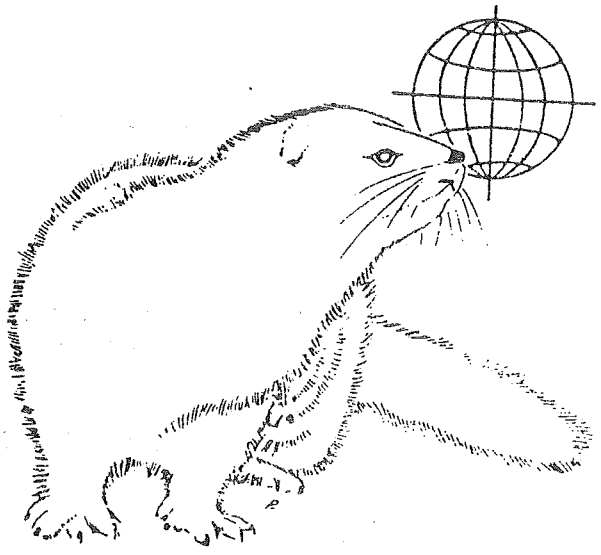

Published by IFASA

INTERNATIONAL FUR ANIMAL SCIENTIFIC ASSOCIATION

SCIENTIFUR
ISSN 0105-2403
Vol. 15, No. 4
November, 1991

Titles of other publications - not abstracted

The martens - their habits and hunting practices. *H. Behnke. Merkblätter des Deutschen Jagdschutz-Verbandes (Germany, F.R.); A. Niederwildausschuss, no. 10; 12. ed.; 16 p; 1986, 6 figs., 6 references. In GERM. Code 1-O.*

Effects of shortening photoperiod on growth of winter fur in raccoon dog. *Men Taoyan, Xiao Yongjun, Song Jianhua. Chinese Journal of Zoology, V. 25 (3), p. 38-40, 1990. 2 tables, 4 references. In CHIN. Code 10-2-O.*

5. Genetics

Titles of other publications - not abstracted

6. Reproduction

Titles of other publications - not abstracted

7. Nutrition

Titles of other publications - not abstracted.

Use of (antioxidants) ionol and kiludin in young mink diets. *N.A. Balakirev. Sbornik Nauchnykh trudov - NII pushnogo zverovodstva i Krolikovodstva imeni Afanas'eva (USSR), v. 36, p. 20-28, 1989. In RUSS. Code 6-M.*

Analysis of Arctic fox and fox diets. *N.A. Balakirev, N.N. Loenko. Krolikovodstvo i zverovodstvo (USSR), no. 2, p. 6, 1990. In Russ. Code 6-F.*

Different levels of fitchet feeding (rearing of the second litter on the "Pushkinsky" state farm of the Moscow region). *G.S. Taranov, L.A. Lutova. Krolikovodstvo i zverovidstvo (USSR), no. 6, p. 8-9, 1989. In RUSS. Code 6-5-O.*

8. Veterinary

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Vaccination against mink virus enteritis. *T.M. Schwartz. Deutsche Pelztierzüchter (Germany, R.F.), v. 63 (7-8), p. 103, 1989. In GERM. Code 9-12-M.*

Immunocytochemistry of pancreatic endocrine tumors in three domestic ferrets (*Mustela putorius furo*). *A.S. Fix, C.A. Harms. Veterinary Pathology, 27 (3), 199-201, 1990. 10 references. Code 3-9-O.*

Diagnosis and immunization of feline distemper. IV. Comparison between non-transferring and transferring culture of parvovirus isolated from cats and mink. *Zhang Cun, Zhang Zhenxing. Chinese Journal of Animal and Poultry Infectious Diseases (China), no. 4, p. 47-48, 1990. 2 tables. In Chin. Code 9-M-O.*

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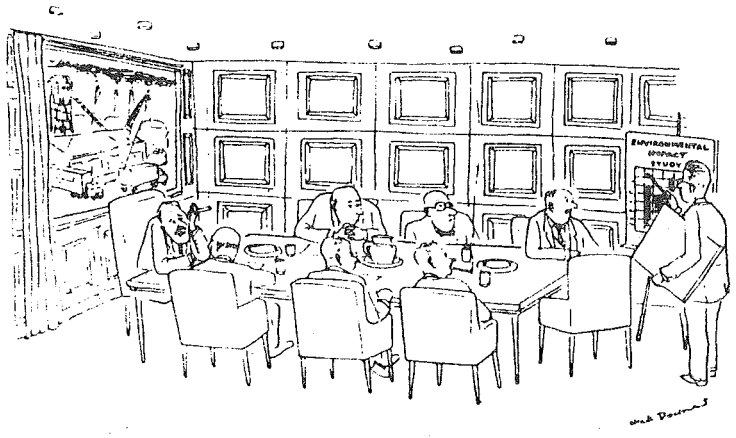
Man as substitute host of the fox tapeworm. *H. Kronauer. AFZ. Allgemeine Forst Zeitschrift für Waldwirtschaft und Umweltvorsorge (Germany, F.R.), v. 45 (36), p. 910, 1990. 1 fig. In GERM. Code 9-F.*

9. Scientific meetings, symposiums and congresses



"Did he say *someday* we'd be sorry or *Sunday* we'd be sorry?"

Scientifur

Notes

SCIENTIFUR

Vol. 15, No. 4

November 1991

In the notes of No. 3 we discussed the informative value of SCIENTIFUR. With a total of 443 titles of mainly scientific reports, we can here at the end of the year conclude that, thanks to the considerable economic support from the European fur breeders associations, and to the effective reporting on the part of the scientists, SCIENTIFUR has not had any problems of financial and informative nature.

Without an exact examination of the scientific work behind the reports referred in SCIENTIFUR, there is reason to conclude that at least 300 of the titles in Vol. 15 represent an investment in research of min. USD 30,000 each. This gives a total international input in fur animal research reported in 1991 of USD 9 mill. Roughly, the value of the 1991 fur production of the animal species involved can be expected to be approx. 600 mill. USD. This indicates a research input of 1.5% of the total production which is not quite as much as the scientific research input in other domesticated animal species.

A calculation like this underlines the importance of international cooperation in the scientific area of fur animal production, as well as the importance of all results from the ongoing research being easily available for the persons involved on the scientific as well as on the production level.

This underlines the importance ot IFASA and SCIENTIFUR.

NEW SCIENTIFUR INDEX

As planned, a SCIENTIFUR INDEX II will be produced covering the latest 5 volumes. The total content will be more than 2,300 titles of scientific reports which appeared in Vol. 11-15 as original reports (110 titles), abstracts (approx. 1,700 titles), titles only (approx. 500), and book reviews (approx. 40 titles).

INDEX II will as INDEX I be in 3 parts, i.e. A: Main subject index, B: Author index, and C: Key word index. Price and form, printed or electronic, will be advertised in connection with the distribution of 1992 subscription invoices.

CONTRIBUTORS TO IFASA & SCIENTIFUR

Here, at the end of the year, we wish to thank everybody involved for their support during 1991. This support has been of various kinds:

1. INSTITUTIONAL MEMBERS OF IFASA

Fur breeders associations in:	Private companies:
Belgium	
Denmark	Japan International
Finland	Fur Trade Co.
France	
Germany	Roche A/S, Denmark
Holland	branch
Norway	
Sweden	
United Kingdom	

2. INDIVIDUAL MEMBERS OF IFASA:

86 persons from 15 countries.

3. ECONOMIC CONTRIBUTION TO SCIENTIFUR

Fur breeders associations in:
Belgium
Denmark
Finland
Germany
Holland
Iceland
Ireland
Norway
Spain
Sweden
United Kingdom

4. SUBSCRIBERS TO SCIENTIFUR

approx. 400 in 20 countries

5. ADVERTISERS

ASL - Schering-Plough Corporation

6. PERSONS INVOLVED IN THE PRODUCTION OF SCIENTIFUR.

The office staff at the National Institute of Animal Science, Dept. of research in fur animals, the staff at the printing office of Danish Fur Sales, and adviser Janne Hansen as language editor.

WE THANK ALL OF YOU AND SEND YOU OUR BEST WISHES FOR A MERRY CHRISTMAS AND A PROSPEROUS NEW YEAR.

INTERNATIONAL CONGRESS IN OSLO 1992.

Enclosed you will find further information regarding the congress which will, according to the final confirmation of the organization of IFASA, be one of the important milestones in the international cooperation regarding fur animal research and production.

Therefore, participation in this congress will be one of your most important activities in 1992. The arrangement committee awaits your registration.

INFORMATION FROM IFASA

On the following pages in this issue a summary will be given of the activities in and the present status of IFASA.

As editor, I wish to thank all of you personally for your contributions and cooperation in 1991.

MERRY CHRISTMAS AND A HAPPY NEW YEAR.

Your Editor

Gunnar Jørgensen

IFASA

NEWS FROM IFASA

WELCOME TO THE INTERNATIONAL CONGRESS IN OSLO NEXT YEAR.

It is only a few weeks until 1992, the year when the V. International Congress will be held in Oslo. It is therefore important for you to apply for a membership of IFASA now.

As a member of IFASA you will pay a lower registration fee at the congress. Furthermore, the number of councillors from each country will be decided by the number of memberships on March 1. So if you want to take part in IFASA and influence its development - become a member now.

The Congress in Oslo will be held at Oslo Plaza Hotel, August 13 - 16, 1992. The Organizing Committee is working together with the Scientific and the Technical Committee to make a successful Congress. We are also honorered that The Norwegian Minister of Agriculture has accepted to be the Honorary Chairman of the Organizing Committee.

The first announcement has already been sent out, so please use the Pre-registration form. The second announcement is distributed these days, mainly concerning "Call for titles and abstracts. Instruction to authors". The final announcement will be sent out at the end of February with final registration on April 1.

REPORT FROM IFASA BOARD MEETING.

The 3rd board meeting of IFASA was held in Krakow, Poland, on August 9, hosted by Prof. Stanislaw Jarosz. The Agenda included the following subjects:

The board was informed about the International Congress in Oslo.

The council of IFASA will meet in Oslo on Thursday, August 13. The council will consist of councillors from each country representing members of IFASA. The number of councillors is based on the number of individual members on March 1, 1992.

The council will elect the board members and the President, based on nominations.

The council will decide where the next International Congress takes place, based on invitations received.

The constitution of IFASA should be confirmed.

The board decided that the working groups should meet in Oslo on Thursday afternoon and elect their own boards. The international activities of these groups must be within the articles of IFASA and the working groups should play an important role in relevant international activities.

On July 31, IFASA consisted of 15 institutional members and 86 individual members. The following countries were represented: Argentina (8), Canada (4), Checoslovakia (1), Denmark (21), Finland (7), Greece (1), The Netherlands (3), Ireland (1), Japan (7), Korea (8), Norway (8), Poland (8), Spain (2), Sweden (3), USA (11), and USSR (3).

An agreement is signed with The National Institute of Animal Science, Foulum, Denmark, for production and distribution of Scientifur and secretary function for IFASA.

Scientifur will continue to be published, mainly because of economic support from the Scandinavian Fur Breeders Associations and also partly from similar associations in other European countries.

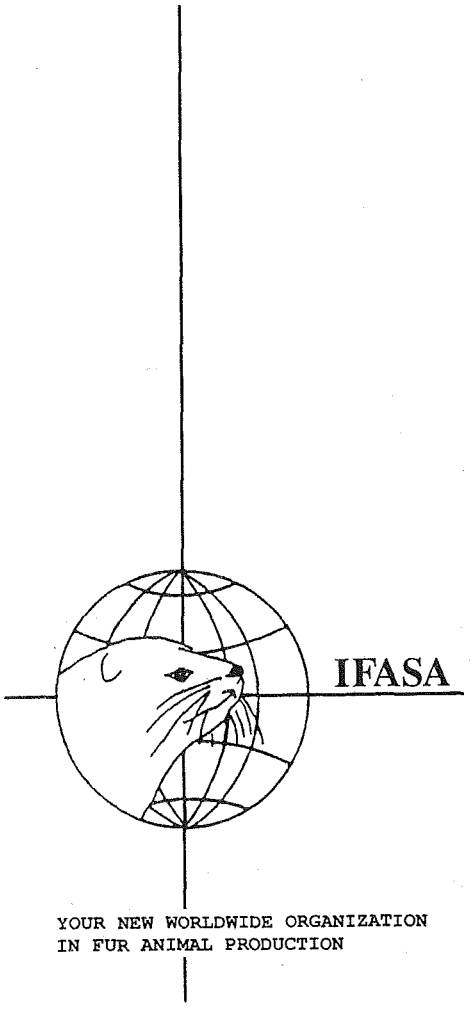
The statement of result and the budget for 1991 for Scientifur were approved.

Instructions for the authors of Scientifur were approved.

It was decided that the goals and strategies for the present board were decided throughout 1992, and that it was up to the next board to set up goals and strategies for the next four years. It is now important to establish and run IFASA, which includes having the board, the council and the working groups in activity, and to present an economic basis for their work. For Scientifur it is important to ensure further publication and keeping the activities within the budget.

With kind regards

Prof. Einar J. Einarsson
President of IFASA



INTERNATIONAL FUR ANIMAL SCIENTIFIC ASSOCIATION

OBJECTIVES

IFASA has the objective to promote knowledge of all aspects of fur animal science and the fur industry, on a worldwide basis. IFASA will encourage the exchange of knowledge among people with an interest in the industry.
IFSA will publish the journal Scientifur, which will include scientific publications, news from the fur industry and advertisements.
IFASA will be the organizing body for international cooperation in fur animal science, and will be the formal link between breeder organizations, government agencies and scientists, on an international level.
IFASA will coordinate and arrange international scientific meetings and congresses.

MEMBERSHIP

The membership of IFASA is based on an individual membership by persons who are, or have been engaged in any activity connected with fur animals- or the fur industry, and who are interested in the objectives of IFASA. Institutions, companies and organizations are welcome to be associate members of IFASA. The annual fee will be decided by the Board of each year, and should be paid to the secretary before February 1. of each year.
Application for membership should be sent to the secretary, to be approved by the Board.

ORGANISATION OF IFASA

The individual members of IFASA are represented in a Council with the following representation from each country:

Number of individual membership	Number of representatives in the Council
1- 5	1
6-20	2
> 20	3

The member of the Council should be elected by members within each country. The Council will meet every fourth year, at the time of the international congress.
The Council will elect a Board of five members who will serve with the past President. Two members will be elected from Scandinavia, one from the western countries, one from the eastern countries and one by free election.

IFASA CONGRESSES

World Scientific Congresses will be organized by IFASA every fourth year. A national committee is responsible for the local arrangements, with a sub-committe of scientists responsible for the scientific programme. The international congresses have been in Finland (1976), Denmark (1980), France (1984), Canada (1988) and will be arranged in Oslo in 1992.
Workshop and other relevant meetings in the name of IFASA may be held at intervals between the congresses.

SPONSORS

IFASA will have official sponsors, which support the organization by means of annual contributions.

WORKING GROUP WITHIN IFASA

Working group 1 - breeding, reproduction and genetics
working group 2 - nutrition
working group 3 - pathology and diseases
working group 4 - behaviour and welfare
working group 5 - fur properties

Your membership in IFASA is welcome,
the International Fur Animal
Scientific Association

Dr. Einar J. Einarsson
President of IFASA

IFASA
P.O. BOX 13
DK-8830 TJELE
DENMARK

Short Communication

Aspects of marking behaviour in farmed blue fox

Hannu Korhonen, Sakari Alasuutari***

**Agricultural Research Centre of Finland,*

Fur Farming Research Station, SF-69100 Kannus, Finland

***University of Helsinki, Muddusjärvi Exp. Farm,*

SF-99910 Kaamanen, Finland

Introduction

Marking behaviour was previously stated to be mainly territorial or to play a role in territorial defence. During recent decades, however, scent-marking has been described in a variety of contexts (*Eisenberg & Kleiman, 1972; Henry, 1977; MacDonald, 1980*).It is now obvious that it has more than one funtion in any one species and different functions in different species (*Johnson, 1973*).

Under farm conditions, marking behaviour and its ethological significance are poorly documented in blue foxes. However, it is tempting to suppose that scent-marking plays a significant role in farmed animals, too (*Korhonen et al., 1991*). The present paper provides some aspects of scent-marking behaviour in captive blue foxes.

Materials and methods

The data were collected from the Muddusjärvi Experimental Farm during the winter period of 1991. The subjects were two blue fox groups: (1) 3 males and 3 females, all coming from different litters. They were housed in an enclosure measuring 17 m long x 8 m wide x 2 m high. (2) 2 males and 2 females, all originated from the same litter, and housed in an enclosure measuring 11 m long x 8 m wide x 2 m high (see Fig. 1). All animals were originally farmborn and -bred.

Behavioural patterns and scent-rmarking of the animals were monitored by direct observations throughout the winter. Sites of faeces and urine were carefully recorded. Hierarchical dominances of the animals were estimated by their social status signals and aggressions.

Results and discussion

A representative schematic illustration of marking sites (urinations) are given in Fig. 1. The data for the figure were gathered on March 19th, i.e. during the breeding season. The females within the enclosures were either in heat or soon to come in heat.

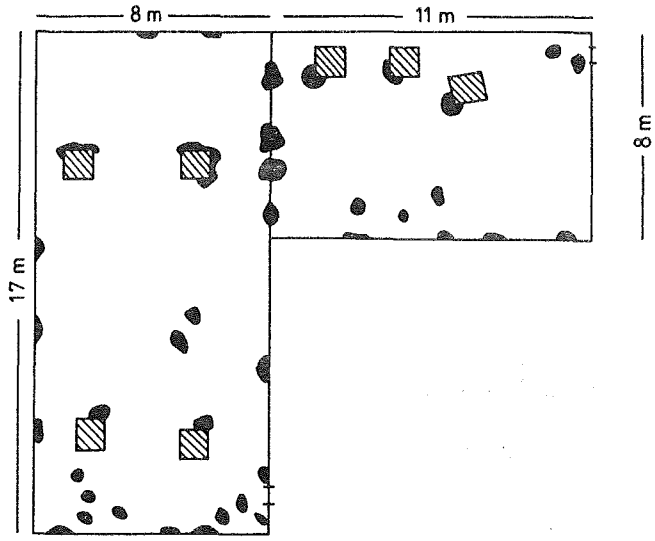


Figure 1. Schematic picture of the experimental enclosures. Shaded boxes are the nest boxes. Dark dots are the fixed sites of urination. Data gathered on March 19th.

Throughout the winter, it was observed that there existed fixed sites at which the foxes released their urine. These sites were thus used as significant marking sites. Normally the sites were located (1) on the corners of nest boxes, (2) on clumps of snow, (3) beneath the poles or (4) on the ground (Fig. 1). Our observations revealed that these sites were regularly used as marking objects. During the breeding season, the marking frequency and intensity increased significantly, especially by the dominant and subdominant males. At its best, the dominant male proved to be an intensive marker throughout the 24 hour period. Furthermore, it was interesting to note that the common wall between the enclosures (see Fig. 1) was scent-marked to a large extent, and by the individuals of both enclosures.

The present results revealed that marking behaviour plays an important role in the social behaviour of blue foxes in captive conditions. It probably has numerous functions which can be related to reproductive performance, social status, feeding rank orders and social behaviour in general.

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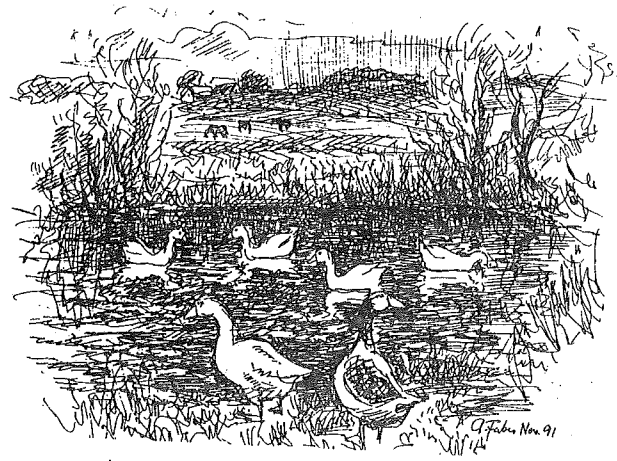
Korhonen, H., Niemelä, P., Alasuutari, S. & Harri, M. 1911. Social behaviour of farmed blue foxes. In Applied Animal Behaviour: Past, Present and Future. Proceedings of the Int. Congr., Edinburgh 1991 (Edited by M.C. Appleby et al.).

MacDonald, D. 1980. Patterns of scent marking with urine and faeces amongst carnivore communities. Symp. Zool. Lond. 45: 107-139.



Isolation and characterization of mink growth hormone.

Motoaki Umezu, Shinichi Ishii, Tadashi Furusawa, Junji Masaki.

Growth hormone (GH) was isolated from the pituitary gland of the mink (*Mustela vison*) and characterized biochemically and immunologically. Mink GH was extracted under alkaline conditions after defatting the tissue with acetone. A GH having a molecular weight of 22 Kd via sodium Dodesyl sulfate gel electrophoresis was purified by ion-exchange chromatography on DE-52, ammonium sulfate precipitation, gel filtration on Sephadex G-75 and reverse phase high-performance liquid chromatography on ODS-120 T. An isoelectric point of 6.9 for the protein was estimated by gel electrofocusing. Amino acid composition of the GH was similar to those of other mammalian GHs. The amino-terminal amino acid sequence, a total of 34 residues, was determined by analyzing the intact protein. Sequence comparison revealed that the mink 22 Kd was homologous to other mammalian GHs. Moreover, the mink protein showed competitive inhibition curves parallel to bovine GH via radioimmunoassay using ovine GH antiserum.

Anim. Sci. Technol. (Jpn.) 62 (7): 605-612, 1991. 1 table, 5 figs., 26 references. Authors' summary.

