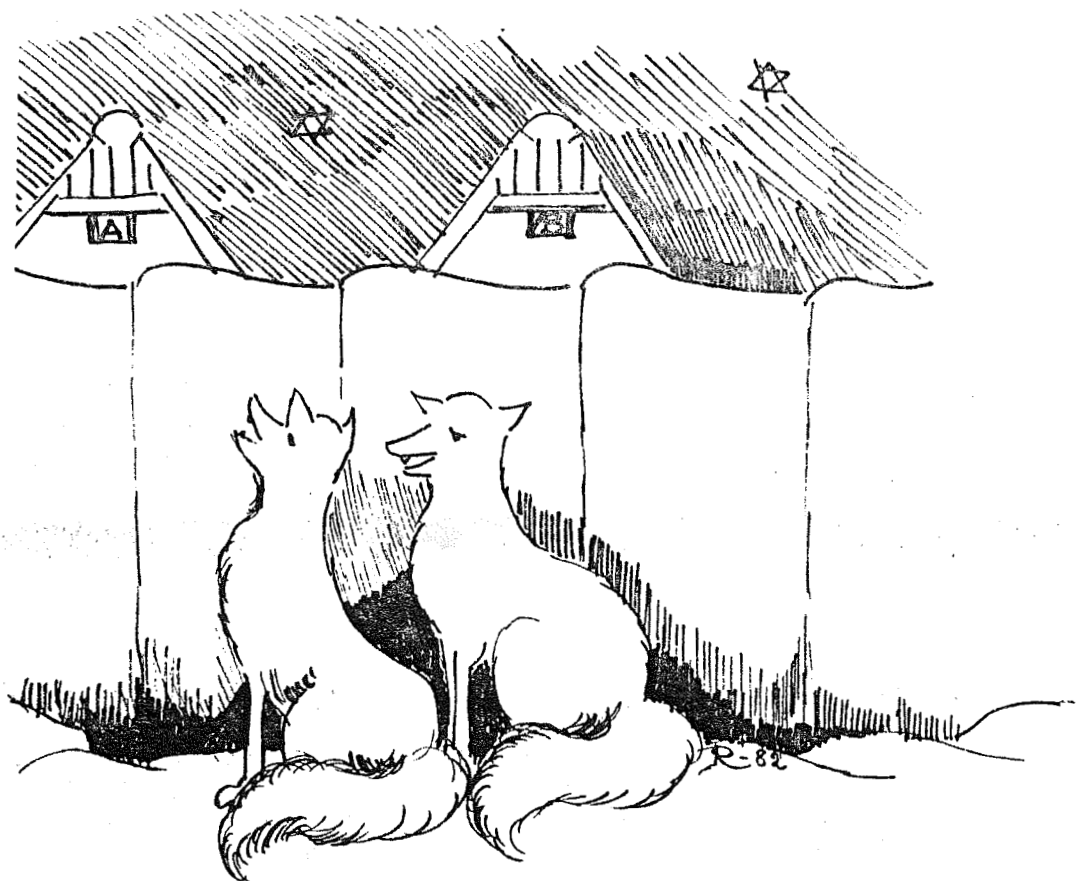
The influence of feed intake on incidence of "greasy mink kits".

R.S. Lund.

Data from several hundred mink farms indicate that flushing, weight reduction of females early in the breeding cycle then increasing feed intake may increase the incidence of "greasy kits". A management system designed to reduce the incidence of "greasy kits" is described.



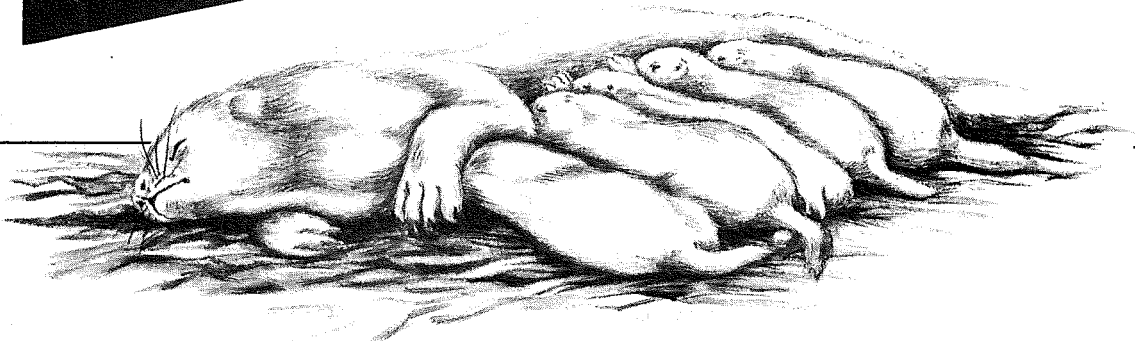
Dansk Pelsdyravl, 52, 1, 37-38, 1989. 3 tables, 1 fig. In DANH. CAB-abstract.



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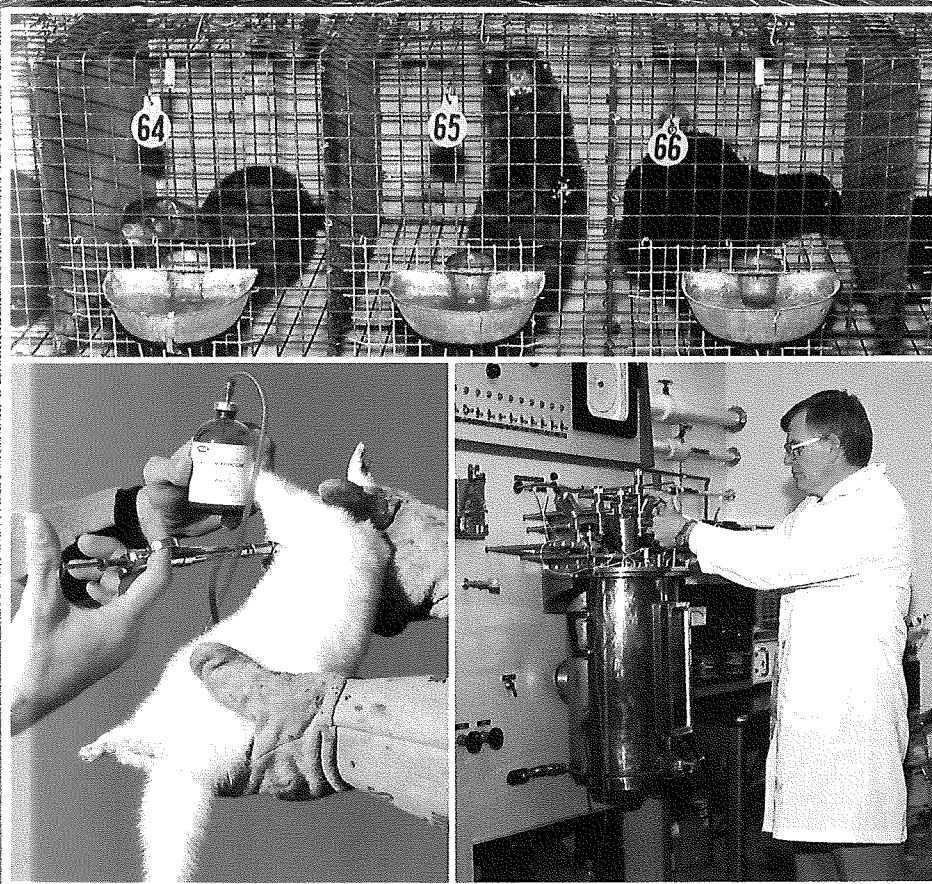
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Original Report

The possible influence of recent vaccination on the serological reactions in mink against Aleutian Disease Virus Antigen

Christian Munck

Danish Fur Breeders Laboratory 60, Langagervej, DK 2600 Glostrup, Denmark.

Summary

Antibodies against Aleutian disease virus are determined at the Danish Fur Breeders Laboratory by Counter current immuno electrophoresis test (CEP test) on a scale of 4 mio samples a year.

The CEP test has an extraordinary high specificity and a very good sensitivity.

False positive reactions in the test account on an average for less than one per thousand samples. Some unexpected positive reactions are however confirmed by the results at a later date.

The false positives are of great inconvenience to disease eradication and to the mink farmers economy when they occur in negative farms, otherwise they have little importance.

Some case stories indicated the possibility that false reactions could in some cases follow vaccinations.

This hypothesis was experimentally tested in 1988.

False positive reactions were provoked in 5 animals in a trial of 408 animals. The positive ones were all found in groups inoculated with vaccines containing virus enteritis antigen. These reactions were not persistent but disappeared again after 7 to 14 days.

Introduction

Aleutian disease (AD, plasmacytosis) is a persistent virus disease, classified among the slow virus diseases.

The infectious agent is a very stable parvo virus (Aleutian disease virus, ADV), extremely resistant to heat, acids and also resistant to proteolytic enzymes.

The virus interferes with the immune system stimulating the host to an abundant plasma cell production (plasmacytosis). The plasma cells produce antibodies and cause massive hypergammaglobulinemia. Unlike many other virus diseases the clinical course of the disease is not due to cytopathological effect of the virus but is the result of the increased production of antibodies against the virus. Immune complexes between antigen and antibody are formed. The antibodies, however, are not able to eliminate virus, and in turn the immune complexes provoke formation of new antibodies. The ADV-antibody complexes, still highly infectious, are deposited at various sites of the organism, to a large degree in the blood vessels, gradually destroying vital organs. The disease most often causes death in 2 to 24 months. The incubation period varies from one to several months under natural conditions depending on infecting dose and many other factors.

Laboratory diagnosis

The antibodies are immunoglobulines, where the gammaglobulines constitute 12-15 per cent of the serumprotein under normal conditions. In Aleutian disease the amount of gammaglobulins rise - even up to 50 per cent.

Antibodies to ADV are measured by means of the counter current immunoelectrophoresis test (CEP-test) developed by *Cho and Ingram (1972)*. The production of plasma cells is extreme; hence it is possible in most cases to demonstrate infiltrations of plasma cells by histopathologic examination of sections from various organs. In 1988 4 mio blood samples were examined for AD antibodies at The Danish Fur Breeders Laboratory as part of a voluntary disease eradication programme. The plasma samples from participating farms are tested routinely by CEP test by which method it is possible to select positive animals.

In one per thousand samples false positive reac-

tion may occur, a fact that can be of great inconvenience economically to AD free farms, especially those selling breeding animals.

Certain cases indicated the possibility that false positives might be caused by recent vaccination.

A preliminary experiment was conducted in the autumn 1987, *Munck and Hansen (1988)*. No false reactions were provoked in this experiment.

Materials and Methods

A total of 360 kits, 5 months of age and 48 young females, were used in the experiment. None of the animals had been vaccinated earlier; the colour types Standard and Wild were represented and the kits involved consisted of half males and half females.

The animals were vaccinated with the following types of mink vaccines from ASL according to the scheme in Table 1.:

Table 1. Experimental group.

	Vaccination.									
	I Ent. TC	II Distem R-TC	III Dis- tox	IV Ent. TC	V Dis- tox	VI Ent. TC	VII Dis- tox	VIII Con- trols	IX Ent. TC	X Dis- tox
Aug.	+	+	+	+	+	+	+	-	+	+
Sept.	-	-	-	+	+	-	-	-	-	-
Oct.	+	+	+	+	+	-	-	-	+	+

Groups I-VIII are kits. Groups IX and X are young females.

Ent-TC containing virus enteritis antigen (MEV).
Distem-R TC containing distemper live virus.
Distox triple vaccine containing components against virus enteritis, distemper and botulism.

The recommended dose 1 ml subcutaneously was applied on the inner side of the thigh. Blood samples were collected in capillary tubes coated with Sodium Heparine after cutting a toe nail. The laboratory technique applied was examination of plasma by means of counter current immuno electrophoresis (CEP) and counter current line absorption immuno electrophoresis (LIE). (*Aasted et al., 1986*). The antigen used was DANAD cell culture antigen ADV-G produced at the Danish Antigen Laboratory in Glostrup.

Groups I - VII contained 48 kits each. The animals in group VIII were controls. Groups IX and

X consisted of 24 females each. All groups except controls were vaccinated on the 5th of August. Groups IV and V were boosted on the 9th of September and the groups I, II, III, IV, V, IX and X were revaccinated on the 10th of October.

All the animals were bled on day 0, 5, 14 and 30 and the blood plasma was tested for AD-antibodies.

At pelting time post mortems were carried out on 8 animals from each group and liver and kidney were examined by histopathology. Blood specimens were taken from the carcasses for a final check for AD antibodies.

AD positive animals found during the trial were thoroughly examined histopathologically for presence of plasma cells in the organs.

Results

A total of 2800 blood samples were investigated during the experiment. Two samples from female kits in group IV, given a booster with Ent-TC on the 9th of September proved positive 5 days after vaccination. Retesting on day 14 after vaccination showed that the positive reaction had vanished and the two kits proved negative by all successive tests.

Three blood samples taken on day 7 following

revaccination the 20th of October showed positive AD reaction in two females from group IX vaccinated with Ent-TC and one female kit from group III. This group was vaccinated with Distox. The positive reaction could be produced 3 days later.

15 days after vaccination only the kit from group III proved positive and on day 22 all three mink showed negative reaction. All positives were found by CEP as well as LIE tests. The test results are shown in Table 2.

Table 2. Positive reactions.

	Number of animals									
	I Ent TC	II Distem R-TC	III Dis- tox	IV Ent. TC	V Dis- tox	VI Ent. TC	VII Dis- tox	VIII Con- trols	IX Ent. TC	X Dis. tox
Aug.	0	0	0	0	0	0	0	0	0	0
Sept.	0	0	0	2	0	0	0	0	0	0
Oct.	0	0	1	0	0	0	0	0	2	0

By all tests in succession all blood samples were found negative. By histological examination of liver and kidney sections no pathological changes could be demonstrated in the above 5 positive animals.