The histochemical changes of mink skin with seasonal moulting.

K. Kondo, T. Nishiumi, F. Nakamura.

The histochemical changes of mink skin, particularly hair and hair follicle during the seasonal moult were studied using the staining methods of sudan, orcein, PAS, ferric ferricyanide and DACM. The results are summarized as follows.
1) The staining intensity of sebum that reacted with sudan in the sebaceous gland was constant throughout anagen and telogen, and the sebaceous gland secreted sebum actively even in telogen.
2) The number of elastic fibers stained with orcein was also constant throughout anagen and telogen. The features shown when using the orcein stain suggested that the elastic fibers played a role in anchoring the hair follicle.
3) PAS positive glycogen was observed only at the outer root sheath between sebaceous gland and hair bulb in anagen.
4) The keratinizing zone of hair in anagen, stained with ferric ferricyanide, was the same as the PAS positive zone, but the hair in telogen was negative to ferric ferricyanide. Keratinization progressed from the hair cuticle at hair bulb cervix to the hair cortex below the sebaceous gland.
5) The localization of sulfhydryl groups and disulfide bonds detected by DACM suggested the keratinizing process of hair observed in ferric ferricyanide staining. DACM staining showed the existence of sulfhydryl groups in hair in telogen and the keratinization of hair follicles.

Reprinted from Memoirs of the Faculty of Agriculture, Hokkaido University, Vol. 17, No. 3, 365-375, 1991. 8 figs., 13 references. In JAPN, Su. and subtitles in ENGL. Author's summary.

The ferret as a model for studying the sexual differentiation of behavioural and reproductive function.

M.J. Baum.

A discussion of work on behavioural, neuroendocrinological and neuroanatomical aspects of reproduction in ferrets.

Journal of Experimental Zoology; Supplement 4; 213-214, 1990. 7 references. CAB-abstract.

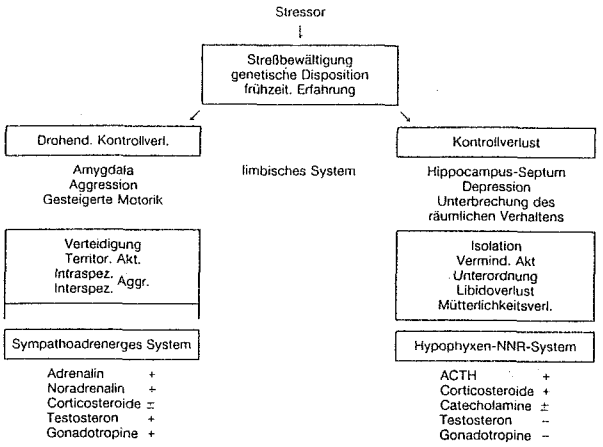
Remarks about the behaviour of fur animals especially in view of animal welfare.

A. Grauvogl.

The Ministry of Agriculture has drafted a prescription for raising animals for fur production. It contains high standards of knowledge about raising, feeding and care of those animals. Included is the combined result of negotiation between farmers and organisations for the protection of animals. Some facts of ethology need clarification soon. Especially
- social deprivation of mink
- bath-taking possibilities for mink
- space requirements for mink
- collar plates on chinchillas
- water requirements of swamp beavers
- group size and occupation density of foxes.

All recommendations, directions and prescriptions up to now are patchwork. In certain cases, the advisor and the farmer must be in a position to

recognize deficiencies in care and management and be able to stop it if necessary. In this connection, they must observe behaviour of tail biting, skin tearing and consumption of new born, disturbances in mating behaviour as well as in upbringing. They must also look for stereotyped movements and the expressions of pain and anxiety. The Council of Europe gave also a draft of recommendations concerning fur animals and in this paper is also attached the importance of farmers' diagnosis of disturbed behaviour.



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Dtsch. tierärztl. Wschr. 97, 236-239, Heft 4, 1990. In GERM, Su. GERM, ENGL. Author's summary.

Medetomidine- and Medetomidine-Ketamine-induced immobilization in blue foxes (*Alopex lagopus*) and its reversal by Atipamezole.

Harry H. Jalanka.

The sedative and immobilizing effects of the alpha$_2$-adrenoceptor agonist medetomidine alone or combined with the dissociative anesthetic ketamine, were studied in blue foxes. Medetomidien at doses of 25 and 50 µg/kg induced moderate to deep sedation, but only with the highest medetomidine dose tested, 100 µg/kg, was the immobilization complete. Medetomidine 50 µg/kg combined with ketamine 2.5 mg/kg rapidly induced complete immobilization, characterized by good myorelaxation, and no clinically significant alterations in serially determined hematologic and serum chemistry parameters. The alpha$_2$-adrenoceptor antagonist atipamezole effectively reversed the medetomidine- or medetomidine-ketamine-induced immobilizations. A transient increase in heart rates was noted after each atipamezole injection.

Acta vet. scand. 31, 63-71, 1990. 3 tables, 5 figs., 18 references. Author's summary.

Kinetic characteristica of aromatic amino acid decarboxylasis from kidney and brain of mink.

Tor Mikael Lassén.

In the first part of this study, aromatic L-amino acid decarboxylase enzymes from various sources were studied. A review was given of the function and properties of amino acid decarboxylases in microorganisms and in animal tissues. This review included a study of kinetical models used in enzyme investigation.

The experimental part included assays of decarboxylase activity against various aromatic-L-amino acids. The assay of aromatic-L-amino acid decarboxylase (E.C. 4.1.1.28;AADC) were performed at 37°C in 1.5 ml 0.1 M sodiumphosphate assaybuffer, containing 3.4 mM substrate, 200 µl enzyme extrakt and 400 µM pyridoxal-5'-phosphate. L-3,4-dihydroxyphenylalanin was used as a substrate for spot testing the AADC activity. The decarboxylase activity was measured by determination of the content of the product (amine) and of unreacted substrate using isocratic high performance liquid chromatography. The assay mixture (160 µl) was acidified with 1 M perchloric acid (40µl), centrifuged (1500 x J, 3 min.), applied to a Novapak® C_{18} column (5 µm, 3.9 x 150 mm; Waters) and eluated with 3.5% acetonitril in water (pH 3.30) with dilute sulfuric acid.

AADC was extracted from mink (*Mustela vison*) kidney and purified to 1.9 times higher specific activity (0.045 U/mg protein*), with a recovery of 171% by ammonium sulfate fractionation.

Gel filtration on fast polymer liguid chromatography (FPLC) was tried as an aid to determine AADC molecular weight, but it failed due to low activity in the FPLC-fractions together with too high substrate concentrations.

The kinetic properties of AADC from mink kidney were studied. Various statistical methods for the tretment of enzyme kinetic data were used and compared. Estimations of K_m and V_{max} were obtained using the double reciprocal plot of initial substrate concentration and initial velocity.

AADC from mink (*Mustela vison*) kidney decarboxylated L-3,4-dihydroxyphenylalanin with pH-optimum at 6.8, and a K_m-value of 0.204 mM and a V_{max} of 0.0555 mM dopamin/minut. Mink kidney AADC was inhibited by L-3,4-dihydroxyphenylalanin concentrations over 1.0 mM; in other words, substrate inhibition occured.

At standard assay conditions other substrates decarboxylated were DL-*o*-tyrosin, DL-*m*-tyrosin and L-hydroxytryptophan. The enzyme showed no activity for L-tyrosin or L-tryptophan. L-phenylalanin was not investigated.

Of the amino acid substrate analogs tested, L-*p*-nitrophenylalanin showed weak inhibition and the carboxylic acid substrate analog *o*-hydroxyphenylacetic acid showed a pattern of competitive inhibition.

*One international enzyme unit (U) katalyses 1 μM product/minute.

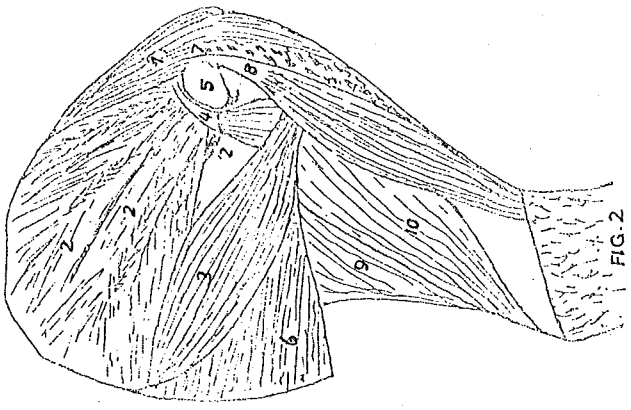
Part of Ph.D. thesis. Chemical Institute, Royal Veterinary and Agricultural University, Copenhagen. In SWED, Su. ENGL. 6 tables, 15 figs. 70 references. 55 pp, 1991.

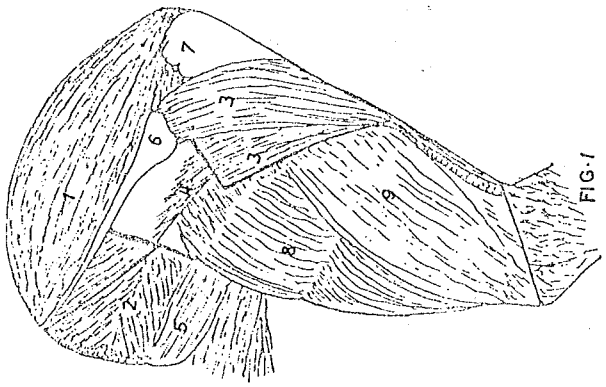
Anatomical studies on the shoulder muscles of the fox (*Alopex lagopus*).

A. Selim, I. Khidr.

Five foxes were used to study the muscles of the shoulder as a contribution to the comparative anatomy with the other carnivores which use their limbs, particularly the front ones, for running and hunting. The animals were fixed in 10% formalin. The origin, insertion, structure, relations and the suggested action of these muscles were studied.

The results revealed that these muscles are generally similar to those of other carnivores with some differences. M. supraspinatus originated from the cranial border of the scapula only, while its insertion consisted of a muscular and tendinous portion. The pars acromialis of M. deltoideus had a wide insertion into the deltoid tuberosity and the crest of the humerus. The M. teres minor had a wide origin from the entire length of the caudal border of the scapula and its insertion was partially muscular. The M. articularis humeri was formed of a flap of M. subscapularis.





LEGENDS FOR FIGURES

Fig. 1 : A diagram showing the shoulder muscles (lateral aspect).
1. M. supraspinatus.
2. M. infraspinatus
3. M. deltordeus
4. M. teres minor
5. M. teres major.
6. Acromion
7. Tuberculum majus
8. Caput largum of M. triceps brachii

Fig. 2 : A diagram showing the shoulder muscles (Medial aspect).
1. M. supraspinatus.
2. M. subscapularis.
3. M. teres major.
4. M. coracobrachialis.
5. Tuberculum majus.
6. M. latissimus dorsi.
7. M. pectoralis profundus.
8. M. biceps brachii.
9. Caput mediale of M. triceps brachii.
10. Caput longum of M. triceps brachii.

Zagazig Veterinary Journal (Egypt.), v. 16 (2B), p. 13-23, 1988. 2 figs., 11 references. In ENGL., Su. ENGL, ARAB. Authors' summary.

The morphology of the penis of the ferret (*Mustela furo*).

A. Awad, I. Khidr, A. Selim.

The penises of 10 ferrets were used for the performance of this work. The morphology of the penis was studied with the aid of gross and microscopic pictures. Histological sections were taken from its different parts. Fine dissection and a radiographical description were done to examine the Os penis. The results were summarized as:
1. The penis was of the musculocavernous type about 3.5 - 4 cm in length and contained a bony structure of about 2.5 cm in length.
2. The penis was nearly cylindrical enlarged at its root, compressed laterally at its middle and tapered distally.
3. The glans penis was covered by non keratinized straitified squamous epithelium free from hair follicles and glands.
4. The free end of the penis was pointed and curved dorso-caudally containing the external urethral orifice which lay ventrally in the urethral sinus. The Galea glandis lay caudal to the free end as it was made of subepithelial venous sinuses of erectile tissue.
5. The Os penis consisted of compact bone and fibrocartilage at its free end. On a cross section it differed in shape according to the region as it was conical proximally, then inverted T-shape, invert V-shaped at its middle and C-shape at its free end.

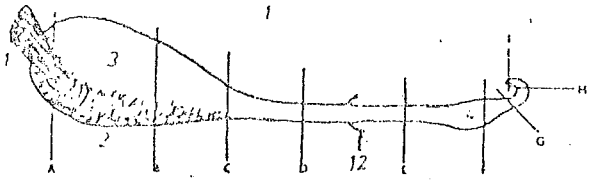


Fig. 1. An outline of the penis of ferret indicating the level of sectioning illustrated from A to I in the next figures.

Zagazig Veterinary Journal (Egypt.), V. 16 (2B), p. 1-12, 1988. 4 figs., 11 references. Authors' summary.

Selected anatomical features of the sea otter (*Enhydra lutris*).

Michael K. Stoskopf, Daniel Herbert.

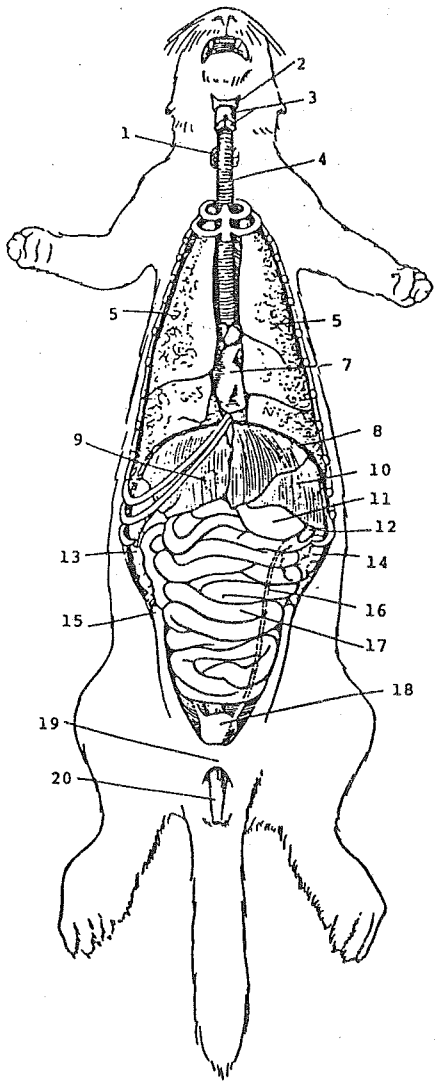


Figure 1. Visceral topology of the sea otter, ventral view: 1) thyroid, 2) hyoid apparatus, 3) thyroid and cricoid cartilages, 4) trachea, 5) right lung, 6) left lung, 7) heart, 8) diaphragm, 9) gallbladder, 10) liver, 11) stomach, 12) spleen, 13) right kidney, 14) left kidney, 15) iliac crest, 16) left ureter, 17) small intestine, 18) urinary bladder, 19) pubic symphysis, 20) rectum.

This study examined selected anatomical features of sea otters (*Enhydra lutris*), using computer topography, radiography, and dissection. Five

animals were dissected emphasizing visceral and circulatory anatomy. Although the anatomy of the sea otter most closely paralleled terrestrial carnivores, some disinctions were noted. The thyroid of the otter was a paired rather than a singular organ. The thymus persisted and was more prominent in older animals than expected. There was considerable variability in the pulmonary and coronary vasculature of the sea otter, with anastomoses between the left circumflex and right coronary arteries observed in some animals. All five animals in this study received interventricular supply from the left coronary artery. Adaptations to the great vessels seen in pinnipeds and cetaceans were not present. The stomach of the sea otter resembled that of a pinniped, but the lack of a cecum and the arteries that would normally supply it was more reminiscent of cetaceans. The sea otter kidney was reniculated with ureters leaving the ventral aspect caudal to the hilus, similar to cetaceans and some phocid seals. A sternal depression found in the adult otters was suggestive of an acquired pectus excavatum.

Journal of Zoo and Wildlife Medicine 21 (1), 36-47, 1990. 9 figs., 20 references. Authors' summary.

Population-biological notes on polecats (*Mustela putorius L.*) in Switzerland.

D. Weber.

Several population-biological parameters of 96 dead and 12 living polecats from Switzerland and adjoining areas of France were studied. Adult specimens were aged by means of counts of tooth cementum annuli. The reproductive status of males was evaluated according to the weight of the testes.

Mating occurs in the study area from February to at least August, and is most usual in spring. The sex-ratio of the whole sample was 1.76 males per female. For different reasons, this value is considered to be male-biased, compared to the living population. The proportion of males in Swiss polecat populations seems to be higher among young adults than among older ones.

Age structure, mortality and life expectancy have been analyzed with the life-table method, which revealed the following results: During their first year of life, between 70 and 90 % of the polecats die. From the second year onwards, this figure is about 40% for males, probably relatively independent of their actual age. In females, the second-year mortality is much higher than in males, but only about 20% for the following years. Ages of 6 and 7 years are not unusual in wild polecats from Switzerland.

Based on the data on the population structure and age-specific mortalities it is concluded that polecat populations should increase rapidly after favorable summers, and react with a marked and long-lasting decline in bad winter conditions; bad summers and favourable winters, however, should only have minor effects on polecat numbers.

Zeitschrift für Jagdwissenschaft (Germany,F.R.), V. 35 (2), p. 86-99, 1989. 3 tables, 6 figs., 27 references. In GERM, SU. ENGL, FREN. Authors' summary.

The structure and growth of the mink pelace: Characteristics of the metallic fur defect.

Leena Blomstedt.

A curved or otherwise deformed upper part of the guard hair of farmed mink (*Mustela vison*) is typical for the phenomenon called the metallic defect. Apart from this the animals are normal. Due to this defect the farmers suffer considerable economical losses.

The nature of the defect, the growth, and the structure of the mink hair, was investigated by morphometry, mineral quantification and skin histology. The type of guard hair classified the hair bundle, the number hairs in the bundle of determined the degree of the pelt development. The number of down in the hair bundle was reciprocal to the diameter of its guard hair. The hair bundles with no guard hairs contained the maximal number of hairs.

The pelt development in the male offspring of metallic parents and of normal parents differed. Counting the hairs in the bundles of the growing summer pelt in metallic kits, gave the following results: bundles with a long guard hair 9.3 hairs, bundles with an intermediate guard hair 11.7, and bundles with only down 12.7. The corresponding numbers in kits from normal parents were 5.5, 7.6 and 8.6, a significant difference. In the mature summer pelt of the metallic mink the number of hairs was unchanged, whereas that of the normal

mink had increased nearly to the number of the former. The number of hairs in the mature winter pelt of the metallic mink averaged 16.2 in bundles with a long guard hair, 24.9 in bundles with an intermediate guard hair, and 29.6 in bundles with only down. The corresponding numbers in the normal mink were 15.9, 23.5 and 28.6. In both groups, the density of the winter pelt grew at a similar rate.

In the winter pelt almost half of the guard hairs longer than down, were of the long guard hair type. Of the long guard hairs, the rate of the curved ones grew with increasing severity of metallic defect; in the normal pelt the quota was 1.3%, in mildly metallic 16.1% and in severely metallic 40.4%. The curviness also increased as the degree of the defect worsened. In the curved long guard hairs, the cuticular scale layers of the lancet were fewer, compared to that of the straight guard hairs. In the lancet of the curved guard hair there was more mercury and potassium, but less iron, than in that of the straight hair. The metallic defect is apparently the result of an increase in the number of down producing epidermal secondary follicles. This may be caused by a disturbance in the keratinization of the skin surface, which in turn may be caused by an abnormal mineral metabolism. As the defect increases its effect extends to the structure of the guard hairs.

Ph.D.-thesis. University of Helsinki. 60 pp, 23 plates of which many in colours, 12 tables. In FINH, Su. ENGL.

Chromosomal localization of the major histocompatibility complex (MHC) in some domestic animals by in situ hybridization.

Ensaf A. Mahdy.

In situ hybridization technique was used in the present investigation for chromosomal localization of the major histocompatibility complex (MHC) in horse, sheep, silver fox and blue fox. Metaphase spreads were obtained from pokeweed stimulated blood lymphocyte cultures. The slides were stained according to different techniques such as QFQ, RBA and G-banding. Well-spread metaphases were photographed prior to hybridization. After hybridization and autoradiography the same metaphases with silver grains were rephotographed. In a few cells the chromosomes were G-banded after hybridization. The metaphases were karyotyped and the grain positions plotted on an idiogram representing the haploid genome of each species. The MHC was localized to chromosome 20 in horse with the peak clustering on the central R-negative and two adjacent R-positive bands, chromosome segment 20q12->q23 in sheep, chromosome segment 15q11->q22 in silver fox and chromosome segment 2p11->p22 in blue fox.

Publications in the thesis.

This thesis is based on the following papers, which will be referred to in the text by their Roman numerals (I-III):

I Mäkinen, A., Chowdhary, B.P., Mahdy, E., Andersson, L. and Gustavsson, I. 1989. Localization of the equine major histocompatibility complex (ELA) to chromosome 20 by *in situ* hybridization. *Hereditas 110:93-96.*

II Mahdy, E.A., Mäkinen, A., Chowdhary, B.P., Andersson, L. and Gustavsson, I. 1989. Chromosomal localization of the ovine major histocompatibility complex (OLA) by *in situ* hybridization. *Hereditas* (in press).

III Mäkinen, A., Mahdy, E.A., Chowdhary, B.P., Andersson, L. and Gustavsson, I. 1989. Localization of the major histocompatibility complex in the silver and the blue fox - a confirmation of interspecific chromosome banding homologies. To be submitted for publication.

Master of Science thesis, Report 85, Swedish University of Agricultural Sciences, Uppsala. 19 pp + the 3 reports. Author's abstract.