Organs from 8 randomly chosen mink from each group including controls were also examined histologically.

In liver sections from 5 non reacting animals slight lymphocyte infiltration was found around a few bile ducts, but no typical plasma cell infiltration could be demonstrated. The changes were diagnosed as inflammation. Kidney sections from these mink revealed no pathological changes.

Discussion

False positive reactions in the AD test are seen only under special circumstances, which we do not know in detail.

On an average the percentage of false positives is less than one per thousand tests at this laboratory. This figure includes an unknown number of true positives which turn up at a later test. Vaccination and in particular boosting seems to be one of the conditions able to provoke false positives. In this trial all the positive reactions were found in groups inoculated with vaccines containing virus enteritis antigen (MEV).

The virus intended for antigen production as well as for vaccine production is grown in animal kidney cell cultures, which are in their turn grown in media containing calf serum. Bovine albumin is added to both products as stabilizer. The cell ingredients are removed by different procedures but small amounts of cell protein are left in the final product - antigen and vaccine.

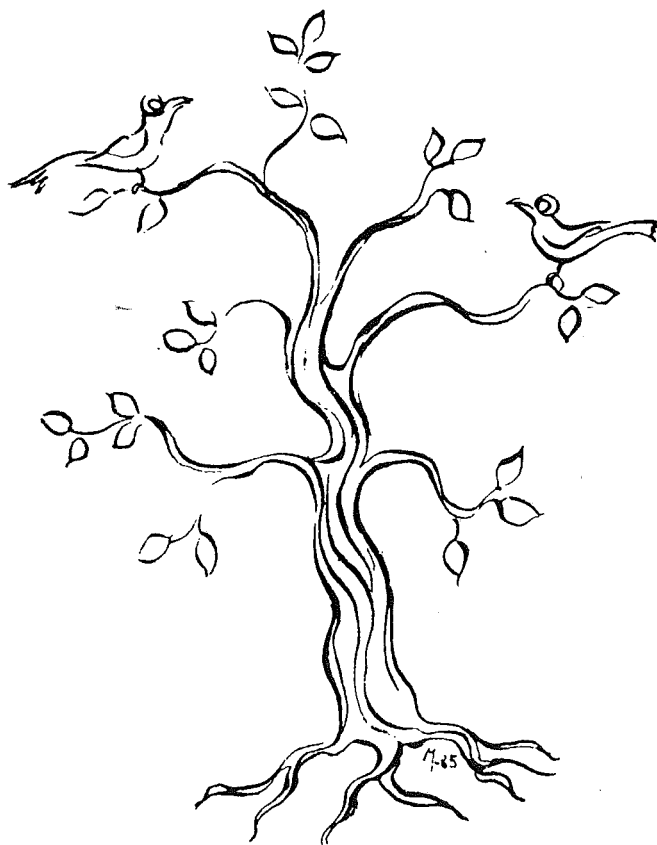
It is assumed that some mink vaccinated within a short period before testing develop antibodies to foreign protein in the vaccine. As the same protein also can be present at a low level in the AD antigen a false positive reaction is possible.

Other factors, however, can influence the AD test. It is known that certain diseases can interfere with the test, for example avian tuberculosis and infection with *erysipelothrix* (Englund, 1988). It cannot be excluded that components in the feed are influencing the results. For example it has been demonstrated that dietary protein antigens can cause immune responses. Small amounts of proteins are not digested by enzymes in the intestine and are therefore absorbed as intact antigens (Mowat, 1987).

At present we cannot give complete and fully satisfactory explanation to the incidence of false positive reactions in the AD test. The conclusion, however, is that mink farmers should be advised that mink should not be bled for Aleutian disease test at least three weeks following vaccination.

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Original Report.

An approach to embryo-phoetal mortality pathogenesis in the Aleutian Disease in minks

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The paper consists of two distinct parts: (I) Ethio-pathogenetic and Epizootological Elements of the Reproduction-Altering A Virus, (II) The Effect of AD Immunopathogenetic Mechanisms and Morphofunctional Disfunctions on Minks Reproduction. It is a synthetic approach to immunopathogenetic problems viewed especially during the incipient stages of ontogenesis, and to certain elements of embryo-phoetal mortality ethiology.

I. Ethio-pathogenetic and Epizootological Elements of the Reproduction-Altering A Virus.

The CEP test (for immunoelectrophoresis) has been carried out as a preliminary step in the thorough study on the effects of the Aleutian virus; it has revealed that the Aleutian disease (AD) has a similar impact upon males and females. Age-dependent differences are, nevertheless, conspicuous, accounting for the growing interest taken by several researchers in these studies. Adult minks were more affected by AD by 7.15% than the juvenile ones. Colour has also been noticed to induce differences: coloured minks were more easily subjected to the disease than the Standard ones (by 3.4%), this implying genetic proclivity.

Mating occurred relatively less (by 2.42%) in the females infected with the A virus, more outstanding differences characterized gestation, which lasted more by an average of 5.5% (especially the diapause), as well as parturition, when the infected group displayed lower fecundity (by 10.38%), significantly higher female sterility (by 5.76%) and mortality (by 4.39%) during the reproduction span.

Noteworthy is also the decrease in prolificacy: in the A virus-infected group the decrease amounted to 0.37 cub/female during parturition, and to 0.62 cub/female during weaning. Cub mortality is greater by 6.62% in the infected group during suckling and especially a short while after whelping. The interest taken in the virus-induced effects of AD is, therefore, constantly growing, and this accounts for the present study on the subject.

In order to better understand the negative impact of the A virus upon the genital apparatus in minks, the emphasis should lay, within the complex morpho-functional disfunctions of the entire organism, on reproductive disfunctions located as area, time and physiological condition in the interaction maternal organism/conception products. The virus may injure partly or entirely these correlations (by direct or indirect impact), according to certain ethio-pathogenetic, epizootic and other peculiarities. That is, the embryo-phoetal period, providing an excellent medium for virus lymphotrophism infection and multiplication (favoured by the labile developing haematophore system), is typical for revealing the disease phenotype both as occurrence and duration, as compared to other periods or organs and tissues in adults.

The A virus is present in the tissues, secretions and excretions of diseased minks. As an extremely small organism of a less complex structure, the virus contains a single type of nucleic acid (DNA) making up the virus gene pool. Its multiplication occurs as gene pool replication, on account of the biosynthesis taking place within infected minks cells, where the compulsory in-

tracellular parasitism uses cellular genetic structures (Table 1).

Both the slow chronic infection and the lasting one should not be mistaken for the carrying condition. The latter is a long lasting condition based on the infection of few cells, where a productive lytic cycle occurs and the free adult virus

horizontally infects a restricted number of cells. This continuous limited infection is considered to affect certain tissues or organs (e.g. the developing embryonic tissue) as a result of the partial resistance of certain cells to the virus, or the direct cell-to-cell transmission of the virus without any discharge into the surrounding environment.

Table 1. POSSIBLE INTERACTIONS BETWEEN THE A VIRUS AND THE HOST CELLS (synthesis according to various authors)

CYTOLYTIC CYCLE	SLOW NON-CYTOLYTIC CYCLE	PERSISTENT NON-CYTOLYTIC CYCLE
<ul style="list-style-type: none"> - virus penetration into a low number of B and T cells. - insertion of the virus DNA on the host cell chromosomes - by taking over the entire genetic information of the virus, the infected cells synthesize virus particles (inactivation of the cellular repressor) - the host cells filled with virus particles "break up" releasing host cell particles with embedded virions. The massive destruction of cells leads to enzyme inhibition due to excessive substratum, when it seems that auto-antibodies occur and favour the phagocytosis of the under-graded matter (immunologic disfunctions are caused by changes in the functions of T and B lymphocytes induced by the suppressing capacity of the virus - autoimmunopathy) 	<ul style="list-style-type: none"> - the metabolic process within the host cell is little affected, as it may carry on even during cell division - in most host cells certain DNA virus bodies are transferred to the functional genome of the host and co-exist with the normal cellular functions (repressed virus genome) - the transfer from one cell to another of intermediate replicate forms of virus nucleic acids or DNA provirus is achieved through: <ul style="list-style-type: none"> a - vertical transfer to the descendants of the latently infected cells, which may alternate with b - horizontal transfer when maturation and the release of complete virions occur - latently infected cellular clones may change in time (under the impact of internal or external factors) acquiring new features which differ partially or entirely from the initial ones (immunological tolerance may also occur) 	<ul style="list-style-type: none"> - low rate of multiplication due to the slow rhythm, with no alteration of the cellular metabolism - the infected cells may survive a long time and produce: <ul style="list-style-type: none"> (i) - entirely mature virions (ii) - virus components (partly expressed virus genome) (the occurrence of non-reactivity in the organism is possible due to the tolerance acquired for low dose)

Minks are affected by the A virus in all periods of ontogenetic evolution but mostly as juveniles (up to three months). The most severe forms are due to stress factors (such as mating, gestation, whelping lactation, weaning, cold) and occur mostly at the beginning of summer and autumn.

The virus activity consist of its penetration and multiplication inside the B and T lymphocytes (with a well-known role in the immunological system), and evolution according to several factors: virulence of virus strain (Utah I > Bitterroot > Pullman > 70261 - Haagsma), genetic resistance (aa < Aa < other mink gene types), age of the animal, defence reaction of the organism, a.o.

The incubation period may last from a few days to several months, ranging from 24 to 120 days in most colour varieties, with more restricted limits in certain mink types, as for instance the Aleutian minks infected experimentally in which the

virus incubation varied between 24 and 50 days (Onet, 1983). Depending upon the infection cycling, the disease becomes conspicuous after different periods of time, according to the type of virus strain and the duration of the evolutive cycle it covers.

Certain incipient immunodeficiency alterations occur during the infection, they interact with the decrease in the organism resistance, so that the organism may be affected by secondary infections. The latter are similar to the ones occurring in the Chediak-Higashi (Kaaden, 1984) syndrome, and represent an immunological helper for virus activity; they are regarded as factors inducing virus DNA replication. A decrease in cell sensitivity to the exogenous interferone activity may also occur, as these intensifying stimuli are useful for the virus infection at the beginning of the disease.

Although the A virus displays no serological and genetic affinities with the other parvoviruses, it nevertheless resembles them by its effect upon the lymphotrophism or its general affinity for tissues consisting of cells with intense metabolism, which provide excellent hosts for virus multiplication; such cells are those in the bone marrow, lymphatic organs, arteries, gastric mucous membrane and embryonic tissue (Porter *et al.*, 1977; Bloom *et al.*, 1980).

The presence of this virus inside the mink organism sets forth antibody genesis, the resulting antibodies making up together with the antigen antibody-antigen complexes. At the same time, the plasmatic cells start an intense polyclonal proliferation (plasmacytosis) which relies upon a strong antigen stimulus and is followed, therefore, by important disfunctions of the proteic homeostasis revealing a massive hypergammaglobulinemia. Virus-antibody complexes play an important part in AD pathogenesis, as their accumulation in large amounts in the kidneys causes progressive glomerulonephritis, the compression upon capillaries and renal tubes and the occurrence of uremia generally leading to the death of the animal. Glomerulonephritis and, as a rule, organic inflammatory injuries are mediated by the above-mentioned immune complexes, which render conspicuously the IgG and C, deposits in the diseased glomerules and artery walls (Müller-Peddinghaus, 1980). An exaggerated increase in the anti-DNA antibody titre is also virus induced.

Noteworthy is the fact that the first reactions occurring within various organs are of a lymphoid type (Paul, 1976). Concurrently with the intensification of the virus action and the development of the above-mentioned processes, plasmocytes start occurring and, in time, dominate the lymphoid elements. The resulting progressive haemolytic anemia is also based on proteinemia alteration, when the specific antibodies and the complement stick to the surface of the red globules and progressively destroy them (Newton and Lipowitz, 1975).

It is interesting to mention here another aspect of virus activity accounting for the disappearance of clinical and morphological disfunctions following treatment with certain suppressors and antibody formation (e.g. levamisol, cyclophosphamid, a.o.), despite the permanent presence of the A virus. This suggests that the virus is not significantly harmful in itself, the injuries being a consequence of the immunologic mechanisms and not of the direct virus impact.

The effect of certain exogenous and even endogenous factors may disturb the autoimmune tolerance leading to the formation of autoantibodies and/or autoimmune cells, which eventually destroy the body's own cells and tissues (cell particles attached to the Aleutian virions) through cellular lysis (Table 2).

Autoantibodies may become cytotoxic, through complement activation mediating autoimmune

Table 2. TOLERANCE AND POSSIBLE MECHANISMS IN THE AUTOIMMUNITY OF THE ALEUTIAN DISEASE (according to various authors)

AUTOIMMUNE REACTION

GENETIC PREDISPOSITION	DISFUNCTIONS OF THE IMMUNE SYSTEM	MODIFIED OR ALIEN ANTIGENS		
- mutations of the immunocomponent cells ("prohibited clones"); the immunoproliferating disease may be caused by somatic mutation and may "release" the so-called "prohibited clones" of a lymphocytary nature and continuous multiplication which trigger autoimmune reaction	- abnormal B cells specific for the autoantigen - quantitative and functional shortage of the T lymphocytes, which stop performing their suppressive role upon autoimmunization	- "excluded", "sequestered" or "in-niche" autoantigens - due to structural or autogenetic reasons these formations never really reach the immune system (spermatozoa); when they are exposed, the autoimmune reaction may set off (azoospermy)	- the break-up of native "auto-tolerance through: a - haptization b - association to a complete adjuvant; c - cross reaction antigens (may occur during various infections or may be represented by streptococcus antigens, which crossly re-activate into autoantigens)	- neoantigens (the modification of antigen structure under the impact of immunoglobulines)

reactions. Immune cells may take part in autoimmune pathologies, as is the case in the A virus-induced infection, even at the level of the genital apparatus in minks, the disfunctions being revealed by lymphocytary infiltration (with or without plasmacytes) and fibroid necrosis.

II. The Effect of AD Immunopathogenetic Mechanisms and Morphofunctional Disfunctions on Mink Reproduction.

Similarly to other tissues and organs, the A virus affects the tissues in the uro-genital apparatus

(mainly the maternal-placental complex) generating immunity, enzymatic and hormonal disfunctions. Many of these problems are still little known. The virus impact is noticeable in all reproductive stages in mink, starting with ovulation, embryo-placental stage (where the endometrial synthesis integrity of the embryotroph is altered) to parturition. Our investigation has attempted at distinguishing stages in the virus activity and differentiating the effects typical for each stage in the infected groups compared to those responding negatively to the CEP test.

Studies have been carried out on two experimental groups of 16 females each, one positive and the other negative to the CEP test, in order to depict the noxious effect of the A virus upon reproduction in the above mentioned stages.

Each animal was carefully selected for comparative fertility analyses during the incipient stages of gestation. Special attention was given to the immunity mediated through the humour and mostly to the processes accounting for IgG participation in embryo protection, when the maternal antibodies cross the selective transplacental barrier starting with the eleventh day of embryonic life (*Olinescu, 1988*). Mention should be made that in this species most of the gestant minks from the northern hemisphere display a diapause during this gestation period (the preimplantation stage). Therefore, the random sacrificing of the 32 Standard mink females from the mentioned groups was carried out between the 25th-27th of March. The females were then on the 20th day since the last covering, and this fact ensured the functioning of immunological mechanisms and provided a reserve of about 7 days till the beginning of the implantation process occurring in this species around the 2nd of April.

The sampled genital tract was examined and anatomically prepared according to the method described by *Pastirnac (1988)* for the perfusion of the uterine horns and the sampling of 20 days old blastocytes. This embryonic stage has been considered as the most relevant from the point of view of the primary or secondary aggressive actions of the A virus upon mink zygotes by releasing immuno pathogenetic mechanisms.

Partial or total infertility in infected females has been investigated comparatively with control females responding negatively to the CEP test. Ethio-pathogenesis in the former correlates with the complex of autoimmunopathies (but also with other A virus-induced factors) against the general background of degrading homeostatic balance.

The analysis of this virus-induced disease affecting reproduction in minks should consider from the very beginning the impact of the virus upon the males, mainly upon the fecundating capacity

of the seminal material. It seems that the highest mortality of conception products due to AD occurs in the early stage (zygote, blastocyte). The phenomenon is severely influenced by the ethio-pathological factor induced by the activity of infected males.

The pathological activity of the virus also accounts for the formation of autoimmune phenomena in males and the cutting off of the process capacitating spermatozoa in females (within the uterus and oviduct).

Due to their complex antigenic structure, the spermatozoa resulting from A virus-infected males display autoimmunity phenomena, being able to induce the formation of auto-spermato-antibodies (auto-spermoimmunization). This may lead to several disfunctions, such as autoimmune aspermatogenic orchitis (azoospermia), caused by the disruption of the physiological barrier between blood and testicle (*Edwards, 1975*); in our case the disruption is produced by the localization of the autoimmune virus/antibody complexes in the most vulnerable spots on this barrier (testis and channels). On the other hand, the occurrence of spermaglutinines is the result of the mechanical obstruction of the paths taken by spermatozoa. The resulting affections (epididimites, spermocystis, etc.) also induce the discharge of antigens, which implicitly lead to antibody formation. Antibodies cause spermatozoa to agglutinate (partially or totally) and thus lose their motility; the most severe cases, the debile organism reaches a zoospermy due to the destruction of the testicular or epididymal parenchyma (Figure 1).

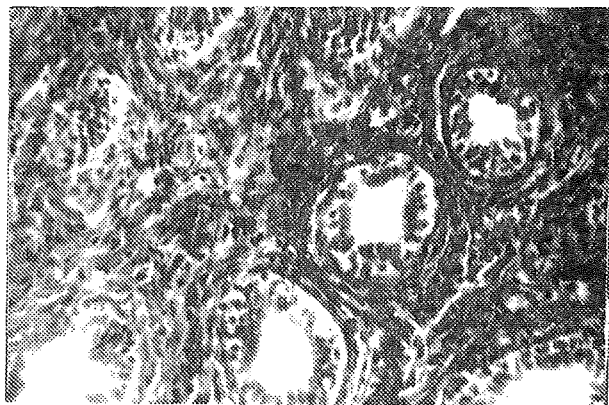


Fig. 1. Severe parenchyma sclerosis of the epididyme in mink males (x 700).

The A virus may induce sterility by some other ways as well, with no sign of morphological injuries at the testicular level. Literature data in this field (*Gluhovschi, 1978*) have revealed that an immunological instability in the sanguine se-

rum and the spermatic liquid may trigger spermatic antibodies, and that both the seminal plasma and the male genital organ contain antigens common to other organs (liver, kidneys, spleen, etc.); therefore, it seems that the disfunctions accounted for by the conjugate immunological reaction of these antigens finally induce the disfunction of the organ and, thus, the ovules are not fecundated and the conceptual rate drops.

Studies on females during middle gestation, advanced gestation and post-whelping are also required, since the A virus affects reproduction even after fecundation. Gestation in mink is provided with an immunologic mechanism broadly similar to that characterizing gestation in other animal species, i.e. the genetic immaturity of the conception product during the first stages of ontogenesis is counter balanced by the passive immunity transmitted diaplacentally, as confirmed by literature data. Immunoglobulines are mainly transmitted through the placenta, when the placental proteolytic mechanism is altered due to conjugate autoimmunity phenomena, the selective olacental passage is altered as well. Thus, the noxious elements resulting from autoimmunogenesis start crossing the selective maternal barrier, accounting for the enzymatic, hormonal and infectious disfunctions which influence not only the growth but even the viability of the concept products.

It seems that the nephrotoxic syndrome leads to uterine disfunctions altering the optimum physiological conditions of the embryotropic environment, and this fact tends to increase the diapause (total gestation, implicitly) and to disbalance the blastocytes towards heavy losses, as shown by previous studies. The conjugate deviations in the functioning of the enzymatic, hormonal and immunogen equipment of the embryotroph and then of the phoetal liquids (generally of the placenta) lead to disfunctions of the modulation mechanism (i.e. the ability of the genetic information to accurately react to environment changes) in the gestating uterus.

When the gestation product is in fact a physiological allografting, where the evidence of immunological (anti-alloantigen) miscarriage is theoretically possible, the occurrence of A virus-induced autoimmunity phenomena in the uterus favours the mediation and intensification (rapid or tardy) of the incompatibility at the level of the maternal-phoeto-placental complex. It should be specified that the investigation has started from the premise that autoimmunity phenomena induced in mink any of the known morphological types of glomerulonephrites, the nephotoxic syndrome respectively (antibody glomerulonephritis, basal glomerule membrane), the ones caused by immune complexes and sporadically by amiloidase (which may be stimulated by the DNA-antigen complex).

Glomerulonephritis and proteinuria generally cause, in their turn, uremia, bring about the discharge of urea through mucous membranes, muscles, skin, cerebrospinal fluid, through uterine transfer from mother to conception products, etc. When discharged as mentioned above, the urea turns into ammonia, which causes vasodilatation, stomatitis, gastroenteritis, haemorrhagic endometritis and the intermittent occurrence of haemoptyses (similar to those in the Goodpasture syndrome in man). The nephrotoxic syndrome has a slow evolution, from the almost inapparent azotemia to the severe uremia syndrome, and is paralleled by a similarly gradual degradation of the general condition. Consequently, polydipsis becomes conspicuous, the lungs display haemorrhagic diathesis, and the digestive organ, melaena. Besides uremia, the biochemical analysis of the blood also reveals hypoalbuminemia and, frequently, hypercholesterolemia (*Ghergariu, 1984*).

The haemodynamic disfunctions induced, as previously suggested, by the immune glomerule deposits within vessels cause the nephrotoxic syndrome to account for the exudative and haemorrhagic diathesis inducing certain oedemas in infected minks (ascites, hydrothorax, etc.). Such phenomena are extremely well illustrated in Figure 2, where the A virus is seen to have mediated these characteristics in uterine horns (the sample was analysed on the 23rd of February). Further on, during gestation the haemodynamic disfunctions of the genital apparatus lead to the decrease in nitrogenous substances (hypoalbuminemia) and oxygen (hypoxia) for the conception products and the occurrence of cytotoxic disfunctions (uremia) mostly in the phoetal kidney. Mention should be made that the haemodynamic insufficiency (deriving from placental insufficiency) accounts for several endocrine disfunctions, due to estrogen and progesterone decrease and exaggerated discharge of ACTH (embryo-phoetal immunodepressors).



Fig. 2. Haemodynamic disfunction of the nephrotoxic syndrome in mink females, it is represented by an exudative endometritis (hydrometre).

Besides the nephrotoxic syndrome, the alterations of the maternal-phoeto-placental balance may also be the result of the secondary placental insufficiency induced by certain interaction phenomena of isoimmunization, which are promoted by uterine receptors, as well as by species peculiarities (such as multiparity superovulation) or individual ones (primiparity, tardy conceptions, ovarian insufficiency, etc.).

The disbalanced immunitary system of the phoetus is subjected to the conjugate influence of both autoimmune factors and infectious (associated) ones, whose synergic impact upon placenta and imbilical cord ("amniotic infection syndrome") favours miscarriage, as a result of conception product mortality and, generally, of phoetal septicopenias. Changes have also been recorded in the structure of the amniotic liquid influencing the phoetal organs (mostly the kidneys), this structure has been found to comprise, besides albumine and alpha- and betaglobuline, also gammaglobuline, which is the effect of the A virus activity.

Another feature of gestation autoimmunopathogenesis in the A virus-generated infection is the system of acquired immunological tolerance, which is revealed by a special type of response characterized by the lack of specific reactivity in the lymphoid tissue coming into contact with the virus ever since the ontogenetic stage of immunologic immaturity. It may be, therefore, possible to induce the non-reactivity of the maternal organism towards the AD germ (repressed or partly expressed virus genome) it has contacted since the embryo-phoetal stage, and this may be regarded as a common phenomenon.

Mink juveniles resulting from infected mothers, even if transferred (through adoptions) to mothers responding negatively to the CEP test, as well as juvenile responding themselves negatively to the test, may exhibit sudden positive responses after a longer period of time. The biological background of this "reactivation" might be explained through virus infections acquired during gestation, when the vital cycle of the virus was latent or persisting and the organism adopted the previously-mentioned tolerance phenomena.

The only existing control means in virus diffusion are the tests already known. Unfortunately, the imperfections arising due to cross immunologic reactivity or to the limited spectra of the diagnostic materials used (antigens, alergens), restrict the diagnostic value of these tests to an accurateness acceptable for group checking but not for a sure individual diagnosis. Under these circumstances, the eradication of AD epizooties requires the knowledge of the part played by tolerated infections in the existence of

residual virus foci, which are a significant drawback in disease control, sometimes imposing the sacrifice of the whole group.

It seems, consequently, that the ability of the A virus to modulate and alternate from one reactive cycle to a non-reactive one, and backwards, is perhaps the greatest obstacle in eradicating and counteracting its severe, economically negative effects in this species.

Conclusions

- The highest embryonic mortality caused by the A virus occurs during the early stage (zygote, blastocyte), being mostly induced ethiopathogenetically by the activity of infected males (during preimplantation).

- The compensation of the functional immaturity of the active immunitary system with the passive one inside the infected maternal organism, occurring under certain circumstances close to fecundation or in the incipient stages of ontogenesis, allows the displacental transfer of autoimmunopathic elements discharged due to the presence of the A virus, elements which account for the maternal-phoetal incompatibility (during postimplantation).