I. (abstract)

The major histocompatibility complex (MHC) consists of class I and class II genes which both encode cell-surface proteins involved in cell-cell interactions in the immune system (reviewed in KLEIN 1986). There are multiple class I and class II genes in the MHC of all mammalian species studied so far. The MHC of the horse is designated the equine lymphocyte antigen (ELA) system (BAILEY et al., 1979; LAZARY et al., 1980). This system has been studied extensively with serological methods, and two closely linked class I loci, designated *ELA-A* and *ELA-B*, have been defined (BERNOCO et al., 1987a, 1987b). Southern blot analysis using human MHC class I and class II probes have been used to study the organization and polymorphism of equine MHC genes (ALEXANDER et al., 1987; GUERIN et al., 1987). These studies revealed the presence of a large number of equine class I genes, more than 20, and showed that class I and class II genes are linked in the horse.

In the pigs, the MHC was first localized to the central part of the q arm of chromosome 7 (GEFROTIN et al, 1984) but was later confirmed to chromosome arm 7p (RABIN et al, 1985; ECHARD et al., 1986; GUSTAVSSON and ANDERSSON, unpubl.). It has also been tentatively assigned to chromosome 23 in cattle (FRIES et al., 1986). In the present study we have tentatively assigned the equine MHC (ELA) to chromosome 20 by in situ hybridization using a human class I cDNA probe.

II. (abstract)

The major histocompatibility complex (MHC) of sheep (OLA) was forst defined by serological methods (MILLOT 1979). The organization and polymorphism of ovine MHC genes have been studied by Southern blot analysis using human MHC class I, class II and C4 cDNA probes (CHARDON et al., 1985). Three class I loci designated (OLA-A, B and C) controlling 16 specificities have been described (MILLOT 1984).

HEDIGER et al. (1988) localized OLA to chromosome 20 between bands q15-q23. In the pres-

ent study, we have confirmed the assignment of OLA to chromosome 20 by in situ hybridization technique using a human class I cDNA probe.

III. (abstract)

By utilization of a cDNA clone for a human major histocompatibility complex (MHC) class I gene, it was possible to map the presumptive site of the MHC in sivler and blue fox. The localization was on chromosome segments 15q11->q22 and 2p11->p22, respectively. These chromosome arms have earlier, by comparions of chromosome banding patterns, been assumed to be homologous.

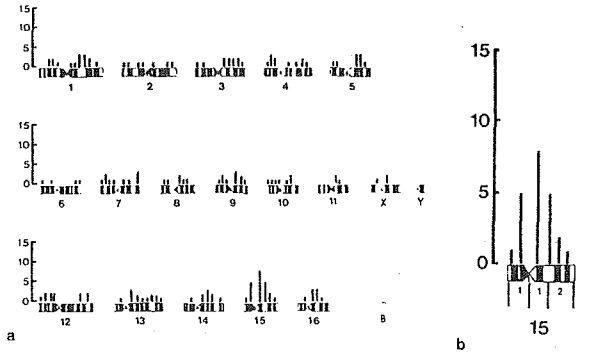


Fig. 1(a). Silver grain distribution of the MHC Class I cDNA probe on the standard idiogram of the G-banded silver fox chromosomes. (b) The distribution of grains on chromosome 15 indicating the cluster of grains on the p11→q22 segment.

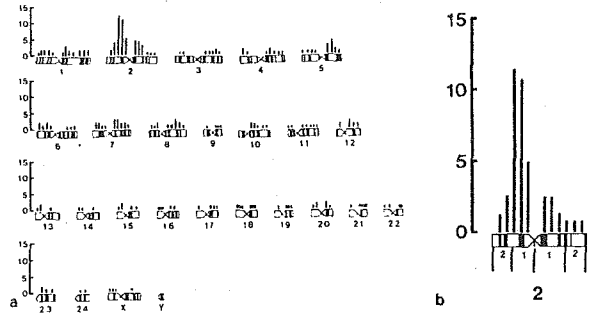


Fig. 3(a). Silver grain distribution of the MHC Class I cDNA probe on the standard idiogram of the G-banded blue fox chromosomes. (b) The distribution of grains on chromosome 2 indicating the cluster of grains on the p22→q11 segment.

Influence of domestication on age changes in the pituitary-adrenal systems in silver foxes *Vulpes fulvus*.

N.N. Os'kina, L.N. Trut, N.M. Bazhan.

The functional state of the pituitary-adrenal system in domesticated and non-domesticated female and male silver foxes *Vulpes fulvus* in various age periods was investigated. It was shown that the selection of silver foxes for domesticated behavior causes changes in the formation of the pituitary-adrenal system during postnatal ontogenesis, especially in females. From the time of sexual maturity, profound functional differences between the selected and unselected animals are observed.

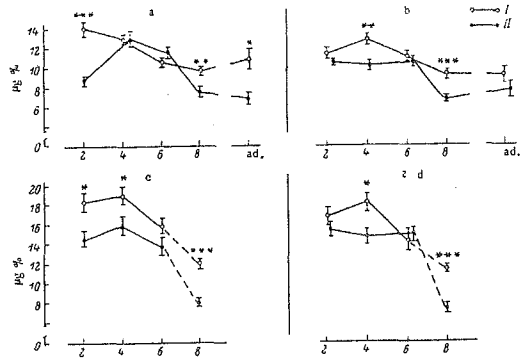


Fig. 1. Level of corticosteroids (ug%) in the blood of domesticated (I) and undomesticated (II) foxes in different age periods. 2-8) Age (months); ad.) adult; a, b) before, c, d) after stress; a, c) females, b, d) males. Asterisks represent the statistical significance of the differences p between undomesticated and domesticated animals of the same age: * < 0.05, ** < 0.01, *** < 0.001.

Journal of evolutionary biochemistry and physiology, Vol. 22, 223-227, 1985. 3 figs., 13 references. Authors' abstract.

Cloning and sequence analysis of mink growth hormone cDNA.

Yasuhiro Harada, Hiroki Tatsumi, Eiichi Nakano, Motoaki Umezu.

A cDNA clone for mink growth hormone (GH) was isolated from a mink pituitary cDNA library, employing a part of rat growth hormone cDNA

sequence as a probe. According to the nucleotide sequence, mature mink GH consists of 190 amino acids with a calculated molecular weight of 21.720. The amino acid sequence homology between the mature region of mink GH and those of pig GH, rat GH, bovine GH and human GH was 98.4%, 93.7%, 89.0%, and 66.7%, respectively.

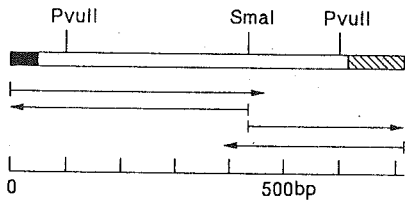


Fig. 1. Restriction map of the cDNA cloned in pMGH100. The diagram shows the pre region (closed box), the mature region (open box) and the 3' non-coding region (dashed box). The sequencing strategy is indicated below the map.

Biochemical and biophysical research communications, Vol. 173, No. 3, p. 1200-1204, 1990. 3 figs., 11 refererences. Authors' summary.

Comparative cytogenesis of mustelidae (*Carnivora*).

A.S. Graphodatsky, A.A. Sharshov, D.V. Ternovsky, Yu.G. Ternovskaya.

Chromosomes of *Lutra lutra, Meles meles*, and *Gulo gulo* were studied by routine *G*-, *C*-, and *AgNOR*-banding technoques. Using the literature and their own data the authors discuss the peculiarities of karyotype evolution of Mustelidae. Like Couturier and Dutrillaux (1986) the authors suggest that the *Martes*-like karyotype was ancestral for Lutrinae, Mustelinae, Melinae and Mellivorinae. Many species of these groups (e.g. *Martes, Vormela, Galictis, Lutra, Melogale*) with $2n$=38 have chromosomes very similar in G-banding patterns and different in pericentric inversions and heterochromatin variations. In all subfamilies the fissions of different ancestral chromosomes and fusions can be detected. In the Mephitinae stock a large number of ancestral *Martes*-like chromosomes may have been disrupted.

Zoological Journal, Vol. LXVIII, No. 12, 95-106, 1989. 3 figs., 33 references. In RUSS, Su. ENGL. Authors' summary.

Regional assignment of the genes for TK1, GALK, ALDC, and ESD on chromosome 8 in the American mink by chromosome-mediated gene transfer.

A.A. Gradov, S.D. Pack, M.A. Sukoyan, N.B. Rubtsov, M.N. Bochkarev, O.L. Serov.

A panel of clones of mink-Chinese hamster somatic cell hybrids was analysed to obtain data for assigning the genes for thymidine kinase-1 (TK1), galactokinase (GALK), subunit C of aldolase (ALDC), and esterase D (ESD) to specific mink chromosomes. The results demonstrate that the genes for TK1, GALK, ALDC and ESD are synthetic and located on mink chromosome 8. Prometaphase analysis of transformed mouse cells obtained by transfer of mink genes by means of metaphase chromosomes demonstrated the presence of mink chromosome 8 fragments of different sizes in some of the independent transformants. Segregation analysis of these fragments and mink TK1, GALK, ALDC and ESD allowed us to assign the genes for TK1 and GALK to 8p24, ASKC to pter-8p25, and ESD to 8q24-8qter.

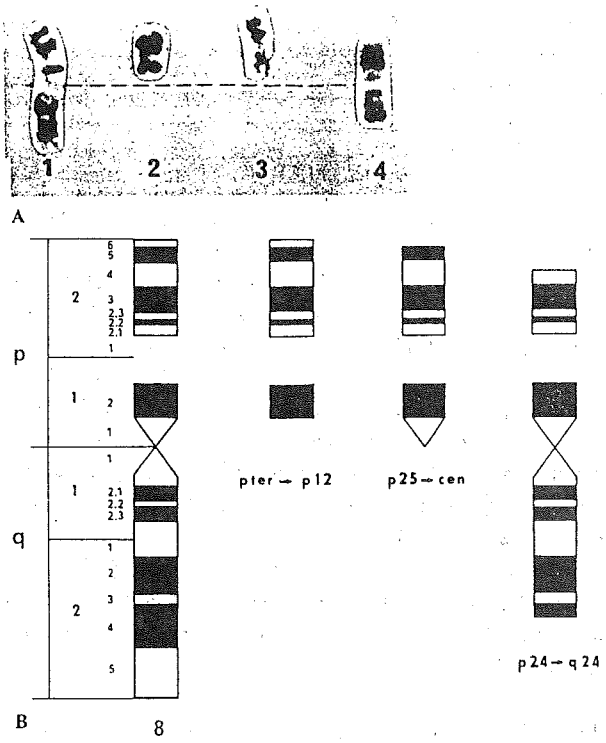


Fig. 6A, B. Karyotype A and idiogram B of mink chromosome 8 and its fragments present in transformants: STT-16-3 (4), STT-16-8 (3) and STT-13-1 (2). Intact mink chromosome 8 of primary mink fibroblasts is shown A(1)

Mol. Gen. Genet. 200, 433-438, 1990. 2 tables, 7 figs., 24 references. Authors' summary.

Comparative evolutionary study of the alpha-macroglobulin immunogenetic system in mink and pigs.

V.I. Ermolaev, E.G. Mirtsukhlava, M.A. Savina, R.S. Mitichashvili.

Allotypic polymorphism was demonstrated for lipoprotein (Lpm) allotypes in mink and alpha$_2$-MF microglobulins in pigs. There were 14 Lpm allotypes, which exhibited complex inheritance. In pigs, there were 4 alpha$_2$-MF allotypes, but only 1 alpha$_2$-MS allotype. The alpha$_2$-MF and alpha$_2$-MS genes were closely linked in pigs.

Molekul mekhanizmy genet protsessov 7 Vses simp, Moskva, 27-30 marta, 1990, Tez dokl 47. In RUSS. CAB-abstract.

Female fertility, increase of live weight and area of hides in hybrids from reciprocal crossing of standard nutrias with black recessive nutrias.

Milan Barta, Ivor Jakubicka, Pavel Flak.

The study investigated the effect of reciprocal crossing of standard nutrias with black recessive nutrias on female fertility, increase of live weight in progeny and area of hides both in purebred and hybrid breeds.

No significant differences were found between standard nutrias (s) and hybrids CxC and SxC in fertility based on obtained progeny. Black recessive nutrias in purebreed mating (C) had lower fertility than hybrid CS and standard nutrias. At the age of 240 days, when first fur maturity of nutrias is anticipated, significant and highly significant differences were found in live weight between purebred and hybrid breeds in favour of hybrids. Statistically highly significant heterotic effect was found at this age in comparing the reciprocal hybrids with original breeds. Positive heterotic effect of the two reciprocal hybrids compared with purebred breeds was also found in hide areas.

Polnohospodarstvo (Czechoslovakia), v. 35 (6), p. 545-554, 1989. 8 tables, 1 fig., 9 references. In SLOE, Su. ENGL, RUSS. Authors' summary.

Tentative studies on breeding VC-1 strain of rex rabbit.

Li Xiuying, Zhu Guoyong.

The female Japanese White rabbit was crossbred with male Californian rex rabbit. The first filial (F_1) generation was backcrossed with Californian rex rabbit sire of the progeny. The percentage of fur type from such a back cross was 42.25%. The ideal fuzz rabbits were selected as a foundation stock for intersect-breeding, and finally a new rex rabbit strain - Veterinary College-I (VC-I) was bred. The VC-1 rex rabbit is better than the purebred in growth rate and reproductivity. There is no significant difference of fur quality between the two kinds of rex rabbits.

Bulletin of Veterinary College of PLA (China), v. 10 (2), p. 195-198, 1990. 1 fig., 10 references. In CHIN, Su. ENGL. Authors' summary.

Dappling in horse colors.

E. von Lehmann.

Dappling occurs as independent pattern not only in white horses but also in other light colors (e.g. Palomino, VON LEHMANN, 1975) and, rarely, in regular dark colors (brown, THOROUGHBREED, WIERSEMA 1977, fig. 59).

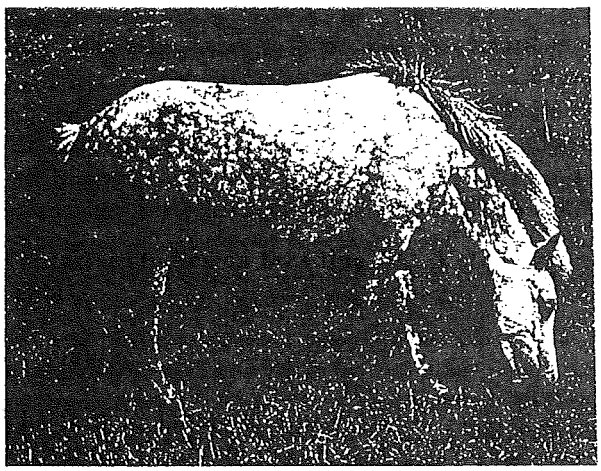


Abb. 1. Apfelschimmel mit voller Zeichnung in typischer Anordnung

Journal of Animal Breeding and Genetics (Germany, F.R.), v. 106 (3), p. 237-239, 1989. 5 figs., 6 references. In ENGL, Su. GERM. Author's summary.

Periovulatory endocrinology and oocyte maturation in unmated mature blue fox vixens (*Alopex lagopus*).

W. Farstad, M. Mondain-Monval, P. Hyttel, A.J. Smith, D. Markeng.

Nine of 10 mature blue fox vixens (*Alopex lagopus*) in spontaneous oestrus ovulated approximately 2 days after the preovulatory increase in luteinizing hormone (LH). Plasma concentrations of follicle-stimulating hormone and progesterone increased simultaneously with the LH peak, whereas oestradiol-17 ß peaked 1 day previously. In the tenth vixen, an LH peak was not observed, and neither visible follicles nor corpora lutea were found in the ovaries 6 days after peak vaginal electrical resistance. Eggs were ovulated as primary oocytes, but oocyte maturation was initiated within the day of ovulation (2 days after the LH peak). Within the next 2 days (3-4 days after the LH peak) the first polar body was extruded, and the cumulus mass was completely dissociated from the zona pellucida. The interval between the preovulatory LH peak and initiation of the final oocyte maturation is thus considerably longer in the blue fox than for example in the cow (48-72 h compared with 9-12 h). This suggests that the relationship between these two events is somewhat different in the blue fox.

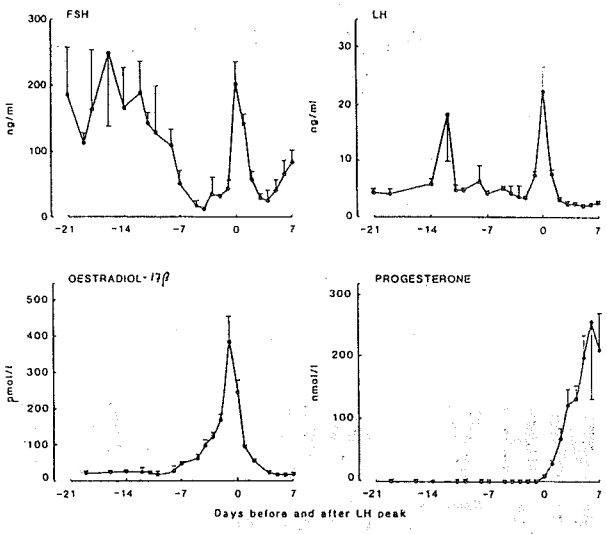
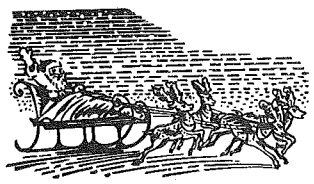


Figure 1. Mean plasma concentrations of FSH, LH, oestradiol-17 β and progesterone in the 7 vixens that ovulated, 1 vixen with luteinized follicles and 1 vixen with preovulatory follicles. The results are synchronized to the day of the LH peak. Values are means ± S.E.M. of 3–9 animals on each sampling date.

Fig. 1. Mean plasma concentrations of FSH, LH, oestradiol-17 ß and progesterone in the 7 vixens that ovulated, 1 vixen with luteinized follicles and 1 vixen with preovulatory follicles. The results are synchronized to the day of the LH peak. Values are means ± S.E.M. of 3-9 animals on each sampling date.

Acta vet. scand. 30, 313-319, 1989. 2 figs., 15 references. Authors' summary,



hair were plucked from 5 localitites of the body (back, thigh, abdomen, shoulder blade, tail) of trial and control animals. Hair samples were divided into guard hairs and undercoat. Their thickness in μm was measured on a lanameter, and their length in mm was determined with the help of a millimetre grid.

The resulting values of the observed morphological properties of fur hair which determine its quality (length of guard hairs and undercoat, thickness of guard hairs and undercoat) were processed to basic variance-statistical characteristics (M±SD). Significance of arithmetical mean differences was tested with a t-test.

The animals were kept under common conditions of cage technology. Cages were located under a shed in two rows. In each cage there were two animals - a male and a female. Physiological demands of animals to nutrition were respected in feeding. Nutritive value of the feed rations is given in table 1.

Table 1. Contents of digestible nutritive substances in feeding doses (g.418 $KJ^{-1}ME$).

Index	Month							
	IV	V	VI	VII	VIII	IX	X	XI
digestible protein (g)	10.7	10.3	10.3	8.6	8.6	9.1	9.2	9.3
digestible fats (g)	3.5	3.8	3.8	4.2	4.2	3.7	3.6	3.9
digestible saccharides (g)	5.8	5.5	5.5	5.4	5.4	6.2	6.5	6.1
ME-plece^{-1}.day^{-1} (KJ)	2092	2510	2510	2929	3096	2594	2176	1966

ME - metabolizable energy

Results

1. Length of guard hairs.
Basic variance-statistical characteristics of guard hair length from individual topological sites of the body are given in table 2, fig. 1.

We found the longest guard hairs in males on the shoulder blade in the first group of animals (92.26 ± 8.54 mm) and in the control group (93.30 ± 7.11 mm) in spite of the fact that a marked length of guard hairs on the tail is a characteristic trait of foxes. With the exception of the above mentioned animals, the longest guard hairs were found in males on the tail in the 1st group 85.07 ± 8.40 mm long ($P \leq 0.01$) compared with 79.59 ± 6.51 mm in the control group. In the locality of the back, guard hair length was approximately on the same level (72.02 ± 5.84 - 74.12 ± 5.17 mm) in all groups, although there was a tendency towards its increase in the first group. A highly significant decrease of guard hair length was found in both trial groups - by 14.26 and 16.95 mm on the abdomen, and in the second group by 8.27 mm on the thigh, and by 16.25 mm on the shoulder blade compared with control individuals.

(1 - Zn, 2 - Se, 3 - Control group)

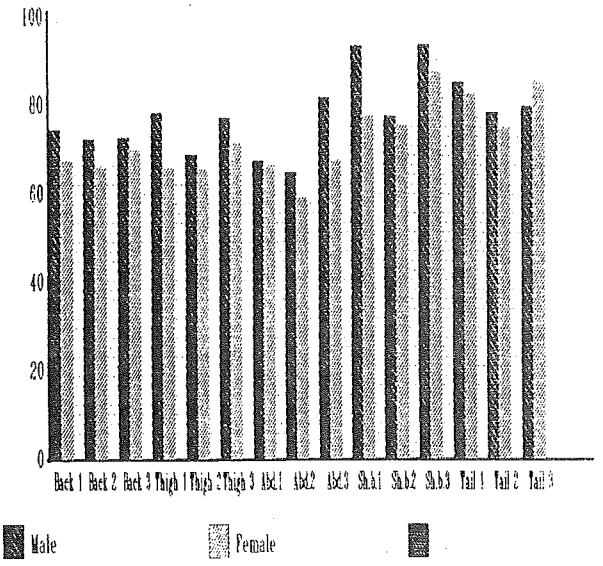


Fig. 1. Length of guard hairs in silver foxes (mm).

Table 2. Length of guard hairs of males (mm) (M + DS).