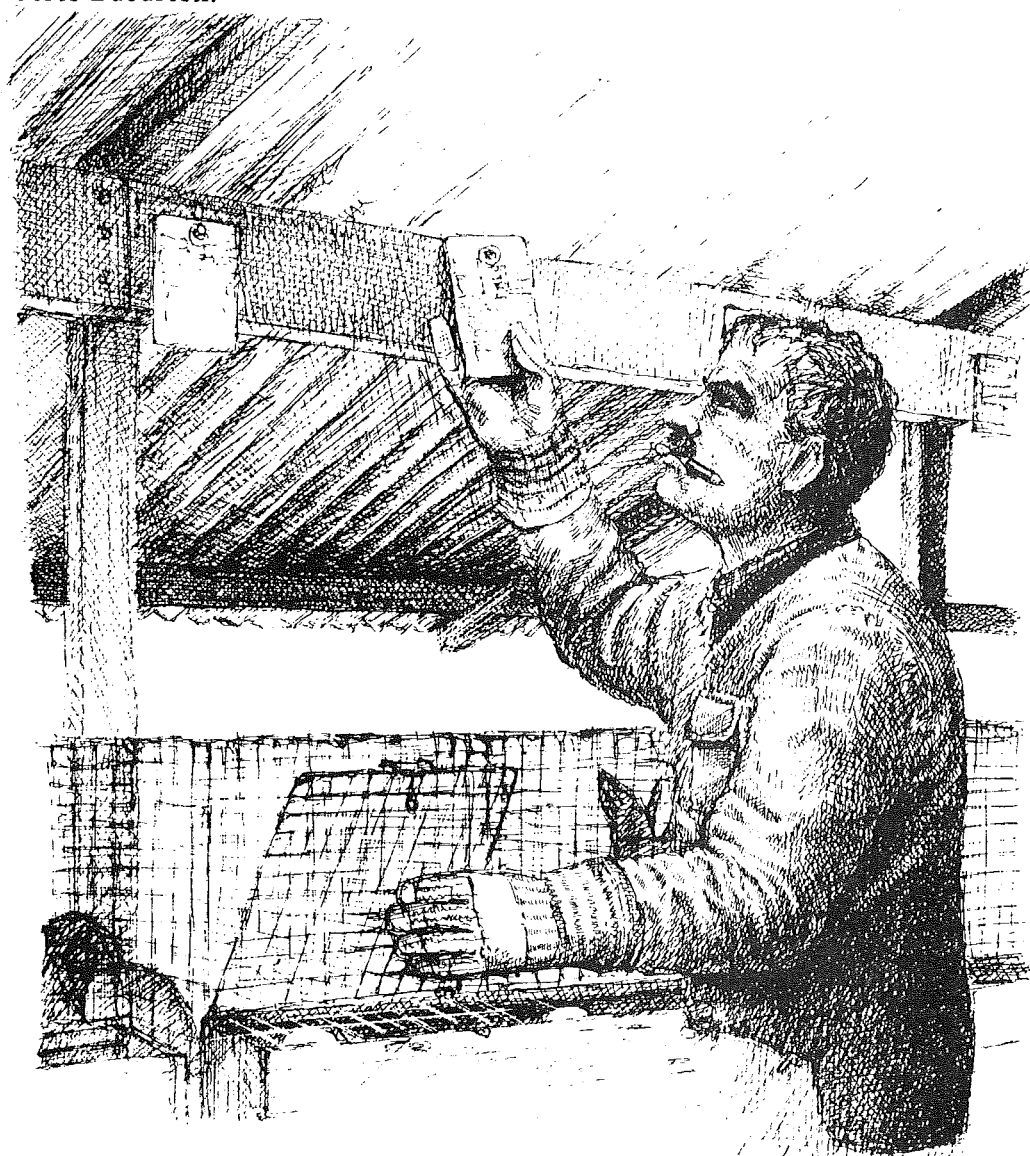
- The conjugate alterations of the enzymatic, hormonal and immunogene equipment lead to disfunctions in the selective placental passage, i.e. in the haemodynamic mechanism (hyponroteinemia and hypoxia) and the modulation mechanism of the gestating uterus.

- The system of acquired immunological tolerance facilitates the induction of non-reactivity to antigen - the germ of the Aleutian disease - in the maternal organism in minks, so that in order to control the autoimmunopathogenesis of gestation it is imperative to know the part played by this type of reaction and thus the existence of residual virus foci.

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A novel replicative form DNA of Aleutian disease virus: the covalently closed linear DNA of the parvoviruses.

M. Löchelt, H. Delius, O.R. Kaaden.

The analysis of replicative form (RF) DNA of Aleutian disease virus (ADV) by alkaline gel electrophoresis revealed that all RF DNA species segregate into DNA single strands which represent integral multiples of a genome equivalent. This demonstrates that as with other autonomous parvoviruses, the virion and complementary DNA strands are frequently linked by hairpin structures and that also, nicks are present at sub-terminal sites. Approximately 50% of the 5'-terminal hairpin contain a subterminal nick whereas no nick is detectable in the 3'-terminal hairpin. This finding together with the presence of nicks in the 3' palindrome sequence of the dimer RF DNA (D RF DNA) bridge fragment is the first experimental proof for the so far hypothetical substrate specificity of a nickase. A novel DNA structure was identified in the monomer (M) RF DNA population. This molecule, designated monomer covalently closed linear RF DNA (Mcc1 RF DNA), consists of a continuous, self-complementary, circular polynucleotide chain of twice the genome length. It was directly visualized by electron microscopy that denatured ADV M RF DNA is a single-stranded circular molecule of twice the genome length with covalently closed terminal hairpins on either end. Alkaline gradient centrifugations, enzymic assays and electrophoretic techniques confirmed the proposed structure. Moreover, evidence was obtained that the D RF DNA species contains an analogous Dc1 RF DNA. It is suggested that the newly described Mcc1 RF DNA form is an important intermediate common to the DNA replication of all autonomously replicating parvoviruses.

J. Gen. Virol. 70, 1105-1116, 1989. 9 figs., 34 references. Authors' summary.

Mink infected with Aleutian disease virus have an elevated level of CD8-positive T-lymphocytes.

B. Aasted.

Lymphocytes, monocytes, granulocytes, B-lymphocytes and CD8-positive T-lymphocytes of non-infected mink and mink infected with Aleutian disease virus (ADV) were measured by flow cytometry. The gammaglobulin levels of the sera were also measured. Besides development of hypergammaglobulinaemia in the infected mink, the most pronounced finding was that the number of CD8-positive lymphocytes doubled on average during development of Aleutian disease, while the number of B-lymphocytes did not

change dramatically. The enhanced CD8 frequency was still apparent 6 months after initial ADV infection of the mink. The present experiments contribute to a better understanding of the immune deficiency stage seen in mink infected with ADV.

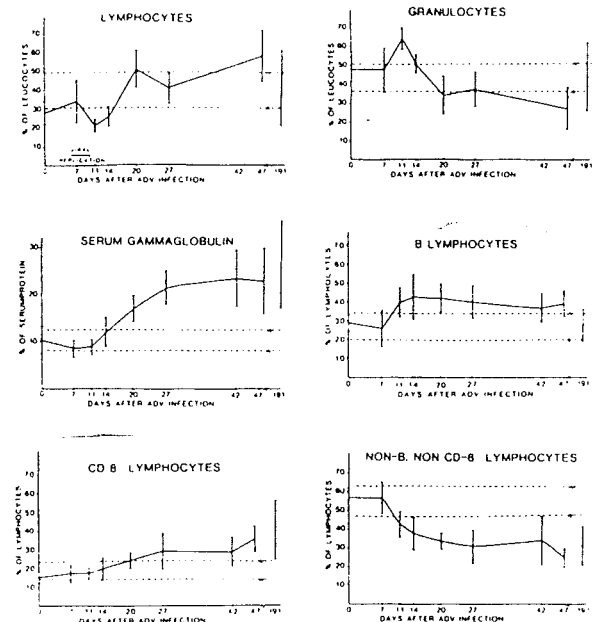


Fig. 2. Flow cytometric studies of leucocytes, B- and CD8-positive lymphocytes from black mink (non-Aleutian genotype mink) infected with Aleutian disease virus.

Veterinary Immunology and Immunopathology, 20, 375-385, 1989. 4 figs., 23 references. Author's abstract.

Plasmacytosis impairs breeding result and early kit growth in the mink.

K. Rouvinen, P. Niemelä.

In the mink, plasmacytosis is a common parvovirus disease, which causes great production losses on farms. The disease spread to nearly 100% of the mink stock of the Fur Farming Research Station during the spring and summer of 1987. In the spring of 1987 a study was performed in which we clarified the influence of different dietary fat sources (beef tallow, fish oil, rapeseed oil) and vitamin E supplementation on the breeding performance and early kit growth in the black mink. The material was then split up into healthy animals (401 females) and plasmacytotic ones (90). In the infected animals the number of barren females was 36% and 10% destroyed their litters. 15% of the healthy females were barren and 2% destroyed litters. The breeding result at weaning per mated female was 2.6 kits poorer for the plasmacytotic than for the healthy females, also kit mortality was nearly four times greater. Moreover, in the infected females, the weight gain of the kits during the lactation period was poorer than in the healthy

females. At weaning healthy male and female kits weighed 460 g and 405 g and infected kits weighed 393 g and 342 g, respectively. In the healthy animals, smaller kit mortality was obtained in the rapeseed oil group and the weight of the male kits was also better in this group at weaning than in the beef tallow group. The breeding result was poorest in the fish oil group. Vitamin E had no positive influence on the breeding result.

Maatalouden tutkimuskeskus, Tiedote 17, 1-17, Jokioinen 1989. 1 table, 4 references. In FINH, Su. SWED, ENGL. ISSN 0359-7652. Authors' summary.

Analysis of the virion of Aleutian disease virus of mink.

D.L. Barnard.

The ADV-G virion was analyzed with monoclonal antibodies and polyclonal antiserum. There was homology between the two major structural proteins, p66.5 and p82, as others have previously reported. Trypsin treatment of the virion with subsequent immunoblotting revealed that the 66.5K peptide represents the main peptide on the exterior of virion, and that p82 is probably embedded within the capsid. Additional analyses of the trypsin-treated virions showed that p66.5 is responsible for binding complement, and that it also represents the structural part of the virion that binds to cellular receptors. A third protein, p34 was detected that might represent a third structural polypeptide because of its many unique epitopes relative to the other peptides detected. The higher molecular weight peptides (104-126K) probably represent products of denaturation of the virions, while the 58.6K and 51.6K peptides may be breakdown products from the 66.5K polypeptide or alternatively products of multiply spliced transcripts. If the 83K and 66.5K peptides are breakdown products instead of the main viral polypeptides, then p86 and p73.4 might represent the true viral polypeptides from which the 82K and 66.5K peptides are derived.

Dissertation Abstracts International, 49, 6, 63 pp. 1988. Only abstract received. Author's abstract.

Aujeszky's disease (Morbus Aujeszki) in minks.

J. Konrad.

The authors describe the clinical, pathologico-anatomic and histologic picture of Aujeszky's disease in minks. It concerns the first occurrence of this illness among minks in Czechoslovakia Socialist republic. The clinical symptoms of this

type of fur animals are exactly identical with those as are known for other meat-eating and fur animals. There were no cases among the minks of typical feeling of itchiness with the intense scratching accompanying. In the course of the disease from the first visible symptoms to death of the animals varied from 3 to 20 hours. During dissection gaseousness of the digestive tract hyperemia and edema of the lungs were regularly ascertained. Deposit ischemic neurons of the heart muscle, spotted lesions on the mucous membrane of the abdomen and a slight serofibrinous pericarditis were among our findings. Dilatation of the veins in the large perenchyma and dilatation of varicose spread on the mesogastros were conspicuous. In some cases as a result of closely dilated veins bleeding occurred in the lung chambers and a massive submucous extravasates in the abdomen. The occurrence of lesions on the lining of the chest, abdominal cavity and on the serous organs of these cavities is excessively frequent. The finding on the CNS characteristics slight leptomeningitis and vacuolization of liquefaction of some ganglionic cells of the cortex of the big brain. In no case did we succeed medically when using symptomatic therapy and antibiotics during the course of the illness, nor could we influence the mortality of ill animals. Mortality was 100% for affected animals. From the total number of animals bred, 73.4% died. We did not succeed in ascertaining the method by which the infection was brought to the farm. The authors are of the opinion that it concerns an alimentary infection. From the point of view of prevention a strict adherence to health and hygienic requirements is recommended during manipulation with feed of animal origin. It is necessary in suspicious cases to feed meat scraps only after they have been thorough cooked.

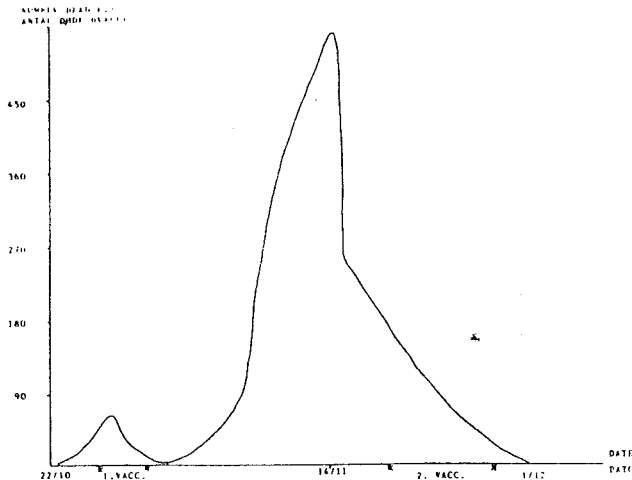
Sborn ces akad zemedelsk ved., in Czech, 3, 31, 803-816, 1958. 1 figs., 35 references. Transl 32369. In ENGL. Author's summary.

Contagious pneumonia in mink.

Mogens Jørgensen.

An outbreak of contagious pneumonia in mink caused by two serotypes of *Pseudomonas aeruginosa* is described. The outbreak started 22/10-88. Serotyping showed type 5 (Difco). In Denmark only monovalent vaccine is available. About a week after vaccination the number of dead mink raised dramatically. At the third examination on dead mink, the serotypes 5 and 6 was found. A polyvalent *Pseudomonas* vaccine was provided from USA. Together with the second vaccination, pelting was intensified. 4952 mink died out of 18200 corresponding to 27%. Sulfadiazin-Trimethoprim mixed in the feed in periods, showed evidently no effect. Using an polyvalent *Pseudo-*

monas vaccine from the start of the outbreak, would have reduced the loss of mink to approximately 200 mink.



Figur 2. Antallet af døde dyr i besætningen.

Dansk VetTidsskr., 72, 17 1/9, 997-1000, 1989. In DANH, Su. ENGL. Author's summary.

Usefulness of Ivermectin (Ivomec) in the treatment of scabies in foxes (*Alopex lagopus*, *Vulpes vulpes*).

M. Wroblewska, A. Malczewski, A. Kopczewski, T. Zdunkiewicz.

The aim of the work is to evaluate the efficiency of the drug Ivermectine (Ivomec) manufactured by MVD-AGVET in curing scabies in foxes of the basic herd. Ivermectine was used in 435 polar foxes (*Alopex lagopus*) and 180 silver foxes (*V. vulpes*) on 6 fox farms in the Gdansk voivodeship. 1 ml of 0.1% solution of the drug was injected subcutaneously; this dose was repeated after 10-14 days. The treatment was carried out on two fox farms on 113 polar foxes during the period of copulation and pregnancy. The clinical diagnosis of the disease and the efficiency of the treatment were confirmed by a laboratory examination of skin scrapes, which had been taken before the treatment started, and later on the 15-th and 30-th day after the drug had been administered to 40% of the foxes. The results achieved (100% cure rate) indicate the high efficacy and simultaneously the low toxicity of ivermectine. No harmful side-effects of the medicine were noted during copulation and pregnancy in the foxes (a high average of fox births and rearing). The new-born puppies were very lively and in good condition, and their further growth and development proceeded normally. Ivomec may be used in foxes of different ages and at different periods of their physiological conditions. The

ease of administering the drug (subcutaneous injection) and its low toxicity should facilitate the efficient treatment of ectoparasite infestation in fox breeding.

Wiadomosci Parazytologiczne (Poland), 32, 4-6, 599-601, 1986. In POLH, Su. ENGL. Authors' summary.

Trichophytosis of Nutria.

Ulf D. Wenzel, G. Albert.

Dermatomycoses play a particular role in nutria farming, on account of negative effects on fur quality. An account is given in this paper of the most common dermatomycoses so far recorded from nutria. Faults in keeping can be conducive to outbreaks. The vourse of the disease as well as necessary therapeutic measures are described by an example selected from the practice of the Fur Animal Health Service.

Mh. Vet.-Med. 44, 275-276, 1989. 2 figs., 11 references. In GERM. Authors' summary.

Studies into occurrence of bacterial infectious diseases in coypu (*Myocastor coypus* MOLINA, 1782). Third communication: Streptococcal, staphylococcal, aeromonas and actinobacillus infections.

B. Köhler, B. Wendland, M. Winkler, E. Kunter, G. Horn.

Streptococcus (Sc.) zoepidemicus may be considered a specific pathogen to cause pneumonia and septicaemia in coypu, with the incidence of both being particularly increased in the transitional period from winter to spring. Postmortem findings from 283 dead coypus from 23 stocks were evaluated and showed *Sc. zoepidemicus* infection to come second to salmonellosis as one of the most common causes of death. The pathogen was also isolated from 34.5 per cent of all organ and swab samples taken from clinically intact slaughtered and skinned coypus. *Staphylococcus (St.) aureus*, on the other hand, was recorded only from 3 animals that had died of diseases. Though a positive rate of 24.7 per cent was recorded from pharyngeal swabs as well as from tracheal and lun samples taken from clinically intact slaughtered animals from eight stocks. 20 of the 28 *St. aureus* isolated belonged to a *St. aureus* subtype which could not be apportioned to any category and had so far been recorded exclusively from coypu. *Aeromonas (Aer.) hydrophila* and *Actinobacillus suis* were isolated as infectious pathogens in 4 or 3 cases. *Aer. hydrophila* biotype-1 strains failed to pro-

duce enterotoxin, but in infection experiments they proved to be pathogenic to mice and coypus, the lethal dosage by intra-abdominal application being $1 \cdot 10^8$ or $6 \cdot 10^7$ colony-forming units per animal.

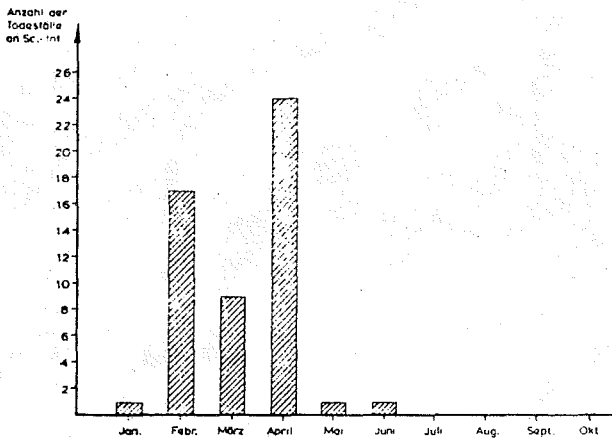


Abb. 1. Monatliche Verteilung der Todesfälle an Streptokokken-Infektionen

Archiv für experimentelle Veterinärmedizin, 42, 6, 877-889, 1988. 6 tables, 1 fig., 32 references. In GERM, Su. ENGL, RUSS. Authors' summary.

Studies on experimental trichinellosis in Myocastor coypus.

S. Popescu, M. Mazanet, V. Fromunda, V. Oproiu, M. Tetu-oporanu, A.M. Ciocnitu.

The experiments demonstrated the high sensitivity of the coypu to the infestation with *Trichinella spiralis*. The studies were conducted in a group

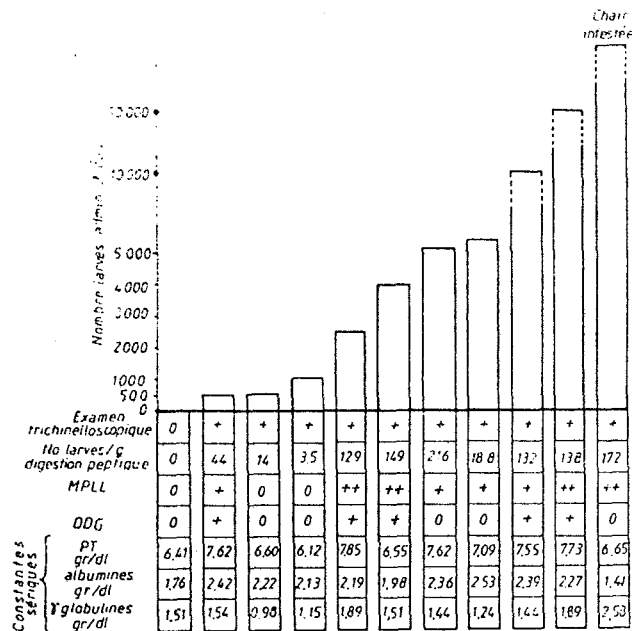


Fig. 2 — Données comparatives concernant la corrélation entre les taux d'infestation et les résultats des examens effectués

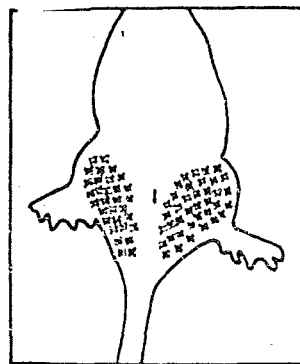
of 25 animals using various infestation variants; the infestation parameters being monitored by: trichinelloscopy, artificial peptic digestion of the musculature, microprecipitation with freeze-dried larvae and agar gel double diffusion. Generally, a correlation was seen between the number of larvae administered and the obtained after the artificial digestion; the presence of the larvae in various muscle groups is similar to that found in the common host species. The correlation of the results obtained on the serological tests with the results given by trichinelloscopy pointed out a higher sensitivity of the microprecipitation reaction with freeze-dried larvae in comparison with the agar gel double diffusion. It is recommended to perform the trichinelloscopic examination of coypu meats for public consumption.

Archiva Veterinaria, 18, 37-46, 1987. 1 table, 2 figs., 5 references. In FREN, Su. ENGL, GERM, RUSS. Authors' summary.

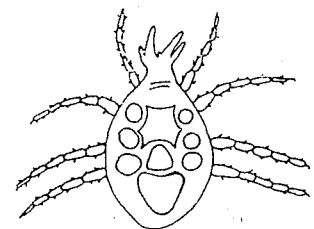
Dermanyssus gallinae (de Geer 1778) on coypu (Myocastor coypus).

W.A. Gibasiewicz.

In a coypu colony kept in concrete cages without swimming facilities and free access to water, a heavy infestation of *Dermanyssus gallinae* was diagnosed in the groins of young animals weakened by *Salmonella* infection. The transmission of the parasite from poultry could be attributed to wild birds and flies. *D. gallinae* is the tenth ectoparasite so far found on coypu.



Ryc. 1. Lokalizacja *D. gallinae* u nutrii (oryz.)



Ryc. 2. *Siphonotus plaszynca* (oryz.)

Medycyna Weterynaryjna, 43, 10, 593, 1987. 2 figs. In POLH. CAB-abstract.

Hyperinsulinism and hypoglycemia associated with pancreatic islet cell tumor in a ferret.

A.E. Jergens, D.P. Shaw.

Pancreatic islet cell tumour was diagnosed in a

ferret with hypoglycaemia, hyperinsulinism, and progressive neurological dysfunction. The tumour was removed and the ferret recovered. Eight months later the ferret died following recurring episodes of hyperglycaemia and glycosuria.

Journal of the American Veterinary Medical Association, 94, 2, 269-271, 1989. 1 fig., 10 references. CAB-abstract.

Campylobacter pylori subsp. *mustelae* subsp. nov. isolated from the gastric mucosa of ferrets (*Mustela putorius furo*), and an emended description of *Campylobacter pylori*.

J.G. Fox, N.S. Taylor, Paul Edmonds, Don J. Brenner.

The name *Campylobacter pylori* subsp. *mustelae* subsp. nov. is proposed for a *Campylobacter* commonly isolated from normal or inflamed gastric mucosa of ferrets. *C. pylori* subsp. *mustelae*, like *C. pylori*, has multiple sheathed flagella, rapidly hydrolyzes urea, is H₂S negative on triple sugar iron agar, and has a variable reaction on lead acetate strips. It does not grow in the presence of 3% NaCl, and growth is variable in 0.04% triphenyltetrazolium chloride and 1% glycine. Unlike *C. pylori*, this organism reduces nitrate, is susceptible to nalidixic acid, and is resistant to cephalothin. Three strains of *C. pylori* subsp. *mustelae* were highly related ($\geq 86\%$) as determined by deoxyribonucleic acid (DNA)-DNA hybridization (hydroxyapatite method, 50 and 65°C). *C. pylori* subsp. *mustelae* was $\geq 85\%$ related to *C. pylori*, whereas the level of relatedness with another seven *Campylobacter* isolates was $\leq 2\%$ at 65°C. The type strain of *C. pylori* subsp. *mustelae* is strain R85-13-6 (=ATCC 43772), and its DNA has a guanine-plus-cytosine content of 38 mol%.

International Journal of Systematic Bacteriology, 38, 4, 367-370. 3 tables, 22 references. Authors' summary.

Cryptosporidiosis in ferrets.

Jerold E. Rehg, Francis Gigliotti, Dennis C. Stokes.

The diagnosis of cryptosporidiosis in two ferrets who died from unrelated causes prompted a survey to determine the prevalence and incidence of the infection in ferrets at our facility. The survey of the existing ferret population and all new arrivals indicated cryptosporidiosis occurred as a subclinical disease in a high percentage of young ferrets: 40% of the ferret population and 38 to 100% of the new arrivals had cryptosporidial oocysts in their feces. The infection was found to persist for several weeks in both immunocompetent and immunosuppressed ferrets. The inter-

species transmission of *Cryptosporidium* implies that infected ferrets should be considered a potential source of infection for the general population.

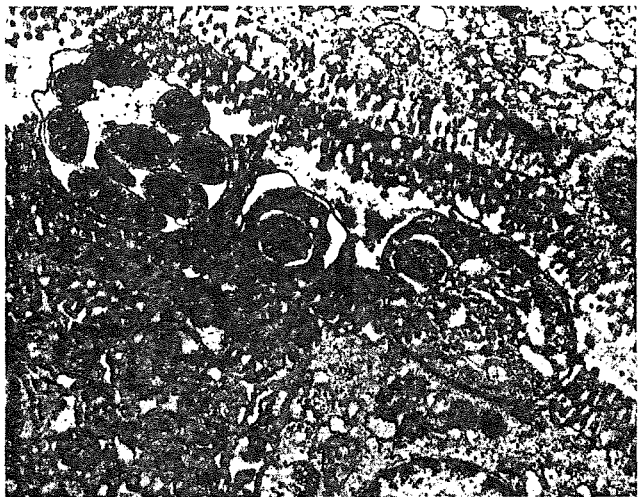


Figure 3 Electron micrograph of ferret small intestine with three cryptosporidia developmental stages. Two abut the microvillous tips of a villous enterocyte. The other is attached to the microvillous surface of a villous epithelial cell. From left to right: schizont with merozoites, early trophozoite, late trophozoite. The late trophozoite shows the characteristic attachment zone (arrow) of cryptosporidia. Magnification 19,000X.

Laboratory Animal Science, 38, 2, 155-158. 3 tables, 4 figs., 15 references. Authors' abstract.

Neoplasia in ferrets: eleven cases with a review.

J.E. Dillberger, N.H. Altman

Records from a veterinary diagnostic laboratory in south Florida, U.S.A. were reviewed for cases of neoplasia in pet ferrets. Twelve ferret tumours were received over a four-year period; one case, a ferret with lymphocytic leukaemia and multi-organ involvement, had been reported previously. The other eleven tumours were: two chordomas of the tail, two sebaceous epithelioma of the skin, a cutaneous mastocytoma, a malignant fibrous histiocytoma from the eyelid, a malignant mesenchymoma and an undifferentiated sarcoma from the dorsal abdominal cavity, a leiomyosarcoma found unattached in the abdominal cavity and an interstitial cell tumour of the testicle. A review of the literature yielded reports of 83 other tumours in domestic ferrets, black-footed ferrets and European polecats. Of the 95 ferret tumours, 46 were considered malignant. Tumours occurred in all organ systems except the respiratory tract and central nervous system. Affected ferrets ranged in age from 209 days to 12 years. The most frequently occurring tumours were ovarian stromal tumours (24 of 95), haemangiomas/haemangio-sarcomas (15 to 95). This information indicates that, contrary to previous

opinion, ferrets appear to be subject to a similar incidence and variety of tumours as other animals.