Locality	Zn (1)		Se (2)		Control group (3)		t-test
	n		n		n		
Back	87	74.11 ± 5.17	120	72.02 ± 5.84	50	72.44 ± 4.95	
Thigh	88	78.05 ± 8.18	95	68.66 ± 7.74	54	76.93 ±10.37	$2{:}3^{++}$
Abdomen	100	67.31 ± 4.42	118	64.62 ± 6.48	115	81.57 ±10.01	$2{:}3^{++}$, $1{:}3^{++}$
Should. blade	73	92.26 ± 8.54	100	77.05 ±15.83	99	93.30 ± 7.11	$2{:}3^{++}$
Tail	40	85.07 ± 8.40	89	78.30 ± 8.92	42	79.59 ± 6.51	$1{:}3^{++}$

++ $P \leq 0.01$

Table 3. Length of guard hairs of females (mm) (M + SD).

Locality	Zn		Se		Control group		t-test
	n		n		n		
Back	88	67.18 ± 5.88	92	65.78 ± 7.66	107	69.65 ± 6.25	$2{:}3^{++}$, $1{:}3^{++}$
Thigh	60	65.55 ± 6.87	78	65.39 ± 6.15	106	71.14 ± 4.41	$2{:}3^{++}$, $1{:}3^{++}$
Abdomen	93	66.09 ± 9.27	90	59.00 ± 7.81	106	67.23 ± 7.11	$2{:}3^{++}$
Should. blade	85	77.19 ±10.29	78	75.11 ± 9.67	108	87.08 ± 8.33	$2{:}3^{++}$, $1{:}3^{++}$
Tail	38	82.24 ± 4.28	82	74.50 ± 7.58	52	85.41 ± 7.40	$2{:}3^{++}$, $1{:}3^{+}$

+ P=0.05; ++ $P \leq 0.01$

Guard hairs are markedly shorter in females compared with males. Similar to males, the highest values were measured on the shoulder blade 87.08 ± 8.33 mm, and on the tail 85.42 ± 7.40 mm, in the control group. It is obvious from table 3 that in all observed localitites there is a significant decrease of guard hair length in trial females.

2. Thickness of guard hairs.

In males, (table 4, Fig. 2) the thickest guard hairs were found on the tail in the control group (96.91 ± 7.81 μm) and in the second trial group (95.32 ± 3.58 μm) and on the back in the first trial group (91.28 ± 5.42 μm). We noticed significant differences in thickness of guard hairs of males in both trial groups in the back site (3.39 μm and 2.81 μm) compared with control individuals. In the thigh site there was a tendency to thickness decrease in guard hairs, and in the second group was observed a highly significant increase from 84.23 ± 8.17 μm to 91.47 ± 10.08 μm ($P \leq 0.01$) compared with control individuals. Guard hair thickness in other observed localitites in animals of the second group, i.e. on abdomen, shoulder blade and tail, remained without significant differences as on the shoulder blade in the first group. Significant differences were observed on the abdomen where the guard hair thickness decreased by 3.38 μm ($P \leq 0.01$) and on the tail by 13.72 μm ($P \leq 0.01$) in males of the first group compared with the control groups.

(1 - Zn, 2 - Se, 3 - Control group)

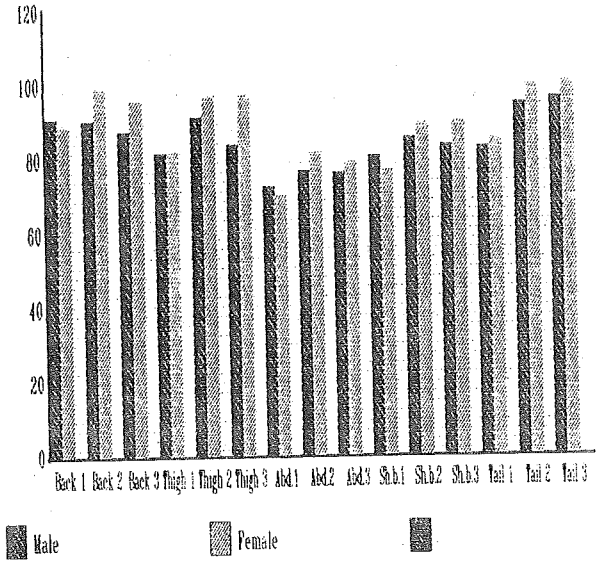


Fig. 2. Thickness of guard hairs in silver foxes (μm).

Table 8. Thickness of undercoat of males (μm) (M + SD).

Locality	Zn		Se		Control group		t-test
	n		n		n		
Back	50	18.72 ± 2.48	60	16.78 ± 2.05	90	16.96 ± 3.25	1:3^{++}
Thigh	50	20.28 ± 3.26	61	19.84 ± 2.37	90	18.20 ± 2.73	2:3^{++}, 1:3^{++}
Abdomen	50	19.56 ± 4.43	61	18.19 ± 3.13	90	15.26 ± 3.23	2:3^{++}, 1:3^{++}
Should. blade	50	17.44 ± 1.89	61	16.75 ± 3.25	90	16.80 ± 2.63	
Tail	50	23.36 ± 4.32	61	26.46 ± 5.63	91	22.49 ± 3.37	1:3^{++}

Table 9. Thickness of undercoat of females (μm) (M + SD).

Locality	Zn		Se		Control group		t-test
	n		n		n		
Back	50	18.40 ± 2.46	50	15.30 ± 1.86	110	15.38 ± 2.61	1:3^{++}
Thigh	50	22.24 ± 3.07	49	17.88 ± 2.09	110	17.94 ± 2.78	1:3^{++}
Abdomen	50	19.20 ± 3.78	50	15.20 ± 1.71	110	12.93 ± 1.98	2:3^{++}, 1:3^{++}
Should. blade	50	18.20 ± 2.37	40	16.37 ± 2.66	110	15.18 ± 2.38	2:3^{++}, 1:3^{++}
Tail	50	24.96 ± 3.21	50	23.92 ± 2.71	110	23.89 ± 4.04	

+ P=0.05; ++ P≤0.01

(1 - Zn, 2 - Se, 3 - Control group)

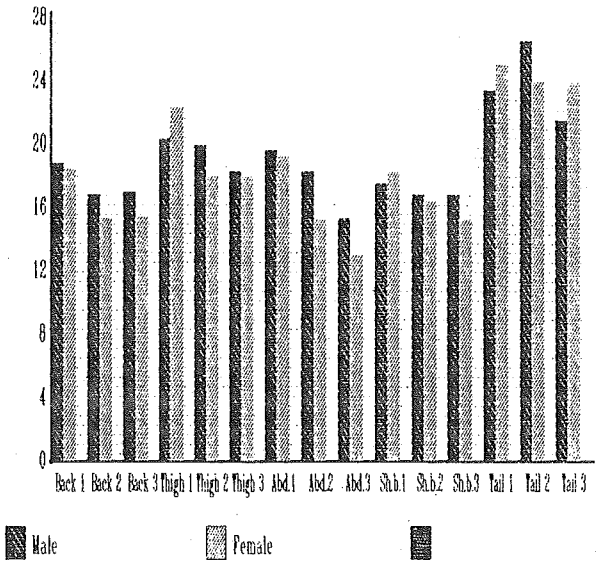


Fig. 4. Thickness of undercoat in silver foxes (μm).

Discussion

Evaluation of results concerning the guard hair length during the application of zinc salt to silver foxes during the ontogenesis showed that there is a tendency towards a guard hair length reduction in the trial group compared with the control group. This tendency was more marked in the group of females.

On all sites of their body the guard hairs were shorter than on females of the control group. This tendency was confirmed in males with the exception of the back and tail. After zinc application the tendency of guard hair thickness decrease also appeared and was more marked than with their length. Differences in guard hair thickness in females were highly significant compared with the control group. We observed high significance of differences in guard hair thickness on tail and abdomen in males. On shoulder blade and thigh guard hairs were thicker in the control group, too, however, the differences were not significant. We found significantly thicker guard hairs on the back of males than in the control group.

Results of evaluation of undercoat length did not confirm a similar tendency as with guard hairs. As far as females are concerned we found shorter undercoat only on shoulder blade and thigh in the trial group, in other studied parts of body we found higher values of length in the the trial group compared with the control group. This

tendency was more marked in males with the exception of the thigh.
We found the most significant influence of zinc addition in the thickness of undercoat. We found a thicker undercoat in all studied parts of the body in both sexes in the trial group compared with the control group. These differences proved to be highly significant in an absolute majority of cases.
From the above results we can conclude that the addition of zinc applied in our experiment had a significant influence neither on length of guard hairs nor on undercoat length. Its influence manifests itself more markedly in the fine undercoat. This fact points out that zinc addition influences positively the firmness of the undercoat which is an important physical property of fur in foxes. If we evaluate the given results from the viewpoint of Georgievskij, V. et al. (1982) we can state that the addition of zinc can influence firmness of foxes' hair positively, mainly the thickness and firmness of the undercoat. Rekos, J. and Tocka, I. (1987) state in their work that undercoat thickness determines its firmness directly as it is of great importance from the viewpoint of value of the fur and fur durability.

From the results on the influence of selenium salts addition on guard hair length, we can conclude that similarly, as in the first group, we noticed in the second one a significantly lower level of guard hair length than in the control group. Shorter guard hairs were observed in all studied sites of body in both sexes. Guard hair thickness in the second group tends towards values of approximately the same level as in the control group.
The greatest differences were in undercoat length. In females the undercoat was longer in all localities in the second group than in the control group. We noticed similar results in males, too, with the exception of the back. These differences were highly significant and, we can therefore conclude that the addition of selenium influences the length of fine undercoat. Evaluation of differences in undercoat thickness in the second group and the control group showed a certain tendency towards an increase of their thickness on some parts of the body. Addition of selenium from the viewpoint of achieved results in our work, influenced the quality of fur to a certain degree, too. According to Rekos, J. and Tocka, I. (1987) not only the representation of undercoat in winter hair is important but also the height of undercoat horizon which determines the amount of air caught in its spatial microchambers which is directly connected with the warming ability of fur. From this viewpoint we can evaluate the influence of selenium to undercoat prolongation positively, according to our results, as the undercoat height rose. According to Tompson, J., Scott, M. (1969) its lack in food will play a more important part during growth and in fur quality. According to the data of the author, a situable addition of selenium has a significant effect on improvement of fur quality in this case.
On the basis of our results, we can state that the addition of selenium salt into feed rations of young silver foxes during the ontogenesis influences their hair quality positively during the period of fur maturity.

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Biotin deficiency in mink and fox.

H. Zimmermann.

The lack of Biotin can cause fur damage, fatty degeneration of the liver and bad breeding results. Feeding of protein from raw eggs can cause this deficiency. Avidin, an ingredient in egg whites, causes the Biotin to be inactivated. To treat affected minks it is recommendable to add 0.5 mg Biotin per animal.

Der Deutsche Pelztierzüchter, 65, 52-53, 1991. 4 references. In GERM. Author's abstract.

Toleration of high concentrations of dietary zinc by mink.

Richard J. Aulerich, Steven J. Bursian, Robert H. Poppenga, W. Emmett Braselton, Thomas P. Mullaney.

Adult and kit male and female natural dark ranch mink (*Mustela vison*) were fed a conventional diet supplemented with 0, 500, 1000, or 1500 ppm zinc, as $ZnSO_4 \cdot 7H_2O$ for 144 days. No marked adverse effects were observed in feed consumption, body weight gains, hematologic parameters, fur quality, or survival. Zinc concentrations in liver, kidney, and pancreas of the mink increased in direct proportion to the zinc content of the diet. Histopathologic examination of the livers, kidneys, and pancreata revealed no lesions indicative of zinc toxicosis. The results indicate that mink can tolerate at least 1500 ppm dietary zinc, as $ZnSO_4 \cdot 7H_2O$, for several months without apparent adverse effects.

J Vet Diagn Invest 3, 232-237, 1991. 5 tables, 32 references. Authors' abstract.

The influence of meat after enzymatic hydrolysis conserved with ortophosphoric acid in the meal dose of minks on selected usable and biochemical indices.

H. Bieguszewski, R. Szymeczko, J. Bodenszat, M.O. Lorek, B. Giowinska.

55 mink females during lactation and 73 young weaned mink were tested. The meal ration of the control group consisted of standard feed and the meal ration of the experimental group consisted of horse meat after hydrolysis conserved with orthophosphoric acid and potassium sorbate. Meat hydrolysis was carried out with the aid of enzymes from the English firm ABM Chemicals Limited.

The influence of meat after hydrolysis as a meal supplement for mink during lactation on the number of reared pups was not noticed. Meat after hydrolysis which young weaned mink received till slaughter did not have a favourable effect on body weight or valuation of animals.

It was noticed that activity of blood plasma transminasis, the level of total protein and ions of chlorine, sodium and potassium of experimental group were greater than those of control group.

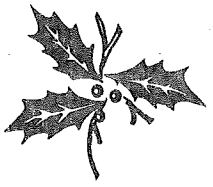
Akademia techniczno-rolnicza im.jana i jedrzeja sniadeckich w bydgoszczy zeszyty naukowe nr 170 - zootechnika (19) - 1991, pp 5-15. 6 tables, 17 references. In POLH, Su. ENGL, RUSS. Authors' summary.

Bacteriological quality of mink feed in Argentina.

N.O. Stanchi, P.E. Martino, J.J. Martino, M.S. Cabral, H.P. Reales.

Mink raising is a multimillion dollar industry worldwide. Therefore mink feed quality must be unquestionable. Because of the extreme sensitivity of mink to bacterial and chemical intoxications, this report was done to evaluate the bacteriological quality of mink feed in Argentina and its importance to animal health. 100% of the analyses of mink feed were unsatisfactory for mink consumption. Several aspects of methodology were discussed.

Med. Vet. Vol. 6, No. 10, 547-550, 1989. 3 tables, 17 references. In SPAN, Su. ENGL, SPAN. Authors' summary.



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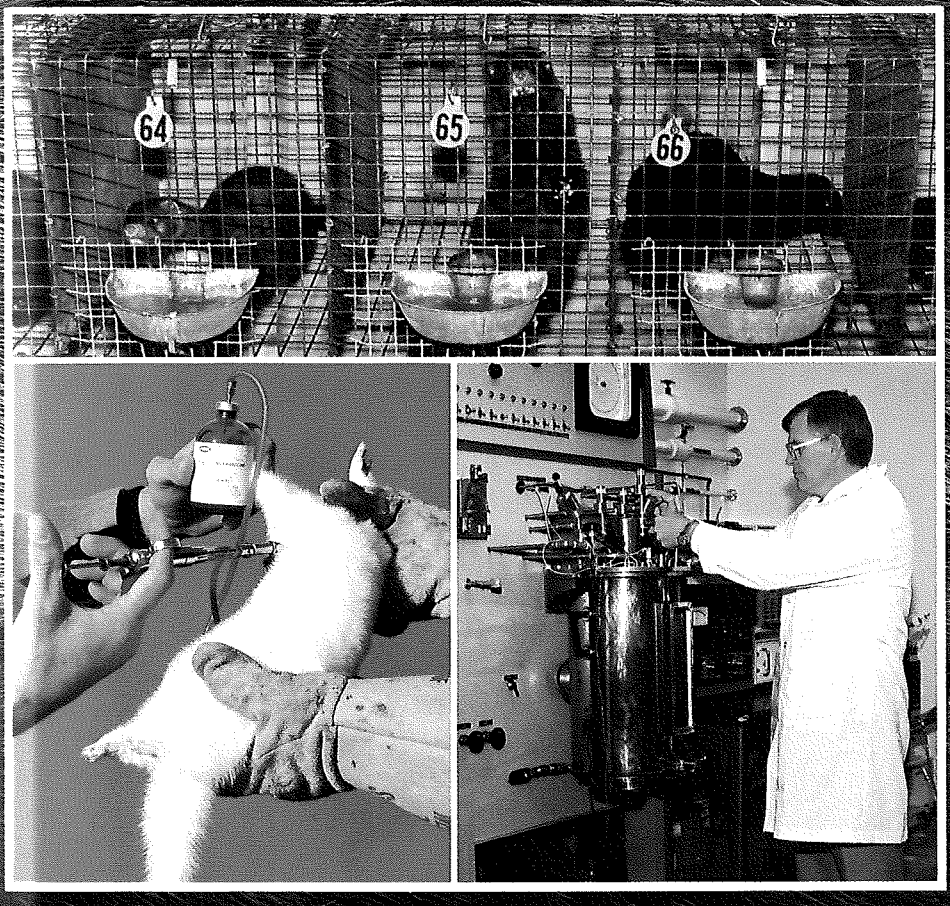

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Aleutian disease in the ferret.

M. Oxenham.

Spontaneous Aleutian disease (AD) in ferrets (*Mustela putorius furo*) has been reported in USA (*Kenyoun and others, 1967*) Canada (*Daoust and Hunter, 1978*) and New Zealand (*Cox, 1984*). This is a preliminary and first report of AD in the ferret in the UK.

AD is caused by a parvovirus and can be a serious problem on mink farms. In the ferret it is characterised by a persistent viraemia, immune mediated pathological changes in various organs and hypergammaglobulinaemia. Clinical signs are variable, such as weight loss and general malaise, chronic respiratory infection and degrees of posterior paralysis. Transmission is both vertical (transplacental) and horizontal (blood, saliva, urine and faeces). Diagnosis is based on histopathology, gammaglobulin estimation and blood serology using the counterimmunoelectrophoresis (CIEP) test.

In January 1990, a six-month-old jill was presented with acute posterior paresis and urinary incontinence. It was treated with chloramphenicol and betamethasone by injection. Within 24 hours the condition had progressed to quadriplegia and euthansia was carried out. Autopsy was performed at the Veterinary Investigation Laboratory, Winchester, and there were no gross lesions on the internal organs. Histopathology on the brain, spinal cord, lung and kidney was done at the Central Veterinary Laboratory, Weybridge, and demonstrated significant changes in the spinal cord suggestive of a viral aetiology. The brain was normal. It was at this stage that AD was suspected. Blood serology was carried out at Harlan Olac Ltd using the CIEP test and was positive for AD. Gammaglobulins comprised 21.5 percent (normal 5 per cent) of the total serum protein. This owner had seven other ferrets, five of which gave a positive CIEP test.

Another owner had a similar case two months later. This ferret was also put down and histopathology is in progress. The CIEP test was positive. This owner had 13 ferrets, five of which were also positive. It was then decided, in cooperation with the Wessex Ferret Club, to carry out a survey of the incidence of AD infected ferrets using the CIEP test. A total of 204 pet ferrets belonging to 49 owners were tested and 11 (5.4 per cent) were positive. Some of these 11 had had episodes of hindleg weakness, or respiratory infection and weight loss. A more detailed account of the epidemiology, symptoms and pathology will be published in due course.

Ferret clubs and societies are concerned about these findings since CIEP test positive ferrets should be regarded as potentially infective to other ferrets. As the test is simple to do and inexpensive, owners who breed ferrets, go to shows and other events are being encouraged by the organisers to have their stock tested. Control of AD is dependent on testing, cessation of breeding and isolation of positive ferrets. Antibiotic and steroid therapy may give some response but there is no known cure. Vaccination is not possible due to the immune-mediated nature of the disease.

I am grateful to David Welchman, Winchester Veterinary Investigation Centre, for carrying out the autopsies, to the Central Veterinary laboratory for histopathology and the Zoological Society, London for the gammaglobulin estimation.

Veterinary Record 126; 23, 585, 1990. 3 references. CAB-abstract.

Antigen distribution in organs of mink with aleutian disease parvovirus infection.

P. Wohlsein, G. Trautwein, B. Stolze, L. Haas, O.-R. Kaaden.

On tissues from naturally infected non-Aleutian mink an immunohistological study was performed using monoclonal antibodies and the immunoperoxidase method. Structural proteins of ADV were demonstrated in cryosections and in ethanol-fixed and paraffin-embedded material which provide antigen detection in a similar amount together with good histological structure. In lymphoid organs viral antigen was restricted to B-cell areas, particularly lymphoid follicles. The pattern of antigen distribution was typical for follicular dendritic cells which are capable of retaining immune complexes. Besides macrophages in the interior of lymphoid follicles the most likely proliferating B-lymphoblasts reveal nuclear and cytoplasmatic presence of structural proteins indicating viral replication. Cells of the mononuclear phagocyte system, such as cells of lymphatic sinuses and heaptic Kupffer cells, harbor viral protein in the cytoplasm, probably resulting from phago-

cytosis of immune complexes. Renal glomeruli were consistently negative for virus antigen whereas in interstitial infiltrates cells resembling macrophages stained positive for ADV structural proteins.

WOHLSEIN, TRAUTWEIN, STOLZE, HAAS and KAADEN

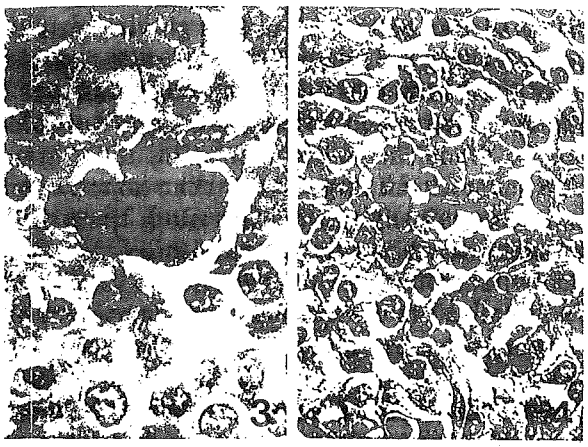


Fig. 3. Lymph node: large antigen-containing cell in close association to a small lymphoid cell. Indirect immunoperoxidase method; magnification 1,200×

Fig. 4. Lymph node: nuclear and cytoplasmatic localization of ADV structural proteins in a cell located in the interior of a germinal center (—). Indirect immunoperoxidase method; magnification 1,000×; Nomarski diffrential interference contrast

Journal of Veterinary Medicine, Series B (Germany, F.R.), Vol. 37 (9), p. 651-659, 1990. 8 figs., 37 references. Authors' summary.

Nephrosis due to oxalate deposits in the kidneys of a stone marten.

O. Geisel, S. Clauss.

In a case report, nephrosis due to oxalate deposits in the kidneys of a stone marten is described. The animal showed severe symptoms indicating a disturbance of the central nervous system, and was euthanized because of an infaust prognosis. It is assumed that the cause of the poisoning is the ingestion of ethylene glycol which is an additive to the cooling water of cars.

Zeitschrift für jagdwissenschaft (Germany,F.R.), Vol. 36 (2), p. 133-135, 1990. 2 figs., 8 references. In GERM, Su. ENGL, GERM. Authors' summary.

Some protozoan infections in carnivores. Neuropathology and host-parasite relationship.

Inge Bjerkås.

In summary, the main objectives of the present investigation were to:
- adapt and evaluate methods for demonstration and identification of protozoan parasites in formalin-fixed autopsy material
- establish morphological criteria for etiological diagnosis in the recently recognized Toxoplasma-like parasite in dogs
- characterize the pathomorphological changes and contribute to the knowledge of pathogenesis and host-parasite relationship in infection with the Toxoplasma-like parasite in dogs, in acute toxoplasmosis in blue foxes, and in encephalitozoonosis in blue foxes and mink.

Papers included in the thesis:

I Identification of *Toxoplasma gondii* and *Encephalitozoon cuniculi* by immuno-peroxidasetechniques and electron microscopy, in stored, formalin-fixed, parraffin-embedded tissue.

II Immuno-histochemical and ultrastructural characteristics of a cyst-forming sporozoon associated with encephalomyelitis and myositis in dogs.

III The neuropathology in toxoplasmosis-like infection caused by a newly recognized cyst-forming sporozoon in dogs.

IV Neuropathology and host-parasite relationship in acute experimental toxoplasmosis of the blue fox.

V Brain and spinal cord lesions in encephalitozoonosis in the blue fox.

VI Brain and spinal cord lesions in encephalitozoonosis in blue foxes. Transmission and scanning electron microscopic studies.

VII Brain and spinal cord lesions in encephalitozoonosis in mink.

Thesis. The Norwegian College of Veterinary Medicine, Oslo, Norway. 74 references. Author's summary.

Isolation and identification of fox encephalitis virus (FEV) and epidemiological survey of the disease.

Zhong Zhihong.

Three strains of virus were isolated from infected foxes in three affected fox farms with the Madin and Darby dog kidney (MDCK) continuous cell line. The virus was identified as fox encephalitis virus (FEV) based upon its electron-microscopic structure, physicochemical, biological and serological properties and structural proteins. The results of the epidemiological survey demonstrated further that the acute infectious disease showing nervous symptoms in these fox farms was fox encephalitis, and this is the first report of this disease in China.

Bulletin of Veterinary College of PLA (China), Vol. 10 (2), p. 111-117, 1990. 6 tables, 3 figs., 15 references. In CHIN, Su. ENGL.

Age specific prevalences of Echinococcus multilocularis infection in red foxes (*Vulpes vulpes*).

E. Schott, B. Müller.

The age specific prevalences of infection with Echinococcus multiocularis in red foxes were examined in an endemically infected area. The mean age of infected foxes was 14 months, in accordance with previous investigations.

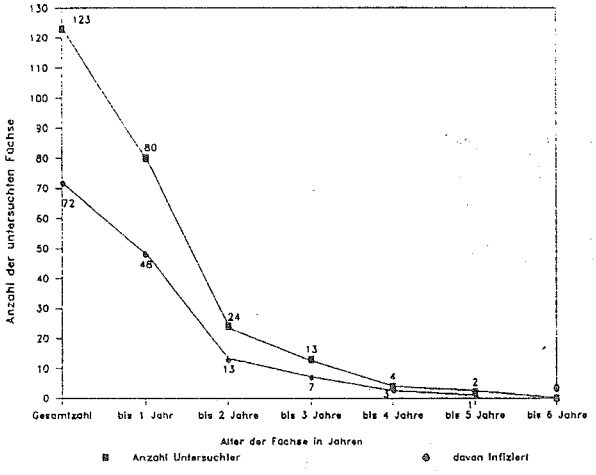


Abb. 1: Alters- und Infektionsstruktur der untersuchten Füchse

In 58.5 per cent of E. multilocularis positive foxes there was no association with age. A tendency to a greater prevalence, and therefore increased susceptibility, in young animals was suspected, but not proven due to the small number of animals examined.

Tierärtzliche Umschau (Germany, F.R.), Vol. 45 (9), p. 620-623, 1990. 1 table, 1 fig. In GERM, Su. ENGL. Authors' abstract.

Feline panleukopenia parvovirus and vaccination of mink against viral enteritis.

E. Rivera.

Only abstract received. Vet. Microbiol., 13, 371-381. In ITAL.

Ivermectin treatment of rabbits, cats, nutria and foxes with nematode and mite infestations.

B. Hartmannova, J. Mouka.

Ten rabbits with Psoroptes cuniculi and eight cats with Otodectes cynotis and Notoedres cati were cleared of their infestations 15 days after a s.c. injection of Ivermectin at 0.2, and 0.4 mg/kg. Ivermectin (0.2 mg/kg s.c.) was also effective against Trichuris myocastoris and Strongyloides myopotami in 92 nutria, but did not eliminate all T. myocastoris. At 0.2 mg/kg s.c. it eliminated all Toxocara canis, Otodectes cynotis and Sarcoptes scabiei from 92 foxes in 10-30 days.

Veterinarstvi, 40; 3, 122-123, 1990. 3 tables. In Czech. CAB-abstract.

Detection of canine distemper viral antigen in formalin-fixed and paraffin-embedded tissue of a fitch (*Mustela putorius*), using an immunoperoxidase technique.

M. Hewicker, S. Damsch, G.Trautwein.

The present study describes how a naturally infected fitch (*Mustela putorius*) caused an outbreak of canine distemper in a colony of insufficiently vaccinated dogs. The detection of canine distemper virus (CDV) on paraffin sections of different organs of the fitch and one of the dead dogs was achieved using a monoclonal antibody against the

nucleocapsid protein (NP) of CDV and the avidin-biotin-peroxidase complex (ABC) technique.

Deutsche Tierärztliche Wochenschrift (Germany, F.R.), Vol. 97 (2), p. 85-88, 1990. 4 figs., 33 references. In ENGL, Su. GERM. Authors' summary.

An outbreak of Aujeszky's disease in foxes and mink in Korea.

Eui Kyung Hwang, Young Bang Kwon, Young Hwa Jean, Mun Il Kang, Soo Hwan An, Jae Young Song, Jae Chin Rhee.

Aujeszky's disease (AD) was first recognized in swine, in 1987 in Korea. Since then, the disease has occurred in pigs sporadically in a few provinces. The present report describes the first natural outbreak of AD in mink and foxes in Korea.

Foxes and mink were submitted for diagnosis at the Pathology Division on August 29, 1989. Clinical signs were depression or excitement, diarrhea, pruritus on mouth and skin, hypersalivation with froth, grinding of teeth, biting of tongue, and nervous signs such as muscular tremour and convulsion. The infected animals invariably died afterwards.

Gross lesions were the congestion and edema of liver, spleen, lungs and kidney, ecchymosis of heart, and catarrhal enteritis.

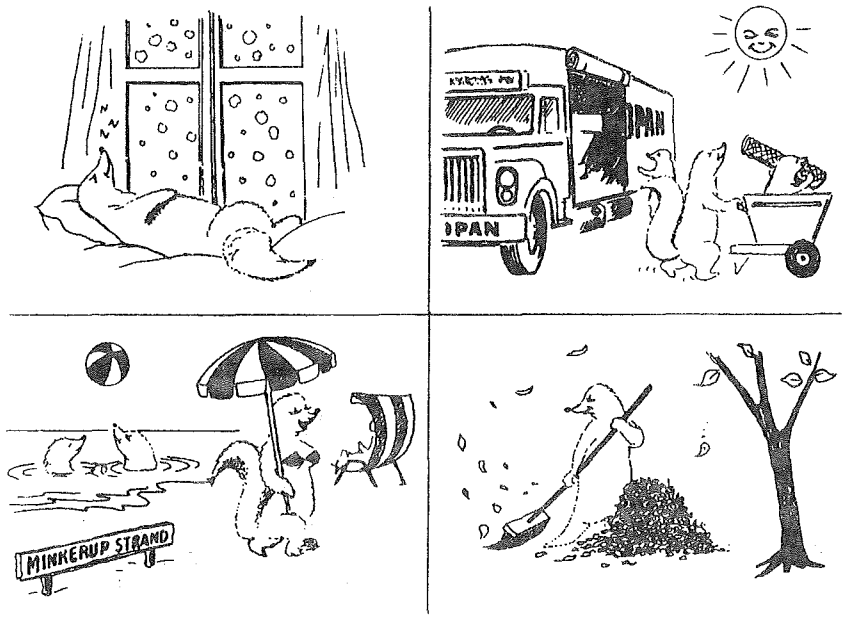
Main histologic findings observed were nonsuppurative meningoencephalitis including perivascular cuffing, glial foci, vasculoendotheliosis, neuronophagia and mononuclear cell infiltration in meninges, and marked pulmonary congestion and edema.

Etiologic agents were isolated from the brain, tonsil and spleen of the infected foxes and mink, and the isolates produced typical cytopathic effects of herpes virus with giant cell formation after two times blind passage in PK-15 cells. Subsequently, the field isolates were confirmed as Aujeszky's disease virus (ADV) by indirect fluorescence assay utilizing specific monoclonal antibody against ADV.

Rabbits inoculated with the pooled tissue homogenates of affected mink and foxes showed a severe pruritus and typical lesions at the inoculation site 3 to 5 days after inoculation, and then died shortly thereafter.

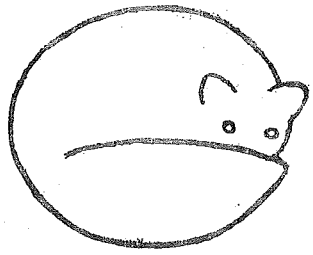
The source of infection was believed to be the ingestion of raw internal organs of ADV-infected pigs, which were supplied as main feed.

The research Reports of the Rural Development Administration - Veterinary (Korea R.), Vol. 32 (1), p. 56-62, 1990. 1 table, 12 figs., 18 references. In KORA, Su. ENGL. Authors' abstract.



ABSTRACTS

FROM



INTERNATIONAL SYMPOSIUM "PHYSIOLOGICAL BASES FOR INCREASING THE PRODUCTIVITY OF PREDATORY FUR ANIMALS"

PETROZAVODSK * 1991

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Scientific Soviet of the USSR Academy of Sciences
on the problem "Optimization of utilization
and extended reproduction of biological resources"

Institute of Biology
Karelian Research Centre USSR Academy of Sciences

Industrial Society "Karelpushnina"

The functional state of the steroid synthesizing systems of mink males in the process of postnatal development.

L.F. Adigamov, N.N. Tyutyunnik.

Secretion of major steroid hormones: 11-oxicorticosteroids, progesterone, aldosterone, total testosterone and 5-dihydrotestosterone was studied by radioimmunological method. In the process of postnatal development of mink males the levels of glucocortiooid production change significantly; some peaks of their content growth were recorded in the blood serum. The increase of corticosteroids secretion was especially pronounced in September-October: the increase of the 11-oxicortioosteroids concentration reaches its maximum value and makes up 22-50 ng/ml; the level of progesterone augment for 3.5%, the content of aldosterone does not change significantly. Till September-October the content of sex hormones in the blood serum of 1-year-old minks is relatively low. The beginning of the increase of sex steroid production is characteristic of the October - late November period. During this period the content of sex hormones in the blood serum varies significantly and is within 0.6-6.0 ng/ml. Thus the period September-November in mink in the first year of their life is characterized by a certain increase of the functional state of the steroid synthesizing system.

Code 3-M.

The invasion of polar foxes with coccidia as an indicator of their physiological state.

V.S. Anikanova.

The dynamics of coccidia secretion by polar foxes was studied under conditions of artificial breeding and in the experiment. Maximum infestation and largest variability of frequency distribution of the parasite was observed in one-month-old cubs. The number of animals invaded by coccidia decreases with age. In adult polar foxes the intensity of coccidia secretion is insignificant. The secretion dynamics of oocysts was found to be of a strictly individual pattern despite the fact that cubs of the same size-weight class were simultaneously infected in the experiment. Variations were observed in the duration of a prepotent period, and the number of oocysts secreted by each concrete animal. Data obtained suggest that the host control for the coccidia number is determined by genetic heterogeneity of polar foxes. Individuals which were characterized by later secretion of coccidia or by their small number seem to have higher adaptability which manifested itself in higher resistance to the invasion, and it is these animals which are more promising for breeding as being more resistant to stress.

Code 3-4-9-F.

New stimulants for fur-bearing animals' development prepared from furfural.

L.A. Badovskaya, V.M. Latashko, G.F. Musychenko, Yu.V. Naidenev. M.N. Kondrashova, N.N. Tyutyunnik, L.K. Kozhevnikova.

New methods based on furfural oxidation with hydrogen peroxide have been developed for the preparation and production of biologically-active substances positively affecting the fur-bearing animals' organism. These substances used in diets of the fur-bearing animals result in their more intensive growth, thus counting for fur-farming economics. Their use in diets of weak younger animals and females is of particular effectiveness. The preparations examined are low toxic and can be easily produced from industrial raw materials: low doses - high results.

Code 6-3-2-M-F-O.

Use of bishophite contained in mink rations.

N.A. Balakirev, R.I. Mikhailova, N.G. Tinaeva.

A possibility of the use of bishophite, a mineral supplement to practical rations (PR) meant for mink, has been studied. The studies were conducted for four years on fur-bearing animal farms in Tatarstan and Moscow Region. Different doses (from 50 to 350 mg per head per day) and various numbers of days (from 60 to 120) of the preparation administration, have been tested. The most optimum dose of bishophite when given for two months, was 200 mg and for four months 100 mg. The use of high doses of the preparation for a protracted period of time results in decreased liveweight, reduced output of pelts of an especially large size, and change in the hormonal status. Post-morten and histological analyses of young mink organs and tissues also revealed the most

effective positive influence of the preparation of animals when fed together with PR at small doses. In this case, a weakend production of protein and fat dystrophies of liver and kidneys is evident as well as improved discharge of bile and there is an increase lytic reaction of hepatocytes and increased glycogen build-up. No changes have been observed in mink's muscle and fat tissues following the ingestion of bishophite, irrespectively of a set dose.

Code 3-6-8-9-M.

Influence of bishophite on blood composition of mink.

I.Ja. Bannov, R.I. Mikhailova, G.Ja. Strikha, V.Je. Chebotaryov.

Blood composition of mink was investigated in case of bishophite additions to common rations (CR). The experiments continued for 2 years. In the 1st year of investigation the doses of preparation of 100, 150 and 200 mg per animal/24 hrs during 4 months were studied, the 2nd year - 50, 100 and 150, the same time periods. Results of investigations have shown that addition of investigated bishophite doses to CR of young minks doesn't markedly influence leucocyte, erythrocyte and hemoglobin counts in blood, hematocrite, glucose level, total lipids, total protein, albumines, α-, ß- and γ-globulins nor the ratio between albumines and globulins. At the same time, the doses of 100-200 mg influenced enzyme composition of blood. This influence on enzyme activity in blood serum was most marked when 150 and 200 mg were applied. The resulting changes (increase of alkaline phosphatase and alanine aminotransferase ALAT activities) can be explained by a toxic effect of the preparation on the liver cells. Increase of asparagine aminotransferase activity resulting from the use of maximum dose was the sign of deeper hepatocyte structure damage, including mitochondria. A bishophite dose of 100 mg also exerted a harmful effect, but was weaker than with doses of 150 and 200 mg. Addition of 50 mg markedly reduces the increased ALAT activity. Thus, minimum doses of bishophite in CR of young minks have a sparing, positive effect on blood composition of young mink.

Code 3-6-8-9-M.

Investigation of enzyme proteolytic activity in the fitch digestive tract.

B. Barabasz, V.M. Oleijnik.

In addition to studies on nitrogen balance and retention or protein digestibility coefficient on investigation was also carried out on an association of activity of proteolytic enzymes with protein digestion in the alimentary tract of fur animals. The authors made an attempt to study a correlation between protein level in fitch diets and proteolytic enzyme activity in different sections of their digestive tract. Fitches were fed diets at three protein levels: 14, 16.5 and 19 g protein/1 MJ EM resp. From the animals killed at 25, 35, 90, 150, and 210 days (30 per every term) samples were collected from pancreas and mucose membrane of the stomach and small intestine. Total proteolytic activity was tested "in vitro", by modified Anson's method. The results obtained indicate that protein is digested mostly in the stomach and duodenum. There is a tendency to increased reaction activity with an increase in protein level in the diet. In the stomach the highest activity was recorded in 90-day-old animals, in groups 39.7; 40.0 and 41.1 mkmol/min/g of protein, resp. The pancreas enzymes displayed the highest activity in 150-day-old animals (19.1; 22.0 and 26.4 mkmol/min/g, resp.).

Code 3-6-O.

Formic acid - allergen for mink.

V.A. Berestov, E.B. Vaisertreiger, L.I. Rakitsky.

Formic acid was the conserving component of the chloroplast paste in an amount of 0.01% to the mass of paste. Chloroplast paste was added to the diet of the young minks from July 9 gradually, beginning from 1 g per 100 Kcal of feed and on the 9th day it was increased up to 6 g per 100 Kcal (about 18 g per mink). On the 12th day the first cases of illness of the animals were registered (rynitis, oedematic head, conjunctivitis). Feeding the paste continued during the next 3 days. All the experimental minks fell ill (1160 heads). The sick animal rushed about the cage, tore up the muzzle with paws, rubbed against the netting and the huts. After the paste was excluded from the diet the symptoms disappeared after 10-14 days. After healing, many animals had such wounded lips that they did not cover the teeth.

Feeding the chloroplast paste without the conservant - the formic acid - proved to have a positive influence on the mink.

Code 6-7-8-9-M.

Chloroplast paste in the diet of minks.

V.A. Berestov, E.B. Vaisertreiger, N.V. Tyurnina.

Chloroplast paste is a product obtained by means of temperature (50-55°C) treatment of cellular sap of green plants (lucerne). It contains (in the natural product) 7.2% protein, 75.9 mg/kg carotene, 15.9 mg/kg copper, 8.3 mg/kg manganese, 0.5 g/kg iron, 16.4 mg/kg zinc, 0.1 g/kg potassium, 15.5 mg/kg calcium, 14.3 mg/kg magnesium and 0.6 mg/kg sulphur. Amino acid content of protein (g per 100 g of protein) is as follows: isoleucine - 5.4; leucine - 10.8; lysine - 7.3; methionine - 2.0 + cystine; phenylalanine - 14.2; threonine - 5.5; valine - 4.0; alanine - 6.3; arginine - 4.5; aspartic acid - 10.2; glutamic acid - 10.0; glycine - 5.3; proline - 5.1; serine - 4.4. An amount of 6-18 g of the paste per 100 kcal of feed ensured a 17% increase of haemoglobin in the blood of mink compared to the control, while the number of erythrocytes and the protein content in blood serum was not changed. The average commercial cost of skins was 3 rbl. 97 kop. over the control due to the absence of such defects as "shearing" and "white down".

Code 6-7-M.

The effect of treating wheat fractions with amylolytic and cell wall degrading enzymes on carbohydrate digestibility in mink.

C.F. Børsting, B.M. Damgaard.

In a special milling process wheat was separated into 6 fractions; fraction 1 comprised the outer layers of the wheat kernel (rich in pericarp/testa), fraction 2 the next layers (rich in aleurone), whereas the following fractions (3-6) contained an increasing ratio between endosperm and aleurone. Of each fraction one sample was treated with amylolytic and cell wall degrading enzymes, and another sample was boiled in water for 15 minutes. Both samples from each fraction were fed in a wet diet, including cod fillet, soya oil, tallow, vitamins and minerals, to five mink in a two-week digestibility trial. The enzyme treatment increased the content of simple sugars in all fractions compared to the content in the equivalent raw sample. This was due to degradation of both starch and non-starch polysaccarides (NSP) showing that the enzymes were in fact capable of degrading cell walls. For all fractions the digestibility of crude carbohydrate was higher after enzyme treatment than after boiling in water. In fraction 1 the digestibility of crude carbohydrate was 24% and 37% after boiling and enzyme treatment, respectively; in fraction 2 it was 52% and 62%, respectively; whereas in fraction 5 it was 77% and 84%, respectively. The higher digestibility for the enzyme-treated samples was partly due to the degradation towards simpler sugars, but also due to the fact that some of the cell wall constituents (NSP) surviving enzymatic treatment were degraded later on. This can probably be ascribed to further activity of the added enzymes in the mixed wet feed and to activity of these enzymes during passage of the intestine, because natural microbial activity in the intestine is too low to degrade cell walls.

Code 6-7-M.

Interferon status in normal mink and in mink with pathology.

L.Ye. Boyarintsev, Prof. B.M. Zhitkov.

The possibility of using interferon level indices in blood serum and interferon reaction of leucocytes as control tests of mink physiological status was studied. For interferon titration we chose the method of estimating an antiviral effect of delay of a test-virus cytopathogenic effect on cells with the use of the diploid culture of human embryo fibroblasts and a test-virus of vesicular stomatitis. The method of interferon microtitration in plates was used. The ranges of serous and leucocytic interferon levels in standard mink were determined. It was shown that mink leucocytes ability to produce interferon is not an absolutely stable characteristic. Leucocytic interferon titer may have individual fluctuations depending on the general immunologic reactivity of the organism. The use of interferon reaction of blood leucocytes as one of the indices of non-specific resistance of wild

animals is shown by certain non-infectious and infectious diseases when a considerable disturbance of immune homeostatis in mink is revealed.