Fig. 1. Chordoma that arose in the tail (case 1). Note focal ulceration.

J. Comp. Path., 100, 2, 161-176, 1989. 2 tables, 10 figs., 39 references. Authors' summary.

Chemotherapeutical remission of multicentric lymphosarcoma in a ferret (*Mustela putorius furo*).

Steven J. Dugan, Sharon A. Center, John F. Randolph, Wayne I. Anderson.

A 29-month-old spayed female fitch ferret (*Mustela putorius furo*) was presented for evaluation of abdominal organomegaly. Multicentric lymphosarcoma was diagnosed by histological examination of a splenic wedge biopsy. Complete remission was obtained with a chemotherapeutical regimen consisting of L-asparaginase, cyclophosphamide, and prednisone.

Journal of the american animal hospital association, 25, 1, 69-74. 2 tables, 4 figs., 26 references. Authors' abstract.

Ramipril inhibitor of rabbit (*Oryctolagus cuniculus*) small intestinal brush border membrane angiotensin converting enzyme.

Bruce R. Stevens, M.I. Philips, Alarico Fernandez.

1. Rabbit small intestinal brush border membranes possessed prominent angiotensin converting enzyme (ACE) activity.
2. Intestinal ACE was located on the lumen surface, as verified by ACE co-enrichment with brush border membrane marker enzymes.
3. Hydrolysis kinetics of rabbit intestinal ACE were comparable to the lung, utilizing the substrate (N-[3-(2-furyl)acryloyl]-L-phenylalanyl-glycylglycine; the $V_{max} = 543 \pm 51 \mu\text{mol}/\text{min}/\text{g}$ and $K_m = 0.62 \pm 0.09 \text{ mmol}/\text{l}$.

4. Intestinal brush border ACE activity was strongly inhibited by the antihypertensive drug Ramipril, which yielded an IC_{50} value of 5 nmol/l; the ACE activity remained completely inhibited during 15 days after a single dose of 10 $\mu\text{mol}/\text{l}$ Ramipril.

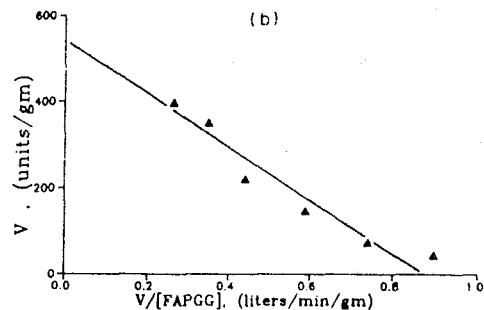
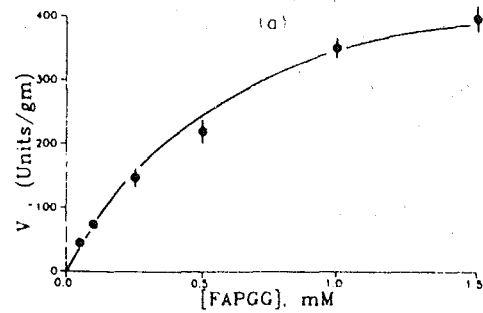


Fig. 2. Kinetics of FAPGG hydrolysis. (a) Linear plot of [FAPGG] vs rate V . The kinetic parameters were solved simultaneously by nonlinear regression analysis: $V_{max} = 543 \pm 51 \text{ units}/\text{g protein}$, $K_m = 0.62 \pm 0.09 \text{ mmol}/\text{l}$ FAPGG. Vertical bars represent SE of 4 separate determinations. (b) Eadie-Hofstee plot of panel a data gave a linear relationship, which confirmed that a single enzyme species was responsible for FAPGG hydrolysis.

Comp. Biochem. Physiol., 91C, 2, 493-497, 1988. 2 tables, 4 figs., 46 references. Authors' abstract.

Subcutaneous dirofilariasis in red fox.

J. Brglez, S. Verbancic.

Dirofilaria repens microfilariae were found in subcutaneous tissue of a red fox first time for Yugoslavia. Morphometric data for males and females are given and epidemiological aspects are briefly discussed.

Zb. biotehn. fak. Univ. E. Kardelja, Vet., 25, 1, 53-56, 1988. 1 fig., 9 references. CAB-abstract.

Specific control measures for trichophyton infection in furbearing animals.

L.I. Nikiforov.

Trichophyton mentagrophytes vaccine ("Mentavak") was developed after it had been shown that this was the commonest dermatophyte of farmed foxes. The vaccine was released by the USSR Ministry of Agriculture in December 1981, and it was estimated that 3.5 million furbearing animals (mainly silver foxes and arctic foxes) had been vaccinated.

Trudy Vsesoyuznogo Instituta Eksperimentalnoi Veterinarii, 65, 25-31, 1987. 1 table, 7 references. In RUSS. CAB-abstract.

Trichophyton infection in nutria and current methods of control.

A.M. Litvinov, L.I. Nikiforov.

Mycological examination of 350 skin specimens from 7 nutria farms affected by ringworm yielded 287 cultures of Trichophyton mentagrophytes. Treatment and prevention with "Mentavak" mentagrophytes vaccine was more cost effective than griseofulvin therapy.

Trudy Vsesoyuznogo Instituta Eksperimentalnoi Veterinarii, 65, 63-72, 1987. 1 table, 16 references. In RUSS. CAB-abstract.

Occurrence of coccidia of the Eimeria species in nutria in eastern Slovakia.

M. Goldova, V. Laciak, M. Breza.

In 1986, 6 faecal samples from nutria on 3 farms

in East Slovakia were examined microscopically by a flotation method after sporulation at ambient temperature for 4 to 5 days (with 2% potassium dichromate as an antifungal agent). Eimeria myopotami was found in 38%. E. pellucida in 19% and E. myocastori in 3% of samples. E. Myopotami occurred in 2 forms: the yellow or brownish oocysts measured 19 to 22 X 13 to 16 microm, or 26 to 32 X 19 to 26 microm. Both forms were spherical to slightly oval and almost completely filled with cytoplasm. The wall was thick, 3-layered, and smooth. Oocysts of E. pellucida measured 27 to 29 X 13 to 16 microm, were oval, transparent, colourless, and the cytoplasm did not fill the space completely; the wall was very thin. E. Myocastori measured 14 to 16 X 10 to 12 microm. No lesions were found in the liver of some nutria examined PM.

Veterinarstvi, 38, 10, 455-456, 1988. 1 table. CAB-abstract.

Health status of Norwegian fur farms in 1988.

G. Loftsgaard.

The following diseases were recorded in 1988: (numbers of affected farms and animals not given) mink viral enteritis; viral hepatitis plasmacytosis; Pseudomonas infection (pneumonia and metritis); Microsporium infection; Sarcoptes infestation; helminth parasites.

Norsk Veterinaertidsskrift, 101, 1, 24-25, 1989. In NORG. CAB-abstract.





NORDISKE
JORDBRUGSFORSKERES
FORENING

**NJF (Scandinavian Association of
Agricultural Scientists) Seminar:**

**"Practical results of Nordic Fur Ani-
mal Research of the latest years"**

Title of the seminar is:

1. "Practical results of the latest years' of Nordic Fur Animal Research"
2. The seminar will be held from September 19th to 21st, 1990 at Scandic Hotel, Tåstrup near Copenhagen, Denmark. Address: Carl Gustavsgade 1, DK-2630 Tåstrup. Tel. +45 42 99 77 66, fax +45 42 99 72 66.
3. Subjects of the seminar will be:
 - a. Production aspects of the ethological research in fur animals, e.g. a summary of the practical results of the inter-nordic project regarding cage and nest box systems for foxes.
 - b. Up-to-date knowledge regarding practical handling of feed and the influence of handling on feed quality as well as reports from working groups regarding energy and minerals.
 - c. In the breeding area the problem regarding EDP-breeding systems as opposed to traditional breeding methods will be brought into focus.
 - d. The excursion in the afternoon of September 20th will go to SAGA Design Center in Vedbæk, where the facilities will be presented, and where the IFTF Ecology Section will tell about anti-fur activities and consequences hereof on production and research.
 - e. Research reports or posters related to the subjects of the programme are invited.

The arrangement committee reserves the right to evaluate and fit in the papers received in the programme of the seminar.

4. Participation fee:

DKK 2.500.- for members of NJF.
DKK 3.000.- for non-members.

Participation fee must be paid before August 1st, 1990 to Dansk Pelsdyravlerforening, Langagervej 60, DK-2600 Glostrup. Giro acc. 7 08 01 23.

5. Deadline:

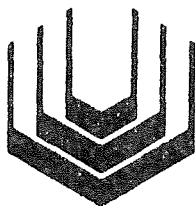
- a. Preliminary enrolment and submission of titles and abstracts at the latest on May 1st, 1990.
- b. Final enrolment and submission of full manuscripts and payment of participation fee at the latest on August 1st, 1990.

6. Languages: Scandinavian.

7. Write or phone for further information.

8. Secretariate:

Dansk Pelsdyravlerforening
(att. Eva Andersen)
Langagervej 60
DK-2600 Glostrup, Denmark
Tel: +45 43 43 44 00
Fax: +45 42 45 25 46



Bioteknisk Institut

International Symposium on Near Infrared (NIR) Spectroscopy

24th-26th April 1990
Kolding, Denmark

Invitation

You are invited to participate in the International Symposium on Near Infrared (NIR) Spectroscopy, 24th-26th April 1990 at Hotel Scanticon, Kolding, Denmark.

The Symposium will cover all aspects of NIR analysis focusing mainly on the feed and food industries.

The aim of the Symposium is to gather scientists as well as actual and potential users of NIR for debate and exchange of know-how.

The Symposium is directed towards:

- Users of NIR and NIT (Near Infrared Transmission)
- Scientists working with near infrared spectroscopy
- Employees from quality departments with an interest in rapid methods of analysis

The Symposium will be held in English with simultaneous translation into Danish, French and German. The number of participants is limited to max. 150.

The program will cover topics within the following areas:

- * NIR and NIT used for feed and food analysis
- * NIR and NIT used for settling accounts
- * Principles, optimization and maintenance of NIR calibrations
- * Implementation of NIR in the feed and food industry

- * On-line NIR measurements
- * Legal acceptance of NIR analysis
- * Global calibrations
- * Developments to be expected in the future

The programme is divided into topical sessions. Each session closes with a debate. The panel will consist of the speakers involved in the session.

We look forward to hearing from you regarding your participation at the NIR Symposium.

International Symposium on Near Infrared (NIR) Spectroscopy, Kolding, Denmark. April 24-26, 1990. The Symposium will feature papers on topics that include NIR/NIT used in the feed and food industries; agricultural applications; calibration techniques, calibration optimization and maintenance; NIR implementation in the industry; on-line NIR measurements; authorization and global calibrations; future possibilities within the NIR/NIT technique. Besides papers, poster presentation is a possibility.

Symposium Fee: DKK 5.500, including hotel room and meals.

For participants presenting papers or posters the Symposium fee is: DKK 2.750.

Further informations, please contact Lone Vejgaard, Bioteknisk Institut, Holbergsvej 10, 6000 Kolding, Denmark (tel. 75520433; fax 75529989).

Results and prospects of cooperation between three countries in the field of clinical biochemistry of fur animals

Lia Kozhevnikova

Institute of Biology, USSR Academy of Sciences, Karelian Branch, Petrozavodsk, 185610, Pushkinskaya, 11

On December 11, 1989 the Symposium on the problems of physiology and productivity of fur animals was held in Petrozavodsk, USSR Academy of Sciences, Karelian Branch. It was organized to discuss the results of long-term cooperation between three countries USSR (Karelia) - Finland - Denmark in studying haematology and clinical chemistry of fur animals. The Symposium was attended by an international group of eight scientists from Denmark and Finland headed by Dr. Tapio Juokslahti, Project manager on production of fur animal feeds, Cultor Ltd. The group was represented by Dr. Maija Valtonen and Dr. Leena Blomstedt, the Finnish Fur Breeders' Association, Dr. Joukko Meriläinen, the University of Joensuu, Prof. Paul Lindberg, College of Veterinary Medicine, Joukko Työpponen, the Assistant Professor, Dr. Gunnar Jørgensen, Research leader, Danish National Institute of Animal Science and Dr. Asbjørn Brandt, researcher, Danish National Institute of Animal Science.

At the Symposium much attention was paid to the state of present-day studies of fur animal physiology, and an agreement for further cooperation was signed.

The idea of the scientific cooperation was proposed in 1983 during the first visit of this group of scientists to the Laboratory of Fur Animal Physiology, Institute of Biology, USSR Academy of Sciences, Karelian Branch. It was then decided to gather all clinical biochemical reference values for fur animals available in the USSR, Finland and Denmark and to supplement them with new data taking into account the fact that no such complex book has yet been published.

The cooperation between the Soviet and Finnish sides became possible in 1985 due to the support from the Scientific-Technological Cooperation Committee between USSR and Finland in the field of biology. At the same time the Finnish researchers established contacts with their Danish colleagues Gunnar Jørgensen and Asbjørn Brandt, National Institute of Animal Science. It was decided to generalize available data on clinical biochemistry and haematology of fur animals in a joint monograph. The initiator of the publication of the book from the Soviet side was Prof. V.A. Berestov, the Head of the Laboratory of Fur Animal Physiology, Institute of Biology, USSR Academy of Sciences, Karelian Branch, from the Finnish side - Dr. Tapio Juokslahti. The idea was supported by the researchers from Denmark whose work was supervised by Dr. Gunnar Jørgensen.

And here is the result. At the Symposium Dr. Tapio Juokslahti and Dr. Asbjørn Brandt presented the joint monograph published in English by SCIENTIFUR and printed in Finland by Gummerus Kirjapaino Oy, Juvvaskylä. The authors of the monograph "Haematology and clinical chemistry of fur animals" are: Prof. V.A. Berestov and Dr. L.K. Kozhevnikova, Institute of Biology, USSR Academy of Sciences, Karelian Branch; Dr. Tapio Juokslahti and Dr. Maija Valtonen, College of Veterinary Medicine, Leena Blomstedt, Finnish Fur Breeders' Association, Dr. Gunnar Jørgensen and Dr. Asbjørn Brandt, Danish National Institute of Animal Science. Asbjørn Brandt is also the editor of the book and has made a large contribution to its publication.

We would like to express our sincere thanks to the Scientific-Technological Cooperation Committee between USSR and Finland, Finland and Nordic Cultural foundation for their financial support without which the book would not have been published.

In the process of the work at the book the authors from the three countries have learned much: to work intensively, to overcome language barriers and psychological ones connected with different research levels and methods. The contacts have enriched the researchers, taught them to treat the work done critically, to assess the results and to see new prospects of investigations. Everyone has understood that the present time requires a rapid exchange of information and ideas to achieve the results which can be used in applied fur breeding in our countries.

It was of paramount importance at the Symposium to discuss the state and prospects of further investigations on physiology and productivity of fur animals. 13 scientific papers were presented. The papers were concerned with the problems of diagnostics, the degree of maturation and phases of hair growth in minks (L. Blomstedt), the formation of immunological status

(IgA, IgJ and IgM) in mink females (A. Brandt), the provision with vitamins at a different level of feeding and adaptation of food factors (S. Izotova), studies of vitamin status of fur animals (G. Petrova), trace element content in fur animals (J. Työppönen), digestive characteristics of predatory mammals (V. Oleinik), strategies and methods for biochemical monitoring on fur farms (L. Kozhevnikova), the trends of investigations on the physiology of fur animals at the Institute of Biology, USSR Academy of Sciences, Karelian Branch (N. Tyutyunnik).

Finally, the third part of the meeting was solved - the problem of further cooperation between the three countries: Institute of Biology, USSR Academy of Sciences, Karelian Branch, USSR (Prof. S.N. Drozdov), College of Veterinary Medicine, Finland (Prof. P. Lindberg) and National Institute of Animal Science, Denmark (Dr. G. Jørgensen). The cooperation will involve further studying the hormonal, enzymatic and vitaminous status of fur animals, an exchange of scholars and information, and as a result a joint book will be published in the USSR.

Let us hope that the cooperation will be fruitful.

HAEMATOLOGY AND CLINICAL CHEMISTRY OF FUR ANIMALS

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Asbjørn Brandt

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HAEMATOLOGY AND CLINICAL CHEMISTRY OF FUR ANIMALS

Editor
Asbjørn Brandt

This book is a result of many years of cooperation between the USSR Academy of Sciences, Karelian Branch, Petrozavodsk (Professor Vyacheslav Berestov and Dr. Lia Kozkevnikova), the College of veterinary Medicine, Helsinki and the Finnish Fur Breeders Association (Dr. Tapio Juokslahti and Dr. Maija Valtonen) and the National Institute of Animal Science, Dept. of Fur Animals, Denmark (Asbjørn Brandt and Gunnar Jørgensen).

The editor of the book, Asbjørn Brandt, is acknowledged for his large contribution to the final result – the first reference book in fur animal clinical chemistry and haematology.

The Production of the book is based on the cooperation between the College of veterinary Medicine, Helsinki and the Finnish Fur Breeders Association, Scientifur – Fur Animal Division of the Scandinavian Association of Agricultural Scientists, with economical support from Scientific – Technological Cooperation Committee between Finland and USSR, Ministry of Foreign Affairs, Finland and the Nordic Cultural Foundation. The present book which is the result of a fruitful international scientific cooperation, would not have been published without this support. Translation of the Russian contribution into English has been done by G.N. Sokolov, and the English text in the final manuscript has been revised by G. Brandt M. Sc.

We thank all contributors, the financing funds, the editor, and the printing house for their cooperation.

Helsinki, October 1989
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Tjele, October 1989
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Nikolaev, October 1989
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With 159 pages, 20 chapters, 25 colour plates, 52 b/w illustrations, 43 tables and 371 references this remarkable book is the first attempt to generalize available data on clinical biochemistry of fur animals obtained in different countries, at the same times confirming the importance of international cooperation in fur animal science.

Price: DKK 250.- + postage.

For scientific libraries in the USSR and the Nordic Countries totally 500 copies are free of charge and can be obtained by payment of dispatch fee and postage DKK 50.- per copy.

The following copy of contents will show the wide spectrum of recent knowledge presented in the book and the list of authors the scientific authority put into the chapters.

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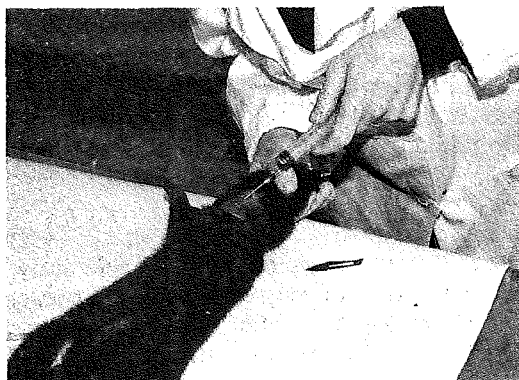
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CONTENTS

Haematology and Clinical Chemistry of Fur Animals
Current Treatise-

	PAGE
PREFACE	
LIST OF AFFITIATIONS	
1. INTRODUCTION by Vyacheslav Berestov	9
2. BIOLOGY OF FARMED FUR BEARING ANIMALS by Vyacheslav Berestov & Lia Kozhevnikova	10
3. HAEMATOPOIESIS by Vyacheslav Berestov & Asbjørn Brandt	19
4. ERYTHROCYTES AND LEUCOCYTES by Vyacheslav Berestov & Asbjørn Brandt	22
5. THROMBOCYTES, MEGAKARYOCYTES AND COAGULATION by Asbjørn Brandt	34
6. PROTEINS by Tapio Juokslahti	38
7. IMMUNITY by Vyacheslav Berestov & Asbjørn Brandt	47
8. LIPIDS by Asbjørn Brandt	57
9. CARBOHYDRATES by Vyacheslav Berestov	64
10. ENZYMES by Lia K. Kozhevnikova	66
11. PLASMA ELECTROLYTES AND ACID-BASE BALANCE by Maija Valtonen	80
2. HORMONES by Maija Valtonen	86
13. VITAMINS by Tapio Juokslahti	95
14. TRACE ELEMENTS by Asbjørn Brandt	105
15. SKIN AND HAIR by Leena Blomstedt & Natalija Tyurnina	110
16. CLINICAL CHEMISTRY IN SPECIAL DISEASE CONDITIONS	114
16.1. ANAEMIA by Asbjørn Brandt & Vyacheslav Berestov	114
16.2. MUSCULAR DEGENERATION by Asbjørn Brandt	116
16.3. STRESS by Asbjørn Brandt	118
16.4. INFECTIONS by Vyacheslav Berestov & Asbjørn Brandt	122
16.5. LIVER DYSTROPHY by Vyacheslav Berestov & Asbjørn Brandt	128
17. SPECIAL TESTS by Asbjørn Brandt	131
18. SAMPLE COLLECTION by Vyacheslav Berestov & Asbjørn Brandt	133
19. REFERENCES	137
20. INDEX	153

It has been a great experience for SCIENTIFUR, thanks to the enthusiasm of the authors and the economic support mentioned before, to add this publication as number 3 to the list of scientific literature regarding fur animal production.



Blood sampling by vena jugularis puncture in anaesthetized mink. (Photo: Brandt)



Blood sampling by heart puncture in anaesthetized mink. (Photo: Brandt)

Atlas of Microscopic Structures of Fur Skins 1

by ANTON BLAŽEJ

Member of Czechoslovak Academy of Sciences
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MILAN MLÁDEK

Technical University, Gottwaldov

Approximately 150 different species of animal furs are presently produced by the fur industry. Insufficient supplies of certain types of skin, and the increased cost of rare skins, have compelled fur manufacturers to change the colour, thickness, hair shape, and other such properties of cheaper skins, and to perfect imitations of rare skins types. It has therefore become increasingly important for people in the fur trade to identify the products in microscopic detail. Such identification is also necessary for archaeologists, zoologists and criminologists. Microscopy is a commonly available method, but when trying to use this technique for identification of an unknown sample, it is necessary to compare microscopic features with those of a great number of species having similar patterns.

The primary objective of this book is to fill a gap in the available reference material by presenting an exact description and proper illustrations of a wide range of skin species. Secondly, it aims to complete the fur microscopic pattern classification with newly recognised types, together with the adaptation of the nomenclature to the microstructures observed by modern electromicroscopic techniques. The book contains a wide collection of microphotographic figures and the numerical codes for the microscopic structures of fur. This first volume covers approximately one half of the range of important skin species. The remaining skin species will appear in a second volume.

This book will be invaluable to animal fur breeders, veterinary specialists, fur manufacturers, zoologists, archaeologists, and criminologists.

1989 about 430 pages

Price: US\$ 144.75 / Dfl. 275.00

ISBN 0-444-98899-8

Distributed in the East European countries, China, Northern Korea, Cuba Vietnam and Mongolia by SNTL, Prague, Czechoslovakia

Atlas of Microscopic Structures of Fur Skins 1.

Review by Palle V. Rasmussen, February 1990.

A: Anton Blazy et al. (Elsevier).

It was with great interest that we heard about the publication of the above mentioned work describing the fur of approx. 50 different animals.

Chapter 1 begins with a short review of basic methods within the field of microscopy - light microscopy and electron microscopy. Hereafter 2 pages with a general description of the morphologically/histologically classified components of the hair: hair shaft, cuticula, cortex, medulla, hair pigment and hair follicle. Regarding the hair follicle, the definition of and differentiation between follicle, cluster of follicles and hair channel could be more precise, perhaps by means of illustrations. For instance the description of *Martes zibellina* leaves a confused impression of these three concepts.

Chapter 2 deals with classification and nomenclature of morphological fur characteristics: Surface of the skin, transition from surface to hair channel, number of hairs per cluster of follicles, surface of hair with regard to various forms of cuticula scales and medulla structures. The chapter concludes with an introduction of a species or individual determined numerical code for the morphological description of the fur. This code could be useful in regard to data processing.

The last and largest chapter of the book describes geographical distribution and type of fur of each individual animal species. Several scanning electron microphotos explain the hair structure, and further the photos describe the so-called numerical code of fur structure. The book contains an enormous amount of photos of varying quality.

The overall impression is an exciting book. We look forward to seeing volume 2.



Pelztieratlas

Fur Animal Atlas

H. Dathe & P. Schöps

Fur was the very first consumer article used by human beings. At first hunting was the only way to get hold of it, but later domestic animals multiplied the possibilities for clothing as well as for ornaments. Nowadays the selection has been increased considerably through farming. Using the latest results, the present atlas offers in words and pictures a rich material of more than 200 wild, farmed and domestic breeds or races. Greatest importance has been attached to the zoological part with indication of sizes, weight, reproduction, behaviour, nutrition, fur quality, environmental protection, origin etc. Eye-catching are the outstanding photos supplemented with maps of distribution. The preceding general section tells about many different aspects of the healthy, sick or damaged hair or fur, respectively. Of great value to expert fur animal practices is also the clarification of confusing namings as well as the useful abundance of information for educational purposes.

331 pp, richly illustrated, In GERM.

Pelztieratlas
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The Natural History of

WEASELS & STOATS

Carolyn King

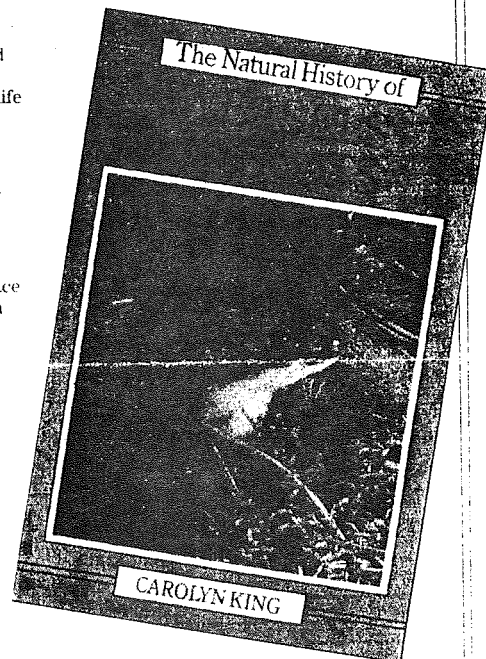
This is the first comprehensive account of the biology of weasels, thoroughly documented and grounded in the author's experience of more than twenty years as a scientific observer of the weasels' life cycle and behaviour.

The unique combination of readily accessible text and exhaustively researched facts makes this book equally valuable to both the interested naturalist and the professional biologist.

CONTENTS

List of colour plates · List of figures · List of tables
Acknowledgements · Series editor's foreword · Preface
1. Introduction 2. Hair trigger mousetraps with teeth
3. Moulting and winter whitening 4. Body size
5. Food 6. Hunting behaviour 7. The impact of predation by weasels on population of natural prey
8. Adjustable living spaces 9. Reproduction
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In memoriam
Mick Southern

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Line illustrations by Larry Douglas

VIRUS INFECTIONS OF CARNIVORES

Virus Infections of Vertebrates, 1

Edited by

Max J. Appel

James A. Baker Institute of Animal Health, New York State College of Veterinary Medicine, Cornell University, Ithaca, NY, U.S.A.