Code 3-9-M.

The use of hormonal preparates for regulation of reproduction in mink.

A.A. Buyanov, L.A. Sharkov, O.V. Kryachko.

We investigated the influence of hormonal preparates on number and sex of newborn mink. Investigations were performed at the fur farm "Voronkovski" Leningrad region on 216 mink (females). Progesterone (43 an.), testosterone (75 an.), pregnant-mare serum (75 an.), prostaglandin estrofan) (48 an.), and sinestrole (75 an.) were used. As control fertility and sex data of 250 mink for which no stimulating preparates were used. Reproduction rate in the group treated with progesterone was 6.31 kits per female; with testosterone - 5.74; pregnant-mare serum - 6.43; estrofan - 5.73; sinestrole - 4.4. In the control group the result was 5.46 kits per female. In the group where the pregnant-mare serum was used according to the adapted program 1.45 times as many males as females were born (242 and 167 corresp.). In other groups the proportion of males and females was 1:1.

Code 3-5-M.

Enhancement of infertility in dark mink (*Mustela vison*).

LeGrande C. Ellis, Baha M. Alak, Holly R. Frantz.

Studies in our laboratory have established that dark mink exhibit several forms of primary infertility the first year of life; constitutional delayed puberty and the classical delayed puberty (hypogonadotropic hypogonadism - HH). In the most severe form of HH the pituitaries showed marked edema and spontaneous cytotoxic cellular destruction while the least serious types had normal pituitaries, but did have some hypothalamic abnormalities and testicular lesions. Treatment of the animals with exogenous GnRH results in a heterogeneous response; those with partially developed testes responded better than those with more poorly developed gonads. Cells containing both pro- and processed GnRH were present in the hypothalamus, but there was an abnormal release of this hormone. We have observed that it takes 30 days for a spermatozoan to form from a stem cell and be transported through the excurrent ducts to be inseminated in the female upon copulation. Thus, these animals must be treated at least 56 days prior to breeding to become fertile, but the most severely impaired testes may not develop sufficiently for the animals to become fertile due to the pituitary and testicular lesions.

Code 5-3-4-M.

Biological characteristics and efficiency of the growth-stimulating effect of the growth hormone analogue obtained by gene-engineering method.

L.K. Ernst, N.N Tyutyunnik, L.F. Adigamov, L.N. Sirotkina, V.D. Nifontov.

Gene-engineering hormones of the human and some agricultural animals (bovine, pig) have been obtained in our country and abroad. But as to fur animals, mink in particular, there is only little evidence on their properties. In the experiments with mink we used a recombinant of bovine somatotropin which differed from natural hypophysial growth hormone of bovine in its chromographic profile, isoelectric point, immunological characteristics and other properties. The differences are due to the fact that the composition of the recombinant is supplemented by several amino acids. Two-month old dark-brown mink males and adult females were used in the experiments. The data obtained enable us to assume that the recombinant of bovine somatotropin produces a stimulatory effect on the processes of mink growth and lactation.

Code 3-2-5-M.

Effect of uniaxial straining of pelts on physical characteristics of male and female blue-fox leather.

M. Eskolin, M. Marjoniemi, E. Mantysalo, K. Rouvinen, P. Niemela.

Previously extended studies were carried out to clarify the effect of uniaxial straining along the line of the backbone in the conservation of blue-fox (*Alopex lagopus*) pelts on their length, con-

traction in dressing, and their general fur characteristics. As in the previous works, in the present study the pelts were divided into four groups and each submitted to the following experimental treatments before fixing them onto stretching boards and drying: no straining, straining with muscle power, a load of 200N and a load of 400N. In addition to the previous works, the samples were now divided into two subgroups according to the sexual background of the material. The length of the raw pelts increased with increased straining load both in male and female subgroups. Contractation of the pelts in the dressing process was also more prominent the stronger the strain had been, but all pelts in both subgroups returned to their initial fresh length. The fur characteristics were significantly affected by straining. Colour purity, mass and quality class deteriorated when the load was raised. The loss in fur mass was very clear in the female subgroup at the extremely high straining. Effects of the uniaxial strain of varying magnitude along the line of the backbone on physical characteristics, i.e. breaking load, tensile strength, elongation at break, and breaking energy were studied for a great number of selected leather samples by using a previously reported special sampling set system. The mechanical strain has a considerable effect on the physical characteristics of blue-fox leather for both sexual subgroups. On the basis of the results obtained in this work it is concluded that pelts of male and female blue fox can be strained with a load of 400N. Even for both subgroups the breaking load remains a high enough value to meet the lower acceptable value for breaking load.

Code 2-12-14-F.

A study of the mechanisms of hypoxia resistance in mink.

V.P. Galantsev, Ye. P. Gulyaeva, S.G. Kovalenko, R.I. Kovalenko, A.A. Molchanov.

In carnivorous fur-bearing animals - mink and sea otters, which are adapted to diving, a prolonged breathholding is to a large extent provided by a specific structure and functioning of cardiovascular and respiratory systems, the normal oxygen supply to the brain and the heart being maintained. In experiments on the American mink (*Mustela vison*) we have shown that during apnoea in other tissues no decrease is observed in the enzyme activity of aerobic pathways of energy accumulation. Thus, in contrast to terrestrial mammals under the same conditions, there was no significant decrease in cytochromoxidase activity in the liver. When analyzing mechanisms of oxygen supply to the tissues, we found in males and females changes in the metabolism of peroxides and in the activity of the cholinergic system which are not seen in non-adapted animals. The results obtained showed that in mink during apnoea the intensity of free radical processes is limited and dissociation of hydrogen peroxide is associated mainly with catalase activity and with the formation of molecular oxygen.

Code 3-M.

Feeding optimization of mink under hot climatic conditions.

V.Z. Gazizov.

Feed leftovers in feed-treating equipment offer good conditions for mikroorganism reproduction. The problem of secondhand infection of the feed during its preparation is very important especially in hot climates. We investigated sanitary-bacterial state of feed-treating equipment on different fur farms in Central Asia. A high bacterial density on the equipment was found. The highest bacterial density was found in spring - summer period in the mixers (0.64 - 1.09 million/sm^2) and conveyers (18.52 - 24.66 million/sm^2). New methods for cleaning and sanitary checking of feed-treating equipment were suggested.

Code 8-12-M-F-O.

Hormonal regulation of fur cover.

A.I. Gladckova, N.A. Karpenko.

The influence of a single intracutaneously injected hormone (estradiol (E) dipropionate, testosterone propionate, dihydrotestosterone, progesterone and PRL) to female rats in different stages of the estrous cycle on fur cover condition was studied. Fur diameter and density were measured in the generation of grown fur after it had been cut off (in 2 ms), endogenous hormone levels were detected by radioimmunology. Treatment with both androgens and progesterone were ac-

companied by increasing testosterone plasma levels and estrogen injection resulted in E concentration increase. The increase of ratio of E/testosterone when treated by PRL depended on the cycle stage at the time of hormone injection. A 3-fold increase of downy fur diameter and 1.5-fold one of spine fur diameter as well as decrease of density and specific mass of fur were observed after E injection. Androgen treatment resulted in acute thickening of the spine fur. This increase was dependent on the cycle stage when treated and was maximum after hormone injection in estrous. Dihydrotestosterone, progesterone and PRL, which were injected in diestrous, increased fur-cover density. The data should be taken into account when treating fur-bearing animals with hormones as well as using skin from animals in various physiological states that differ in their endogenic hormone levels.

Code 3-2-5-M.

Seasonal changes of vitamin C concentration in the blood and liver of mink.

I.I. Grigovich, S.P. Izotova.

Vitamin C, being a water-soluble antioxidate takes part in many reactions of the metabolism in the organism. A spectrophotometric method (*Jagoda & Dani, 1982*) was employed to determine vitamin C in the blood and liver of dark-brown mink females during different seasons. Preliminary data showed that, in summer, the content of ascorbic acid in the blood comprised 0.360 mmol/l (the values varied between 0.250 mmol/l and 0.450). In autumn, the concentration of vitamin C in the blood of mink was equal to 0.332 mmol/l, and in winter, it was definitely lower (0.286). In spring, the concentration of vitamin C in the liver of mink was 1.580 mmol/l. In autumn, a significant decrease of the value was observed (0.979 mmol/l, $p<0.01$). In winter, the level of ascorbic acid in the liver was 1.605 mmol/l. It is safe to assume that in winter, when the food is poor in this vitamin, the liver is one of the major depots of vitamin C. Thus, the concentration of ascorbic acid in the blood and liver was variable and was dependent on the season.

Code 6-3-M.

Modification of the reproductive function in mink accompanied with hormonal status changes under the influence of artificial light conditions.

R.G. Gulevitch, D.V. Klotchkov.

The photoregime applied consisted of artificial illumination from 22.6 till 21.7 (from 17.30 till 9.30) and 8-hour day light from 22.7 till 10.10. This light regime stimulated the sexual system of female mink at the beginning of pubertal period. Unlike the control female mink, the experimental ones showed earlier signs of estrus in vaginal smears, uterus weight indices increased significantly and their gonad reaction to hCG was observed to increase. Later, the experimental animals were noted to have higher levels of estradiol in the blood at the start of the mating season and higher progesterone levels during the preimplantation period of pregnancy. This appears to cause an increase of fertility compared to the control.

Code 3-5-10-M.

Thermal protection provided by a nest box for adult and newborn foxes.

M. Harri, J. Mononen, L. Nurminen.

Fur coat increased the thermal insulation of a thermostatically controlled model fox from 1.1 to 6.5 C/W. The additional insulation provided by a nest box was negligible. Due to the rather low amount of heat produced by a live animal, the temperature inside the box was only 1-2°C higher than outside. Fur pups are born practically without any ability for thermoregulation. Live blue fox pups weighing less than 65 g cooled down even faster than dead pups of the same size. Solitary pups cooled down twice as quickly as pups in a huddle. The thermoregulatory capacity of the pups improved following an exponential time course; within a few days the pups attained sufficient thermoregulatory capacity. Unexpectedly, the nest box did not offer thermal protection to the pups. The heat stored by the box escaped twice as fast as that of the newborn pups. Accordingly, the behaviour of the vixen is decisive for the survival of her pups.

Code 10-12-5-F.

Thiamine content in the liver of animals.

T.N. Iljina, G.G. Petrova.

By the introduction of ether thiamine one can judge the provision of fur animals with vitamin B_1. Total and free thiamine were measured by fluorimetric method and that of ether thiamine by the difference between them. In November, the total vitamin B_1 concentration in dark-brown mink was 4.01 mmol/kg, in white - 4.07, sable-brown ones - 3.56; free thiamine - 1.17, 1.36, 1.07, respectively. The level of thiamine ether varied from 67% (white) to 74% (standard). The concentration of the total thiamine in polar foxes was 2.75-3.74, free thiamine - 1.20-1.60 mmol/kg. At the same time, the level of thiamine ether varied between 41 and 58%. The highest content of thiamine was registered in raccoon dog: 7.49 - total, 5.05 - free, at the low level of ethers - 33%. Thus the concentration of total thiamine was similar in mink and polar foxes. Raccoon dog was characterized by its highest level. The induction of ethers occurred in different ways: their highest content was found in the liver of mink (70%), then of polar foxes (49%) and raccoon dog (33%). This is indicative of different intensity of the thiamine metabolism in these animals that seems to be due to their specific characteristics.

Code 6-3-M-F-O.

The correlation of litter size with biochemical and histochemical mink blood indices.

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

The dependence between different blood indices and mink litter size was investigated. The content of erythrocytes, haemoglobin, total protein, character protein formula, the level of transaminases (ASAT, ALAT), alkaline phosphatase (AP), lactate dehydrogenase (LDG), alpha-naphthylacetatesterase (ANAE), leucocyte alkaline phosphatase (LAP %) activity and medium cytochemical coefficient (MCC) LAP% were measured. The highest connection was found between litter size and ASAT, ANAE and LAP% activity. These characteristics are well inherited. The level of erythrocytes, haemoglobin, ALAT have influence on the litter size, but heredity is low. The increased content of ASAT, LAP%, MCC LAP%, esterase positive lymphocytes with diffusion painting and most 4 and 8 particles were connected to higher litter size. Selection in this direction produced an increased index of litter size heritability of 50%. At the same time, the changes of resistance and immunological reactivity, which are determined by the cytoenzymatical properties of leucocytes, and intensity of energy production which are connected with transaminases activity, may be expected.

Code 3-5-M.

The influence of diiodotyrosine on the productivity of minks.

G.N. Ilyutkin, S.I. Lutinsky, V.M. Grishin, V.K. Noginov.

We investigated the influence of the inactive form of the thyroid gland hormone (diiodotyrosine) on growth and development, some hematological, and biochemical data and the immune status of mink. 228 animals were under observation. Diiodotyrosine was injected subcutaneously in doses of 5-25 mg per 1 kg of body weight within 2.5 months before slaughtering the animals. Diiodotyrosine in doses of 10-25 mg per kg contributed to the increase of the absolute body weight of experimental animals (males) of 7-18 per cent compared with control animals. The increase of body weight within the period of observation in experimental animals was 2-3.5 times higher than in control animals. General condition and behaviour of animals in various groups and hematologic data showed no essential differences. Biochemical analysis of blood serum showed an increase of common lipids, protein, residual nitrogen in the experimental animals.

Code 3-2-M.

Stimulation of the immune system (IS) function of mink by peptide bioregulators.

T.A. Ivanova.

The influence of peptide preparations obtained from the lymphoid organs (thymus, spleen, lymph nodes) by the method of acid extraction, ion-metabolic chromatography and gelfiltration on the IS of minks with the initial immune deficiency condition (IDC) was investigated. Mink with the hypotrophy served as the model. IDC in the hypotrophic minks was characterized by undevelop-

ed organs of IS, the reduction of specific concentration of karyocytes in thymus, bone mar-row and lymph nodes. It was determined that the preparations have tissue specific influence on the processes of proliferation and differentiation of cell populations which are the initial material for their production. Thymus peptides have a regulative action mainly on the function of the thymus gland. As a result, the number of T- and B-lymphocytes normalizes and the production of lymphokynes is restored. The immune active peptides isolated from spleen and lymph nodes increase the number of cells and restore the functional activity of the peripheral organs of IS.

Code 3-M.

The dynamics of interaction of vitamins B_1, A and C in mink.

S.P. Izotova, I.I. Grigovich.

When formulating the diets it is very important to take into account not only the norms of vitamin content in the ration and the needs of the organism but also how the vitamins interact with eachother. To elucidate the character of the relations of vitamins B_1, A and C, we have calculated the coefficients of correlation (r) between them. When the animals were adequately provided with vitamin $B_{1,a}$ high r was registered between thiamine (Th) in the blood (B) and brain (0.94), Th in the brain and retinol in the liver (L) (0.93), Th in the B and kidneys (K) (0.84), Th in the L and vitamin C in the K (-0.80). Th in the heart (H) and vitamin C in the K (-0.81). In minks with Th deficiency, significant r were found between Th in the K and vitamin C in the H (0.89), Th in the brain and vitamin C in the K (0.87), Th in the B and K (-0.96), Th in the B and vitamin C in the H (-0.82). High r in animals with different degrees of provision with vitamin B_1 were recorded between Th in the blood and retinol in the L (0.83), Th in the blood and in the H (0.83), Th in the L and vitamin C in the K (-0.98), vitamin C and retinol in the L (-0.90). Preliminary data provide evidence for the presence of various interactions between vitamins in mink depending on the provision of the animals with thiamine.

Code 3-6-M.

The manifestation of mink adaptation to the conditions of vitamin B_1 - deficiency in the feed in the dynamics of thiamine metabolism.

S.P. Izotova, G.G. Petrova, E.Yu. Tcherkashina, T.N. Ilyina.

Vitamins play an important role in the biochemical adaptation of animals to essential factors as they themselves are the additional feed ingredients and at the same time biological catalysts which significantly affect the metabolism. We have studied the adaptive reaction of mink to the introduction of diets that contained thiaminase. The results of the experiments have shown the presence of various adaptive forms in mink which contribute to thiamine preservation in them. Thus, at the early stages of B_1-hypodeficiency, transketolase of blood was shown to activate, the level of TDP and the enzymes of thiamine synthesis in the blood stabilize, and the activity of the enzymes of vitamin B_1 degradation to decrease. In the process of the development of thiamine deficiency in mink, the rate of its deprivation from the organism is different. With hypodeficiency, only the pool of free TDP declines not affecting the thiamine-bearing enzyme of transketolase. The level of TDP in the brain is not affected. The state of vitamin deficiency is characterised by a more intense decrease of transketolase and the level of TDP in the brain. Thus, long existence of animals without introduction of exogenous thiamine seems to be possible due to the high mobility of their organism because of the development of adaptive processes contributing to the preservation of the most important metabolite.

Code 6-3-M.

Technology of carrying out mating inside a house.

A.H. Japparov, A.K. Koldaev.

In order to determine the main conditions for conducting mating in many animal cage batteries inside a house which have never been studied before and to reveal simultaneously reproductive ability under such conditions, the following experiment was carried out on "Raifsky" Fur Farm

on February 12, 1989. 364 Pearl mink females (90 of them were 3 years old, 90 - 2 years old- yearlings 7 and 79 males were put into 4-animal cage batteries inside a house being divided in equal proportions of 3 animals per cage. Gonadotropic hormones were used during the mating period. 3-year old females got them on March 2, 2-year old ones - on March 4 and yearlings - March 6. Males were put into the females' cages on the 8th day. 233 females of 321 were remated, i.e. 1.73 matings per female were carried out. 22 females of 321 did not get pregnant. 1287 whelps were received from 299 females i.e. 3.37 whelps per female. The results of reproduction in 1989 showed that fur animals raised in a moving technological line inside a house underwent stress but this stress was not strong enough to change their physiology. The second conclusion was that raising fur animals in many animal technological lines was possible, but there is a need to consider thoroughly the changes in microclimate condition in every animal cage. The main conclusion was that mink productivity reduced, but varied depending on the animal, so there was a possibility to improve it.

Code 10-5-12-M.

The appearance of oestrus patterns outside the breeding season and the possibility of fertility prediction in mink.

D.V. Klotchkov, Yu.D. Koveshnikov.

The onset of sexual maturity of mammals, its controlling endocrine mechanisms and environmental factors influencing this process are in the centre of investigations of the sexual system. The process of sexual maturity plays a pivotal role in future reproduction. The first signs of oestrus registered by means of vaginal smears appeared in mink in November (3%). The percentage of females in oestrus increased in December (30%). It was shown that the December oestrus patterns correlated with folliculogenesis and in some degree determined the level of fertility in the breeding season. The significant coefficient of correlation in oestrus patterns between sibs (0.3) was shown in the herd of the farm "Magistralny" Altay region, which gives an opportunity to use this trait in selection for maturity.

Code 5-3-M.

Additional light exposure in the gestation period of polar fox females obscure in colour.

E.M. Koldaeva.

The polar fox chiaroscuro colouration (Shadow) gene has a lethal effect on homozygote viability. Since the work (*Belyaev et al., 1973, 1976*) to overcome a lethal effect for the embryo is known, an attempt was made to get pup homozygous in a chiaroscuro colouration gene. For this purpose, experiments were carried out to expose such females to additional light in the gestation period. After mating, the females of the test groups were placed in a specially equipped close house and kept under 18-hour light exposure during the entire gestation period. The experimental results showed a tendency in females towards increased fecundity when compared to that of a control group. However, homozygotes in chiaroscuro colouration were not produced, and differences in progeny segregation for this trait were not observed. The cause of a negative result presumably is that the light factor, while stirring up homozygote hormonal activity, probably increases embryo survival of homozygotes only in the preimplantation stage of development. In the studies it was established that the death of homozygotes in colouration occurs largely following implantation. Total and post-implantation females deathrate in autosexing was higher than in crossing with haze males, by 25.9 and 22.4 per cent, respectively.

Code 5-10-4-F.

Energy and oxidation processes in mitochondria under active and restoration states in the organism.

M.N. Kondrashova.

Physiological functioning is provided by the preferential rise of input in respiration of the most powerful source for ATP synthesis, succinate - amber acid (AMB) and not by a total increase of oxidation of all substrates through the Krebs cycle. This mechanism is induced in the organism by catecholamines (CTA) and is bound with activation of a number of metabolic pathways of more rapid AMB formation than the Krebs cycle, in particular its shunting by aspartate- and alanine-aminotransferases (rapid cycle of oxidation

or amber acid cycle). Periods of rest and restoration connected with increase of protein and nucleic acid synthesis are provided by stimulation of α-ketoglutarate (KGL) oxidation coupled with GTP synthesis. These processes are induced in the organism by increase acetylcholine (ACH) in the blood (non-mediatory ACH). Administration of AMB and KGL to animals in its turn stimulates CTA-ergic and ACH-ergic systems respectively. In particular, AMB administration and ACH-ergic systems respectively. In particular, AMB administration increases functions of muscles, heart, kidney, neuro-endocrine system, stress resistance, stimulates growth of weakened young animals and reproductive system of females.

Code 3-M-F-O.

Regulation of physiological condition of farm mink by succinic acid.

L.K. Kozhevnikova, H.I. Meldo, A.R. Unzhakov.

It is known that succinic acid (SA) is a biologically active preparation, i.e. a natural metabolite. The purpose of the present communication is to demonstrate the SA influence on the level of blood enzymes (LDH, AP, GOT, GPT), body weight and isoenzymatic spectrum of LDH of some organs of mink. SA at a dose of 50 mg/kg body weight added from 20 of June to October to diets of kits was found to have a positive effect on their metabolism and development. This preparation normalized the blood enzyme activity, and the effect on dystrophic kits is stronger that on healthy fur animals.