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Contents

Preface, by M.C. Horzinek	v
Introduction, by M. Appel	vii
Authors	ix
Abbreviations	xi

Virus Infections of Dogs	Many chapters from page 003 to page 214
Virus Infections of Cats	Many chapters from page 215 to page 348
Virus Infections of Mink and Ferrets	Many chapters from page 349 to page 386
Virus Infections of Non-domestic Carnivores	Many chapters from page 387 to page 470
Virus Infections of Pinnipeds	Many chapters from page 471 to page 490
	subject index from page 491



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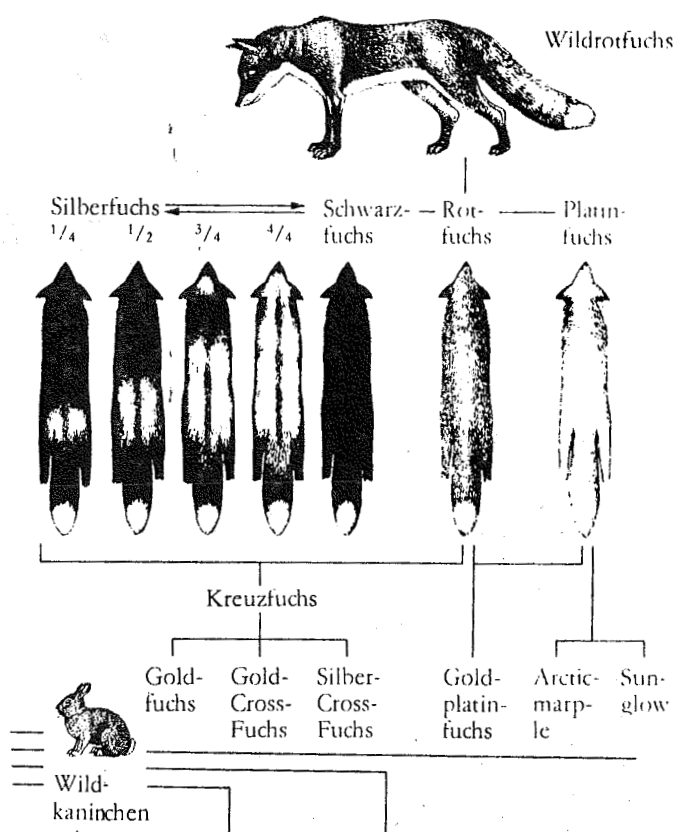
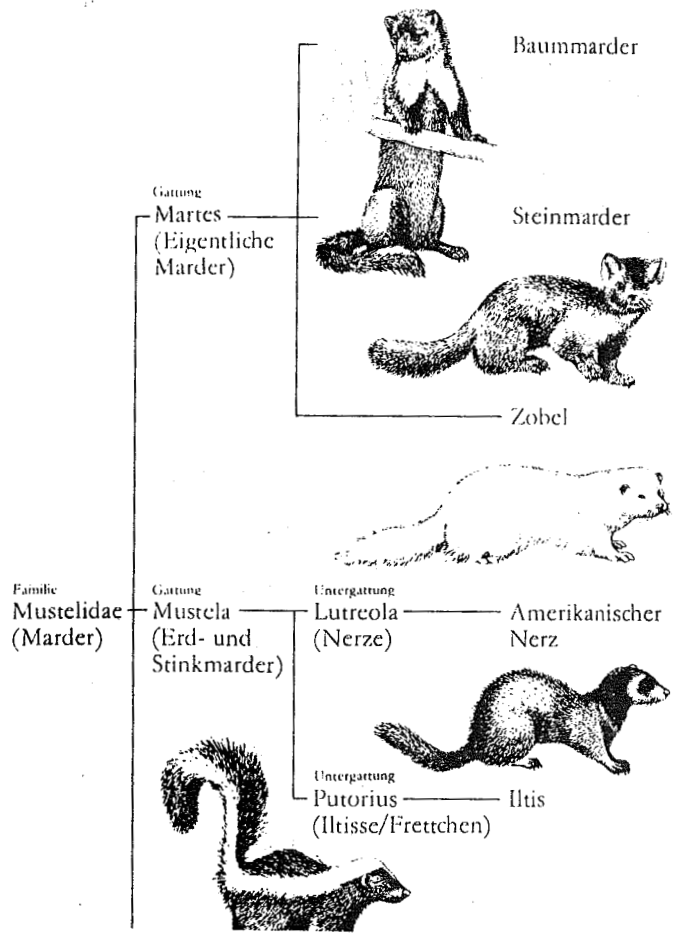
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Kaninchen und Edelpelztiere

von A bis Z

Rabbits and Fur Bearing Animals from A to Z

K. Löhle & U.D. Wenzel

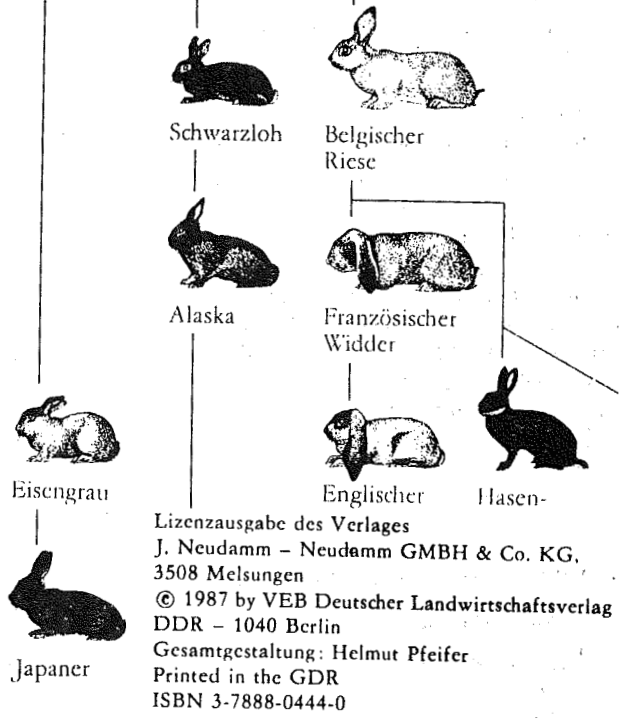


The breeding of fur animals - no matter whether it is a question of rabbits, nutrias, mink or chinchilla - becomes still more popular, as this can also be a lucrative sideline.

However, again and again questions arise which the breeder wants to clear up quickly and without any problems. Therefore the present work of reference was made by the authors who will be known in fur animal circles. All trade terms regarding fur animal breeding have been listed alphabetically and are briefly and thoroughly explained.

A special effort has been made not to explain trade terms with other trade terms, and the book is therefore of real assistance to the beginner.

308 pp, rich illustrated (many in colours).
In GERM.



VETERINÁRNÍ PŘÍPRAVKY PRO KOŽEŠINOVÁ ZVÍŘATA

Prof. MVDr. Jaroslav Konrád DrSc.

Veterinary Preparations for Fur Animals.

Prof. MVDr. Jaroslav Konrád, DrSc.
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Palackého 1-3
612 42 Brno (Czechoslovakia)

Dear Mr. Jørgensen!

On the occasion of the new year 1989 I would like to wish you good health and further success in your work in the area of fur animal breeding and fur animal research. I would like to thank you for sending me regularly the scientific journal SCIENTIFUR.

Enclosed I send you my new publication dealing with dosage of mainly veterinary medical, pharmacological preparations for fur animals. The publication is intended for veterinarians who work with fur animals.

Although the publication deals with preparations produced in the Soviet Union, this is only a question of product names and their composition is equally valid in other European countries. As the book is only in Czechoslovakian, I give you below information of the contents:

	Page
Introduction	3
Anatomic-physiological characteristics, fixation and application technique of the preparations	7
Short clinical symptomatology and disease therapy	11
Group listing of the drugs	25
Recording of the SPOFA-drugs	29
Recording of the supplement of bio-factors, minerals and medicament-feed preparations	79
Alphabetical list of preparations	83

The publication first came out in 1988 and is in great demand by veterinarians, as this is a special presentation of drugs for fur animals, which is not seen before here or abroad.

This year my university textbook on Fur Animal Diseases will be published.

88 pages. In. CZECH.

Prof. MVDr. Jaroslav Konrád, DrSc.:

VETERINÁRNÍ PŘÍPRAVKY PRO KOŽEŠINOVÁ ZVÍŘATA

Nakladatelství Merkur. Vydal odbor klinického výzkumu a vědeckých informací VÚBVL. Edice Veterinaria, řada 1. Vydání první v roce 1988. Náklad 3 000 ks výtisků. Vytiskly Jihočeské tiskárny n. p., závod 8, Strakonice.

SPOFA



VR Dr. Ulf D. Wenzel
Kaninchen

Eine Anleitung zur
Haltung, Fütterung,
Zucht und Nutzung

Unter Mitarbeit von
Veterinärarzt Dr. Peter Arnold



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VR Dr. Ulf D. Wenzel
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Rabbits

VR Dr. Ulf D. Wenzel

If you want to keep and breed rabbits, this book gives a thorough instruction with regard to housing, feeding and care as well as information on modern breeding methods and objectives. The individual rabbit breeds are described properly according to their use - meat, fur or wool - and the economic advantages and disadvantages are weighed both with regard to breeding and product applicability.

A separate section contains a detailed description of rabbit diseases and their treatment as well as prevention of these diseases.

The popular text is supplemented and illustrated with numerous pictures and tables.

192 pp, 63 figures, 38 tables. In GERM

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OLD BOOK

UNITED STATES DEPARTMENT OF AGRICULTURE BULLETIN No. 301	
Contribution from the Bureau of Biological Survey HENRY W. HENSHAW, Chief	
Washington, D. C.	October 29, 1915

SILVER FOX FARMING IN EASTERN NORTH AMERICA.

By NED DEARBORN, *Assistant Biologist.*

CONTENTS.

	Page.		Page.
Introduction.....	1	Handling foxes.....	22
The silver fox.....	2	Sanitation.....	23
History of domestication.....	4	Improved strains.....	25
Area suited for fox farming.....	6	Accessories.....	28
Ranch sites.....	8	Costs.....	30
Inclosures.....	9	Profits.....	31
Food.....	15	Preparation of skins.....	31
Breeding.....	18	Legal aspects.....	32
Behavior in captivity.....	21	Summary.....	34

The silver fox is a color phase of the common red fox. The beauty and rarity of its pelt have made it the most valuable of fur animals. It was first successfully domesticated in 1894 in the Canadian Province of Prince Edward Island. In 1910 pelts from ranch-bred foxes brought higher prices than those from wild foxes, the average value being over \$1,300 each. Since that time the demand for breeding stock has been so great that very few domesticated foxes have been slaughtered. Prices of live foxes soared beyond reach of the ordinary purse, but they have declined heavily since the beginning of the European war. Stock companies, some of them very much overcapitalized, have been organized to engage in the new industry, which thus has suddenly been transformed from a secret enterprise into a widely heralded speculation. One of the favorable results of this expansion has been a careful study of foxes in domestication, and this will contribute materially to the permanence of fox farming.

A fox ranch should be situated where it will have good drainage and be partially shaded by a young growth of deciduous trees. Each pair of foxes should have a runway of about 2,500 square feet. They thrive on a varied diet, including meat, fish, bread, mush, milk, and table scraps. The reproductive period is about 10 years. The young are born in April or May, the average litter containing four cubs; but as only about half of the captive females produce young in any given year, the annual increase has not averaged above 100 per cent.

Foxes bear captivity well. No widespread disease has appeared among them. Wounds heal readily, and cases of sickness are usually attributable to a

lack of proper care. By selective breeding the originators of fox culture produced a superior strain of animals in the course of a few years. This fact is an assurance that even greater improvements can be achieved by selecting, from different geographic races, foxes of the largest size and crossing them with animals having the finest fur.

The exceedingly high value of silver foxes has led to the adoption of a variety of precautions against their loss. On the more pretentious ranches the animals are regularly examined by a doctor and guarded by watchmen, bulldogs, and burglar alarms. Cats are kept to act as foster mothers to orphan cubs. Foxhounds are trained to overtake and hold without injury foxes that have escaped, and bloodhounds are employed to track thieves.

The cost of yards runs from \$100 to \$150 each, and that of foxes from \$150 to \$250 for common silver foxes up to several thousand dollars for the best silvers. The price of foxes will decline as the supply increases. The profits from breeding silver foxes have thus far been very large. So long as the demand for breeding-stock exceeds the supply, the value of the annual increase, or the gross income, will average approximately 100 per cent of the value of the breeding stock. When part of the increase can be disposed of only by slaughtering for fur, profits will be less than at present, but even then they are likely to be much greater than from ordinary lines of husbandry involving like capital and attention.

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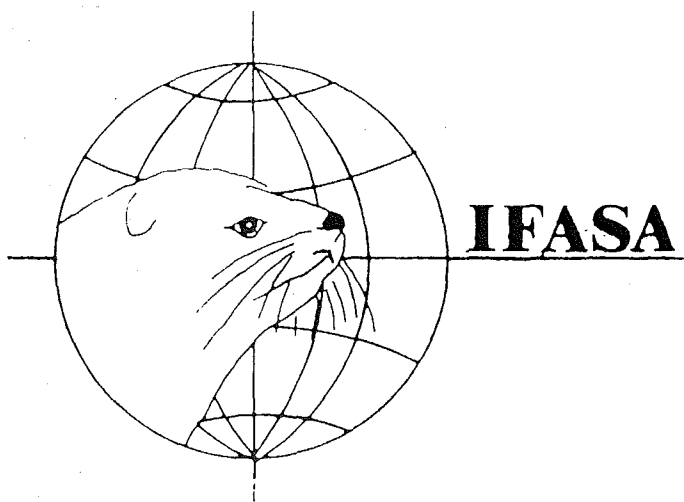
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