Code 3-6-2-M.

Alumosilicates in the feed of fur-producing animals.

A.F. Kuznetsov, H.V. Mukhina, I.V. Barsov, V.P. Denisov.

Ionmetabolic absorptive properties of alumosilicates, high absorption of moisture and fat render them quite promising in feeding to fur-producing animals. Physical, mechanical, chemical and biological properties, and the composition of different alumosilicates (zeolite, vermiculite, kiselgur, perlite) were investigated. Inclusion of 3-5% alumosilicate in the diet of mink instead of the basic diet had a positive effect on their natural body resistance, on the condition of the digestive tract, and on the development of their viscera. Thus, alkaline phosphatase factor of the small intestine of experimental animals was 206.4 ± 16.3 mmol/l, and 73.1 ± 11.4 mmol/l in the control group; maltose factor was 96.3 ± 6.1 mmol/l and 76.6 ± 17.5 mmol/l, respectively; dipeptidase factor was 98.3 ± 4.6 mmol/l and 84.3 ± 3.5 mmol/l. Values in the experimental group were the best as regards both preservation of animals and fur quality.

Code 6-3-M.

Maintenance of the level of reproduction capacity of mink when given feeds of a conditional value.

E.G. Kvartnikova.

Feeding mink with conditionally valuable feeds, which make up over 50 per cent of the total volume, results in decreased performance, for instance, the reduction in the number of kits per pregnant female. There are practically no methods to decontaminate the feeds having the products of nutrient decomposition but in order to properly make use of them, it is expedient to add probiotics to the feed mixtures. As a result of the laboratory and field experiments carried out on the State Fur Animal Farm "Rodniki", Moscow Region, in 1988 to 1990 and which involved pastel mink females, it was established that owning to the inclusion into conditionally valuable mixed feeds of binary bacterial concentrates it is possible to produce 5.68 kits per pregnant female, or 0.57 kits more than the control due to the increased fecundity and decreased percentage of barren females.

Code 6-5-M.

The use of ionol and bishophite as supplements to rations for silver polar foxes.

N.N. Loenko, N.A. Balakirev.

In the laboratory and field experiments conducted in 1989 and 1990 the effect of the antioxidant "ionol" and mineral supplement "bishophite" used in the ration for young silver polar foxes at the growing stage, was studied. The ration of test groups in 1989 contained the following in grams per 100 kcal of DE: 7.5-7.6 digestible protein, 5.2

fat and 4.2-4.4 BEV, and in the ration for a control group there were the following nutrients, respectively: 8.5; 4.7 and 4.4 (1 group). Ionol was used at the dose of 20 mg/100 kcal for the 2nd group (71 days), and bishophite - 80 mg/100 kcal for the 3rd group (88 days). By the time of slaughter, liveweight of the animals of both groups was higher, for females it was significant (P>0.999) and body length was greater for the animals of the 2nd group. The output of pelts of the 1st size and quality rating were higher in test groups. Feeds consumed per area unit in terms of roubles were as follows: 1st group - 1.48, 2nd group - 1.37 and 3rd group - 1.43. A positive effect of supplements on liveweight and body length of animals, was confirmed in the experiment of 1990.

Code 6-2-F.

Morphological peculiarities of adrenal cortex structure in domesticated silver foxes at different ages.

N.D. Lutsenko.

Selection of silver foxes for domestication is followed by significant changes in the pituitary-adrenal system. A morphological study of the adrenal cortex in relatively wild and tame foxes at different ages (1 to 7 days, 1, 2, 8 months and 2 years) revealed that domestication decreased the functional activity of zona fasciculata (produced glucocorticoids) and increased function of zona reticulata (produced sexual hormones). Differences found in the first days of postnatal life became more pronounced in the later age periods. It seems that the revealed changes are a consequence of a general re-construction of the hormonal system which facilitates earlier sexual maturation of tame animals.

Code 4-3-2-F.

Phenoclustering as a method for determining the degree of population resistance.

G.M. Malinina.

The characteristics of the immunological structure of a population by comparing its features allows us to predict the viability and productivity of the animals. Data are presented on the phenotypic structure of a mink stock obtained by the method based on determining the degree of natural resistance of an organism (*Pavel et al., 1981*). Four factors of resistance (Lam, Com, Hb, Prn) were shown to occur in the form of 14 phenotypic combinations. No females with very strong characteristics (4+) were found in the group studied; the number of those with very low (4-) is relatively small - 1.8%. The frequency of strong combinations (3+1-) makes up 33.3%, middle (2+2-) - 44.5%, weak (1+3-) - 20.4%. Most frequent are combinations Lam+Com+Hb+Prn- (22.2%). It is obvious that in most cases the mink phenotypes are determined by a mean of their strength factors. A fairly large number of strong combinations ensures the possibility of selection of highly productive and resistant stocks of mink.

Code 3-4-M.

Differential assesment of natural resistance by the summary method.

G.M. Malinina, G.A. Petrova.

The possibility of assessing non-specific resistance of mink organism was studied by minimizing the number of indices and the abundance of animals. It is proposed to calculate the total index of natural resistance according to the formula: PR=(LgS1+LgS2...+LgSn/n, where PR is the index of resistance; LgS1...LgSn = individual indices reduced to the normal logarithm; n = the number of indices. The activity of lysozymes and the complement of blood serum, the level of hemoglobin and common protein, the amount of albumins, and the albumin-globulin coefficient were determined. In the 30-50 healthy mink studied, the average statistical PR was estimated. The index of resistance in the animals studied was determined by its value relative to the known norm: PR of the experiment/PR of the norm. Depending on the PR values, the level of natural resistance is assessed as follows: PR<0.97 - low; PR<0.98 - subnormal; 0.98 < PR >1.02 - normal; PR>1.02 - higher; PR>1.03 - high.

Code 4-3-M.

Genetic and physiological aspects of the use of biochemical markers in fur farming.

L.G. Markovich.

With conventional breeding methods being employed, we also apply genetic markers in the work on sables kept on the "Pushkinsky" Fur-Bearing Animal State Farm and polar foxes kept in "Rodniki", Moscow Region. The work has been conducted for a number of years on several animal generations. We kept an eye on genetic drift by the use of automatic processing and monitoring. We make use of 5 polymorph systems out of which we isolate blood serum transferrin and hemoglobin of the red blood cells. Concurrently, while checking for significance of origin we select animals with high performance, resistance, good growth vigour and this accelerates breeding procedures applied to fur-bearing animals kept in cages.

Code 4-3-F-O.

Toxoplasmosis invasion influence on physiological functions of fur animals.

V.D. Melnikov.

During 20 years 6.000 fur animals from 11 Karelian fur farms were examined for toxoplasmosis. Latent forms of invasion were diagnosed in 8-25 per cent of Arctic foxes and in 6-32.2 per cent of mink. Changes in the protein picture of blood serum were observed in infected animals: hyperproteinemia (9.61 per cent), increase of gamma and betaglobulins - 117.56 per cent and 24.36 per cent, albumin decrease (42-45 per cent). Increase of neutrophil count, especially in young species, decrease of eosinophil and monocyte counts in the blood were found but no changes in erythrocyte count. In mink, decrease of acid phosphotase (10.96 units), increase of lysozyme (12.13 per cent) and complement (40.7 units CH_{50}) were observed. In toxoplasmosis, 63 per cent of Arctic foxes and 50 per cent of mink are not fertile. The number of cubs per female Arctic fox is 1.3 and for female mink 1.4 times lower than in healthy animals. Study and interpretation of the main physiological parameters in fur animals should be carried out with consideration of latent forms of toxoplasmosis invasion.

Code 9-3-M-F.

The contents of macro- and microelements in fox hair of Vulpes vulpes in fur maturation season.

D. Mertin, J. Rafay, V. Stepanok, V. Berestov.

The hair samples of silver and cross foxes from 3 topological regions (middle of the back, middle of the tail, end of the tail) were analysed for K, Ca, Mn, Fe, Cu, Zn, Br, Rb, Sr, Pb content by disperse-X-ray-fluorescence spectrophotometry. The authors found a significant influence of sex in cross foxes and significant or highly significant influence of topological region on concentration of most elements in both fox genotypes. The t-test confirmed statistical significant differences among concentration of elements in end of the tail and other regions.

Code 2-3-4-F.

Studies of use of resting platforms by farmbred foxes and raccoon dogs.

J. Mononen, M. Harri, L. Nurminen.

There are general demands and recommendations drafted by animal welfare organizations that a resting platform with a solid surface be provided for farmbred foxes and raccoon dogs. In addition, there have been some claims that resting platforms might have a positive effect on reproduction. The aim of our studies was to evaluate whether or not animals themselves prefer to use the platforms and to determine the underlying factors affecting their use. Data were collected by direct visual observation combined with automatic sampling. Blue foxes spent an average of 98±15 (mean±SE) min per day on the platforms. Inter-individual differences contributed to 59% of the variance of use of platforms. Other factors affecting the use were type of platform (open ones were used more than ones with walls), temperature (the colder the weather the less use), wind with temperature (warm weather with high wind promoted use), disturbances (promoted use) and the time the animals had had the platforms (eagerness to use declined with advancing time). The effects of sex and orientation of platforms with respect to sun were not significant. According to preliminary results, silver foxes and raccoon dogs spent an average of 152±27 and 374±72 min per day on the platforms, respectively.

Code 10-11-12-F-O.

Seasonal changes of blood lysozyme and ß-lysin activity of mink in various living conditions.

E.E. Muratova.

Activity of blood lysozyme and ß-lysin of mink was studied in different living conditions. It was established that ß-lysin and lysozyme activity of young mink living in standard sheds was 3-8% higher than the activity of animals living in the newly designed sheds (height of the roof was higher than in standard conditions by 40 cm). The high activity of ß-lysin and lysozyme of mink living in standard sheds in Central Asian conditions show an increase in organism resistance.

Code 3-10-M.

Effect of climatic peculiarities of Central Asia on hormonal status of mink with different genotypes.

E.Yu. Musina.

A study of mink hypophysial-adrenalin system activity is of great interest because of the importance of the system in the process of adaptation to various living conditions. The level of 11-oxycorticosteroid activity of growing mink from the age of 1-2 to 6 months testifies to an increase of the hypophysial-adrenalin activity in these periods. The highest level of 11-oxycorticosteroids was found in the winter (time of preparation to reproductive period). Palomino mink had 6% higher hormone concentrations than blue mink.

Code 3-10-M.

Hormonal effects on inducing sexual activity in female polar foxes.

V.V. Natarov, A.I. Gladkova, L.B. Litvinova, G.A. Petrova.

Animals were intramuscularly injected with 0.1 mg/kg androgeno-estrogenic preparation of digitol. Digitol appeared to cause hormonal shifts corresponding to those observed in libido. Thus, estradiol levels (E) increased. Progesterone concentration (P) on the contrary, decreased. It resulted in an increase of the E/P ratio. Testosterone concentration (T) didn't change. Correspondingly, E/T ratio increased. Sexual stimulation was seen in all animals. The pharmacokinetik investigations have shown that maximum digitol accumulation in blood plasma was observed 3-24 h after the injection. The most intensive urine excretion was found on the 3rd day. These data explain the time of sexual activity demonstration following digitol injection. Hormone treatment accelerated (4 days earlier) the moulting that made up 100% of both experimental and control groups. At the same time mating results which occured 3 weeks after digitol injection differed from behavioural and hormonal indices in the nearest days after digitol injection.

Code 3-5-2-F.

Homeostasis normalization in rabbits with the help of thymus humodral factors.

A.M. Nikitenko.

The aim of this work was to study how thymus humoral factors influence the homeostasis of young rabbits under industrial growing conditions. We have scientific documentation adopted for using thymus chemicals. The subcutaneous dose of 0.2 ml/kg of humoral thymus factors was administered to the experimental group of rabbits. The result showed that application of humoral thymus factors promoted an increase of erythrocyte differentiation (erythropoesis) by 4.1%, haemoglobin content by 11.1%, total protein by 9.5%, gamma-globulins - by 1.2% and a decrease of lymphocytes by 2.7%. At the same time the average daily weight gain was 31.8% greater at the end of the experiment compared with the control group.

Code 3-2-O.

Specific and individual adaptations of the digestive enzymes to diet composition in fur-bearing animals.

V.M. Oleijnik.

Comparative-specific research with mink, polar foxes, silver foxes and raccoons has revealed some special features of the enzyme spectrum of the digestive tract of the predatory fur bearing animals: a relatively powerful chain of proteolytic enzymes and a weak carbohydrolytic one. This phenomenon reflects the specific adaptation of

predatory animals to feed rich in animal protein. Changing of the qualitative composition of the diet (protein, fats, carbohydrates) does not cause an adaptive change of the absolute value of digestive hydrolases in the pancreas and small intestine of predatory animals, which is typical for the omnivorous animals. Individual adaptation to feed composition in mink occurs on the level of the functional organization of the small intestine mucosa. While keeping mink on the standard daily diet a high enzymatic activity takes place in the distral part of the intestine, reflecting the poor ability of mink to assimilate carbohydrates. The increase of the carbohydrate level in the diet results in a displacement of some enzyme activity in the distal, and an increase of the protein one - in proximal direction.

Code 3-6-M-F-O.

Digestive enzyme activity in mink during postnatal development.

V.M. Oleijnik, E.B. Svetchkina.

The activity of some digestive enzymes was investigated during early postnatal ontogeny in mink's pancreas and small intestine mucosa. A considerable level of total proteolytic (TPA) and lipase activity was detected in the pancreas at birth, but that of amylase was low. Afterwards the activity of all three enzymes increased. The increase started early in the case of TPA. A powerful rise of lipase activity took place with mixed feeding. During postnatal development there was an increase in the small intestine of the activity of amylase, TPA and especially invertase and the decrease of lactase activity up to absolute disappearing after the 30th day. The monoglyceridlipase activity had a maximum at this age and then it declined. The dipeptidase activity was high at an early age. The activity of protein-hydrolizing enzymes generally developed in mink at an earlier age, primarily, in the small intestine.

Code 3-5-6-M.

Genetic and endocrine aspects of silver fox reproduction.

L.V. Osadchuk.

The influence of selection of silver foxes for domesticated behavior on the endocrine function of gonads was studied. The increase in the hormonal activity of corpus luteum during the preimplantation period of pregnancy in selected females correlated with the increase in the number of corpora lutea. It was demonstrated that artificial photoperiod affects the endocrine function of the ovaries in silver foxes and the hormonal reaction in domesticated animals was changed. The data suggest that under selection, the influence of photoperiod on the synchronization of the reproductive cycles is decreased. The results of the pleiotropic effect of fur colour mutation occuring during selection of silver foxes on the endocrine function of the corpus luteum are presented. The selection of silver foxes leads to an earlier extinction of hormonal function of testicles and a decrease of plasma testosterone level in the reproductive season. It may be supposed that the selection process changes the zoo-social mechanisms of regulation of the hypothalamo-pituitary-testicular complex activity in silver foxes.

Code 3-5-4-11-F.

Hormonal aspects of maternal behavior in the silver fox.

I.N. Oskina.

In all mammals, the rapid postpartum appearance of maternal behavior is essential to infant survival. In mammals, such as the rat and sheep, there is direct evidence that the hormones which are intimately involved in pregnancy and parturition also stimulate the onset of maternal behavior. However, the possible role of hormonal factors in the regulation of maternal behavior in the silver-fox has hitherto not been investigated. The pattern of the secretion of the principal sex steroid

hormones estradiol and progesterone and anterior pituitary prolactin were studied in the silver fox during pregnancy and after two days postpartum. The results point to the disorder of maternal behavior in vixens being related to changes of sex hormones and prolactin activity during pregnancy. The most essential changes in the hormonal status were found for progesterone. Vixens with the disorder of maternal behavior differ in plasma progesterone concentrations and its dynamics during pregnancy from normal vixens. In conclusion, this study has demonstrated that postpartum maternal behavior in silver fox may be related to levels of sex steroid hormones and prolactin.

Code 5-3-11-F.

The effect of succinate on the metabolism of laboratory animals.

V.V. Ostashkova, N.M. Sudakova, M.N. Yakovleva, L.K. Kozhevnikova.

Further perfection of methods for timely elucidation of metabolism disturbances and effective methods for its correction are needed for successful development of fur breeding. In this connection succinic acid which is able to regulate and normalize different physiological and biochemical processes has become the object of much interest. The present research was centered on studying the effect of succinate on the organism of laboratory animals (albino rats) receiving the preparation with potable water 1 mg/ml for 2 months. The protein content was found to increase by 1.3-fold in the liver and skeletal muscle of experimental animals as compared with the controls, and that of common lipids, glucose and glycogen decreased to 1.3-fold. In the kidney and brain, a small rise of individual fractions of lipids was observed, in the blood - an increase of the glycogen level (1.4-fold) and a decrease of protein, cholesterol, glucose and SOD activity (1.2, 1.6, 1.8, and 1.2-fold, respectively). The results of the experiments allow us to assume that succinic acid causes a rearrangement of metabolic processes promoting the activation of protein biosynthesis and more intense incorporation of hydrocarbon and lipid components in the catabolism.

Code 6-3-O.

The comparative cytogenetics of hybrids between polar and red fox.

V. Parkanyi.

For the cytogenetics analysis were used 4 hybrids (3 females and 1 male) that were obtained by artificial insemination of a polar fox female with the semen of a red fox male. The polar fox female had 2n=50 chromosomes and the red fox male had 2n=34+1B (Microchromosome). The hybrids were characterised with diploid chromosome number 2n=42+0-1B. On the basis of G-banding were classified the polar female chromosomes (24+X) and the red male chromosomes (16+X+0-1B), or (16+Y+0-1B), respectively. The most common arms of hybrids (the origin of polar female and male chromosomes) are very common and they are homologized. The dissimilarities are caused by pericentric inversion and tandem fusion translocation. Only a few chromosomes could not be homologized. The interspecific dissimilarities with regard to chromosome number and morphology are so extensive that no production of chromosomally balanced gametes can be expected. This could explain the sterility of the hybrids.

Code 4-3-F.

Animal feeding optimization with the use of personal computers (IBM PC).

D.N. Pereldik.

To optimize mink, polar fox, red fox, and polecat feeding, there has been developed a program "Optimum Ration Computation" with the use of personal computers (IBM PC). The program is intended for experts engaged in fur farming. No prelimenary preparations for work with the program are needed. The program permits one to compute in 2-3 minutes a ration made up of available feeding stuffs (in storage facilities), which would be optimum as for its complete value, and minimum in costs. Rates and limits put to the program enable one to make up a ration with regard to an ideal ratio of amino acids, amount of minerals, limits of certain feeds to be included, needed cooking, feed mixture moisture content regulation. The program makes it possible to have the resultant ration adjusted for the control of its indices, change and added norms, taking account

of feed consumption, compling and storing in memory the monthly and annual reports on feeds.

Code 6-12-14-M-F-O.

Protein levels in rations for young minks.

D.N. Pereldik.

Three levels of digestible protein - 10.8 and 6 g per 100 kcal D.E. (45, 36, and 27 per cent of energy) were studied involving three groups of male kits of large mink (40 head in each group for the period from July to October). The rations of all the groups contained whole fish - 31%, bovine viscera - 44%, cottage cheese - 14%, boiled barley - 5% and yeasts "paprin" - 6% of the ration digestible protein and also grease. This revealed a significant relationship between the protein level of the ration and the relative gain in liveweight for July, August, September-October. Protein levels have been defined which produce the highest effect on liveweight gain.

Code 6-2-M.

The effect of oxythiamine on the vitamin B_1 status in the organism of mink.

G.G. Petrova, S.P. Isotova, I.P. Chernikevich, T.N. Iljina.

The effect of oxythiamine (OT) injections at a dose of 1.5 mg/kg on the thiamine status in the organism of mink with different background provisions was studied. This was achieved by feeding raw thiaminase-containing fish, ivasi herring (group 1) in the preliminary period, introducing benfhothiamine with a prolonged effect into the general diet (group 2) and using control animals (group 3). Seven hours after OT-injection a sharp rise of total thiamine, TDP, thiamintriphosphate and inorganic phoshorus in the blood was observed. The activity of thiaminkinase increased in critical groups (1st and 3rd) and somewhat decreased in the 2nd group with an initial adequate provision. TDP-kinase decreased its activity in the first period of the experiment in all three groups. The enzyme of TDP increased, and especially intense in the 1st group with mixed vitamin deficiency in which the values of thiamine metabolism were much lower than in others. In the second group characteristic biochemical changes developed including a distinct reaction of transketolase. The 3rd group took an intermediate position, probably, due to the presence of spontaneous vitamin hypodeficiency in these animals at the beginning of the experiment.

Code 6-3-M.

Influence of trace elements supplementation on reproduction performance and trace element status.

H. Pingel, A. Manfred, A. Elke.

During three years the effects of zinc and mangan on reproduction performance, litter size and growth were investigated. Furthermore, the status of trace elements in hairs, cerebral, serum, ribs, kidney and liver were compared. Deficiency of zinc had an adverse effect on pregnancy rate and litter size.

Code 6-5-M.

The genetic-physiological study of maternal behaviour and its disorders in silver foxes.

I.Z. Plyusnina.

The study of maternal behaviour and its disorders is undoubtedly important because its disturbances are connected with an essential loss of pups. We worked out a fully automatic method of recording daily locomotor activity which permits us to estimate the time spent by vixens in the cage and in the nest. We determined the distribution of the time spent in the cage and in the nest by vixens with normal maternal behaviour before delivery, during delivery and during the time before, weaning. Cannibalism was the most frequent form of abnormal maternal behaviour in vixens and manifested itself at two periods: on the first day and on the 5th to 7th days after delivery. Depending on these periods, vixens with abnormal maternal behaviour had different distributions of the time spent in the cage and in the nest before and after delivery. We also tried to analyse the maternal behaviour in vixens whose mothers had abnormal maternal behaviour and the influence of selection for domestic behaviour on the maternal behaviour.

Code 11-4-3-5-F.

The isoenzymatic spectrum of lactate dehydrogenase of organs under hypoxia.

N.V. Predtechenskaya, H.I. Meldo.

We have shown earlier (*Kozhevnikova et al., 1983*) that the isoenzymatic spectra of lactate dehydrogenase (LDH) of organs and tissues of fur animals from the order of predators are dependent on the ecological specialization of a species, and on the environmental oxygen content in particular. The aim of the present study was to investigate the effect of acute hypoxia and the adaptation to it on the total activity of LDH and the ratio of isoenzymes in the organs and tissues of rats. Methods of microexpressanalysis and gel-electrophoresis of enzymatic proteins by the procedure of Wieme (1959) have been employed to show that during adaptation of mongrel albino rats to height hypoxia (7000m) the activity of LDH increases in the heart, liver, muscles and spleen in a month. In untrained rats, the total activity of LDH in the heart, lungs and spleen decreases under conditions of acute hypoxia, and it tends to decline in the kidneys, and there is a small increase of it in the liver and muscles. Significant changes of the LDH enzyme spectra in organs and tissues which are involved in stimulating the pathways of glycolysis providing energy production under oxygen deficiency have been shown under hypoxia.

Code 3-10-O.

The use of melatonin in fur-farming.

O.L. Rapoport, V.G. Bernatsky, A.A. Hudiakova, V.D. Cheprasov.

The hormone Epyfiz (melatonin) regulates the biological cycle of humans and animals. A new medicinal preparation has been developed for acceleration of winter fur ripening. It contains melatonin on polymer biodestructive tela - Melakril. The Hypodermic implantation of Melakril to mink, polecats, foxes and polar foxes accelerated the ripening of fur by 40-60 or more days; dependent upon the date of surgical treatment of genotype and upon the species of animal. We begin to implant young animals from June 25 till July 10. Their ration contained 9.5-10 g of protein and they were given large portions. Grown-up animals were implanted in the second half of May. Their ration was ordinary. The slaughter began in September-October (young mink) and grown-up mink - in August-Sept. Animals which had been implanted with Melakril differed by having a very good appetite and weight and the dimensions of their skin increased. Histologic and organoleptic examination did not show a difference between the skin quality of implanted and control animals, killed in November-December. About 600-700 thousand fur animals are implanted with Melakril in the USSR yearly. That gives a large economic effect due to the expense of feed and lowering of labour costs (10-12 roubles per mink). We succeeded in getting second offspring from the mink in December by implantation of Melakril in combination with another active biological substance. The research in this sphere is to be continued.

Code 3-2-5-M-F-O.

Minks' assimilation of various iron combinations.

O.L. Rapoport, M.A. Golushkova.

In balance experiments, conducted with young mink, it was fixed that ferroceron is the best to assimilate: ferroceron is assimilated 35.2%, ferroanemin - 21.9%, highly dispersive iron in electroneutral form - 19%, sulfuric acid iron - 3.5%. It was proved that ferroceron ($C_{10}H_{13}FeO_3Na$ x $4H_2O$) is a preparation of organic salt groups. The iron was deposited in the liver and spleen of young mink depending upon the dose of the preparation. It has been also determined that ferroceron iron does not react with trymethylaminoxyd, which is contained in fish of the cod family. Ferroceron turned out to be the most active combination of iron, which can prevent "white down" on the skin of mink, the ration of which contains 60% mintaj. There is no dependence between the level of hemoglobin in the blood in October and the appearance of "white down" on mink skin. There is a dependence between iron in the liver and the appearance of "white down".

Code 6-3-2-M.

Growth stimulation of young minks by biotin-F.

O.L. Rapoport, A.A. Hudiakova.

In 1989-90 we ascertained the influence of addition of biotin-F into the ration of growing young mink. A 100 kcal ration contained 9.50 g protein,

4.3 g fat and 4.1 g anitrogenous extractive substances. The most efficient were the following doses: 150 & 300 mg of biotin per animal. During the observation period the experimental mink developed better than the control. Before slaughter the males whose ration included 150 mg biotin per animal, weighed 2700 ± 33 g after addition of 300 mg - 2600 ± 55 g and the control mink weighed 2200 ± 27 g. After addition of 150 mg biotin the average area was 11.9 dm^2, 300 mg - 12.1 dm^2, and control mink had 11.2 dm^2. Skin quality of animals whose ration included 150 mg was 115.3%, 300 mg - 114.6%; in control group - 111%.

Code 6-2-M.

The lipid composition of mink and polar fox serum lipoproteins.

T.I. Regerand, E.I. Lisenko.

The lipid composition of serum and lipoproteins extracted from blood as low (LDL) and high (HDL_2, HDL_3) densites of mink and polar fox from the farm were studied. Lipoproteins were extracted by the selective precipitation method. LDL was precipitated by $CoSO_4$ and geparin, and HDL by dextransulphate in NaCl solution. The separation of total lipids and phospholipids was made by thin-layer chromatography method on silufol plates. It was found that the amount of total lipids in mink and polar fox blood is as high as 1165 and 922 mg/dl; 55% of them are phospholipids, and only 23-32% refer to total cholesterol. The quantity of HDL is twice as much as LDL. The aterogenic factor was calculated (0.2). The powerful reverse cholesterol transport by HDL is the protective mechanism against atherosclerosis in mink and polar fox blood.

Code 3-M-F.

Physical and chemical urine properties of clinically healthy mink and polar foxes.

A.P. Rodukov, A.A. Berestov.

Some properties of metabolism products of clinically healthy mink and polar foxes have been studied and they can serve to evaluate their state of health. The method of obtaining urine has been studied. This work has been conducted on the fur farm "Kondopozhski" in Karelia for 3 years. Three hundred mink and polar foxes have been investigated. Generally accepted methods of urinoscopy were used. It has been established that freshly-received urine of mink and polar foxes during all the biological periods was transparent - from a yellow-straw up to a yellow-green colour, specific gravity was 1024-1075 and 1046-1051 respectively, pH 5.0-7.0; urea concentration was - 844.6-892.9 mmol/d and 684.2-893.1 mmol/d, urea nitrogen - 393.6-416.2 mmol/d and 318.8-416.2 mmol/d and albumen contents was 0.084 g/l and 0.105 g/l. Qualitative reactions to sugar, acetone (retone) bodies, atrabilious pigments were negative. Epithelial cells, single leucocytes and erythrocytes were found during the microscopic investigation of urine sediment, in some cases urinary acid salts and calcium salts were found.

Code 3-M-F.

Mechanisms of central regulation of animal reproduction.

O.N. Savchenko, G.S. Stepanov.

Many wild species, including those which are bred in sheds, have some mechanisms of reproduction regulation in common with animals with unseasonal breeding. Puberty in males and females has many identical features with processes of sexual activation after seasonal interruption of reproduction. It is based on the elevation of concentration and metabolic rate of norepinephrine, lowering of serotonin, opiates and other inhibiting neuromediator effects. This results in functional activation of hypothalamic gonadoliberin neurons, and an increase in pulsatile secretion of this neurohormone. It leads to increasing sensitivity of the hypothalamus to the inhibitory action of sex hormones with following activation of gonadotropin secretion and gametogenic and hormonal function of gonads. These neuroendocrine interactions are induced by the pineal hormones, because the prolongation of the light period activates the function of the pineal gland. The continuation of a long or short light period induces the refractoriness of the hypothalamus to epiphyseal hormones. After spring (or autumn) gonad activation the inhibition of their function takes

place. The influence of photoperiod changes on reproduction regulation is low in animals with unseasonal breeding.

Code 3-5-M-F-O.

Reproductive functions of American mink in the acclimatization process under Central Asian conditions.

R.T. Shaichov.

The morpho-functional state of mink gonads with different genotype has been investigated by histomorphological and radioimmunological techniques during the first 3 years of acclimatization. It was established that adaptation to the high temperature and different light day take place by the third year of acclimatization.

Code 5-10-2-3-M.

Postnatal ovary development and stimulation of ovary functions in sables.

N.K. Shulguina, M.D. Donskova.

The present study is devoted to the scrutiny of morphological and endocrinological parallels in the dynamics of postnatal ontogenesis in caged sable females, and to testing methods to stimulate ovary functions in juvenile females (gonadotropins and their combination, luliberin). The source of sex steroids in females under 2 months of age, is the interstitial tissue of grey matter, the ultrastructural cell characters of which indicate a highly active steroidogenesis (blood hormone levels are comparable to the definitive ones). Multiple hormone - dependent structures appear in females' ovaries by 5 months. At this stage, administration of gonadotropins induces a preovulatory growth of follicules with an adequate transformation of their wall; hemodynamics of the organ undergoes changes. Restructuring the tissue homeostatis of the organ under these conditions is logically combined with specific changes in the hormone background. A characteristic feature of ovary reaction to the administration of luliberin is expressed in a wide spread of atresia, lessened stimulation of folliculogenesis, and significant "androgenization" of a hormone profile. The main parameters of ovary reaction in juvenile females to a hormone - induced ovulation, are comparable to those in a physiologically provocative ovulation in mature animals at the time of reproduction.

Code 3-5-O.

Physiological status of polar foxes established by their blood hormone levels.

N.K. Shulguina, E.N. Koldaeva.

The research was carried out to define the dynamics of hormone levels (progesterone, oestradiol, testosterone, thyroxin, cortisol) of peripheral blood plasma of silver foxes in the different stages of postnatal development. The possibility to apply the values of peripheral blood hormone concentration as a criterion to characterize the physiological status of animals at various ages was studied. It is known that it is possible to predict reproducibility of haze polar fox females at an early age by the ratio of progesterone to oestradiol (*Diveeya and coauthors, 1983*). We have conducted the experiments applying the methods developed by these authors to predict reproduction qualities of silver fox females at an early age, promising results have been obtained. Another direction in research was the study of the relationship between thyroid hormones, cortisol and female intensive growth. It has been established that the cortisol level can be employed in order to develop a test to select the young animal at the age of two-three months for an intensive growth rate. A coefficient of correlation between the intensive growth rate of an animal at this age and its peripheral blood plasma cortisol content was 0.47.

Code 3-2-5-F.

The ontogenesis of silver fox foetal gonad and adrenal hormones.

T.A. Shurkalova, L.W. Osadchuk.

The problem of foetal endocrine functions in fur animals is of significant interest for the theory of ontogenesis. It was shown by radioimmune method that sex hormone secretion begins on the 31st day of embryogenesis. Sex hormone secretion by the testicles seems to begin simultaneously with differentiation of gonad tissue. Sexual dimorphism of testosterone levels is found from the

same period. The content of progesterone (the precursor of sex hormones in the gonads) is very low. The data suggest that progesterone of the adrenals may be the precursor of sex steroids in the testicles. It was shown that ACTH and HCG regulate cortisol and testosterone secretion in foetal glands in vitro. It may be concluded that the interactions between pituitary and gonads or adrenals is established in the prenatal period.

Code 3-5-1-F.

The effect of belvitamil on the hormonal function of mink and polar fox gonads.

L.N. Sirotkina.

The reaction of the endocrine function of mink and polar fox gonads to the introduction of belvitamil into their ration (active silt from the Kondopoga pulp and paper mill) was studied. The addition of belvitamil at a dose of 2 g/100 kcal to the ration of mink kits during a four month period resulted in a definite decrease of testosterone (T) in males; in females, the concentration of estradiol (E) and progesterone (P) was at the level for the control animals. In the kits of the 1st generation, on the contrary, the concentration of T was definitely higher at two-months of age, but at 5 months revealed no differences in the level of sex hormones. A definite decrease of the estrogen function of female gonads was found in the 2nd generation. In the pure-strain females fed diets with food additions and left for reproduction of further generations, no definite differences were found. Analysis of polar fox blood has shown an increase of E in the kits of the 1st generation at the age of 5-months, while in the kits of the 2nd generation, a decline of estrogen activity of female gonads was observed. Thus, the addition of belvitamil into the rations of mink and polar foxes does not produce a gonad-toxic effect but results in rearrangement of the hormonal activity, especially in the period of growth and development of the animals.

Code 6-5-3-M-F.

The effect of digitol on the hormonal function of gonads of veil polar foxes.

L.N. Sirotkina, N.N. Tyutyunnik, A.I. Gladkova.

The effect of digitol on the functional activity of female gonads of blue foxes was studied in the late period of the mating season (April). The substance was intramuscularly injected at a dose of 0.2 mg/kg of body mass followed by the injection of digitol on the 2nd and 4th day if the females did not begin rutting by that time. The character of vaginal smear and a change of the sex loop were the indices of the stage of sexual cycle. The blood was analysed before the injection of the substance and two days after this. It has been found that after the injection to experimental females the level of progesterone was higher, but the difference appeared to be doubtful, whereas the concentration of estradiol increased to 2.5 found ($P<0.01$). But in spite of the changes of the hormonal background and the active course of rutting due to the activation of the endocrine function, some females produced no kits that seemed to be connected with spontaneous ovulation of ovicells before the treatment of females with the substance. Thus the results obtanined enable us to assume that digitol can be used for stimulating estrus in females.

Code 3-5-F.

Hematological and clinical-chemical parameters of blue fox cubs during the early postnatal period.

M. Stoinska, M. Valtonen, J. Treuthardt.

In order to establish reliable reference blood values for blue fox cubs and to evaluate the possible reasons for early cub mortality, blood samples were collected from ten cubs four times from birth to three weeks of age. The mean number of leukocytes was 8.5 x 10^9/l at birth. It increased during the first week and then decreased to normal level in three weeks. The erythrocyte count as well as hemoglobin and haematocrit values were

high at birth and clearly decreased during the early postnatal period. Mean values for serum alanine and aspertate transaminase and alkaline phosphatase were at birth 30, 140 and 4289 u/l respectively. These enzyme activities decreased during the first weeks. Serum urea values decreased from high values at birth, mean 17 mmol/l, to more normal values within three days. Mean serum cholesterol and triglycerides were 2.8 and 1.1 mmol/l at birth and increased in 5 days to 6.2 and 3.3 mmol/l respectively. Total protein concentration in the serum of blue fox cups was low, mean 46.6 g/l, during the first three weeks of life reflecting the albumin concentration in serum.

Code 3-5-F.

The effect of transport forms of microelements on the metabolism of experimental animals.

N.M. Sudakova, V.V. Ostashkova, M.N. Yakovleva, I.A. Bolotnikov, V.M. Nikolsky.

Microelements in the form of metal complexes with different ligands are widely used as feed additions to increase the productivity of fur animals. The effect of zinc, manganese, copper, and ferrum on the major characteristics of carbohydrate, lipid and protein metabolism was studied. 80 rats and 24 rabbits were used in the experiments and were selected according to the analogues principle and subdivided into control and experimental groups. Experimental animals received the complexes studied with water at a concentration of 1 mg of cation per 1 ml for 60 days. The zinc complex affects the interaction of metabolic processes resulting in a rise of glucose and cholesterol content in the blood and a decreased level of glucose in the liver, with a simultaneous drop of the common lipids number due to their breakdown with the formation of KoA succinyl and KoA acetyl which further enter cholesterol gluconeogenesis and synthesis. The transport forms of manganese and copper result in the increased content of cholesterol in the blood, liver, spleen; and that of glucose and glycogen in the liver. The increased amount of total protein and lipoproteins of the liver is due to the activation of the synthetisizing ability of this organ. The ferrum complex does not exert a considerable effect on major metabolic parameters.

Code 3-6-O.

Increased reproduction capacity of silver polar foxes as a result of regulated fatness.

L.V. Tolstenko, I.M. Nironova, V.S. Snytko.

The effect of polar foxes' fatness on their reproduction capacity was studied in the period of service preparation (from November to March) and during the first half of gestation. The experiment involved over 1000 females. Fatness was estimated on the same animals by using two different techniques: for fatness index and thickness of the groin area fat fold. During the entire period of the study optimum index values and those for a fat fold were determined and permitted to have an increase in reproduction capacity by 0.5 pup. Fatness adjustment according to the index and fold thickness, gives similar results though the latter method is easier to employ and less labour-intensive (labour intensiveness is 10 to 15 seconds per animal).

Code 5-6-2-F.

The effect of prostaglandin analogues on the level of sex hormones and corticosteroids in the blood of mink.

N.N. Tyutyunnik, L.N. Sirotkina, O.N. Savchenko, N.N. Sidorov, L.N. Sidorova.

The effect of prostaglandin analogues on the endocrine system of dark-brown mink has been studied 7 days before the beginning of their rutting period. Prostaglandin S16 at a dose of 50.0 mkg/kg of body mass and estuphalan at 5 mkg/kg were applied to the experimental females through a single hypodermic injection. The blood was analysed 24 hours after the injection of the substances. No significant changes were found in the level of hemoglobin, common protein and its fraction. The injection of prostaglandin S16, however, resulted in a definite increase of estradiol and a decrease of progesterone in the blood of mink. A somewhat different picture was observed with the injection of estruphalan consisting in a simultaneous but insignificant increase of the level of estradiol and progesterone whereas the content of cortisol increased 1.8 fold. In mink treated with prostaglandin S16, the concentration of cortisol was at the level of values for the control animals. Thus, the results obtained show that the experimental doses of prostaglandins are not

toxic and they can be used in fur breeding for stimulating the hormonal function of gonads.

Code 3-M.

The influence of succinic acid on mink growth.

A.R. Unzhakov.

Succinic acid (SA) is a biologically active compound. The influence of two doses (I and II) SA on the growth of mink (n=193) was studied from June to November under farming conditions. The weighing of animals was done monthly. The experimental males and females weighed 869.3±93.4 g and 1604.6±129.2 g respectively compared to 771.4±97.9 g and 1457.5±110.4 g in the control. It was found that dose I had the greatest effect on males and dose II on females. We suppose that the positive influence of SA on the growth of mink may be due to stimulation of energetic metabolism. The dose dependence of SA effect on males and females may be the result of metabolic peculiarities.

Code 6-3-2-M.

The peculiarities of the development of the ovarian glands in fur-bearing canines.

P.V. Ushkevich.

Morphofunctional peculiarities of the ovarian glands development in canines in the postnatal period of ontogenesis is of interest not only in the aspect of studying the regularities of individual development but also in solving many actual problems of reproductive biology. The ovarian gland morphology undergoes constant changes as the result of high age and functional dynamics, and the cyclic character of activities depending on the season. It is noted that the organ stroma is characterized by the significant development of the interstitial tissue which prevails over the support structures. The connective tissue stroma of the ovarian corcical layer is formed thanks to numerous spindle and poorly differentiated cells. The fact indicates that this kind of tissue has high plasticity and the ability of transformation of its certain cells in to hormone-producing ones.

Code 2-3-5-O.

The influence of some vegetable oil products on the organism of mink.

A.S. Ushkevich, V.M. Grishin, V.K. Noginov.

The influence of pogons of sunflower-seed oil desodoration and phosphorilated soapstok lipids on the organism of mink was investigated. 0.5 g pogons were included in the daily mink ration and 0.8 g of soapstoks per 100 kcal of feed. The experiments were conducted on three generations of animals. 883 animals were used in the experiments. It was determined that the inclusion of the above mentioned oil products in the ration of the animals had increased their body weight by 29 percent. The body weight of the experimental animals was 1.7±0.04 kg, while the body weight of the animals that received pogons and soapstok was 2.1±0.08 kg and also influenced the normalization of the lipid-cholesterin metabolism. The blood serum of the experimental animals contained 1816±20 mg % common lipids, 879±52 mg % beta lipoproteins and 456±37 mg % cholesterin. In the animals that received pogons these data were accordingly 1774±24 mg %, 803±38 mg %, 320± mg %. The inclusion of pogons and soapstocks in the ration reduced the accumulation of lipids in the liver, lowered the index of their saturation as well as the deposited oils. The reproductive characteristics of mature mink and the quality of their fur improved.

Code 6-7-2-8-5-M.

The effect of succinic acid on cytoenzymological properties of mink blood.

L.B. Uzenbaeva.

The activity of lymphocyte succinate dehydrogenase (SDH), alkaline phosphatase of polymorphonuclear leukocytes (LAP), and the character of leucoformula (LF) was studied cytochemically in mink by the addition of succinic acid (SA) to the ration of females and their kits. The reaction to the addition of SA, which is characterized by the effect of energizing mitochondria, varies depending on the physiological condition of the organism. Redistribution of individual cellular elements in the LF and the increased content of phosphatase-positive leukocytes were observed in the blood of mink fed diets that contained SA from the second half of their pregnancy period.

The activity of SDH was within the control values or higher in females which received SA only before weaning the kits from mothers. No changes in the level of the LAP, SDH activity and LF composition were revealed in kits feeding. Thus the leukocyte metabolism of the female blood is more sensitive to the effect of SA compared with that of kits. The changes observed can be due to the non-specific adaptation reaction to weak irritants which is known to be characterized by an increase of resistance and a mild anti-inflammatory effect.

Code 3-6-9-M.

Determination of fertility of silver fox males by certain environmental and genetic factors.

L.L. Vasilyeva.

We report on a study of the determination of male fertility, (measured by number of mated females), during the first reproductive season, by certain characteristics which might be used in artificial selection: fertility of the father, fertility of the grandfather on the maternal side, body weight, testis size before the reproductive season, dominance status of the male in between-male contacts, and sex of animals kept in two adjacent cages after the spring separation of pup into separate cages. It is shown that the fertility of the young male is significantly correlated with its dominance status ($r=0.36$, $p<0.05$) and the father's fertility ($r=0.36$, $p<0.05$). Testis size is also dependent on the father's fertility ($r=0.37$, $p<0.05$) and the sex of the adjacent animals ($r=0.38$, $p<0.05$); fertility is highest when these are males. Although body weight is not directly correlated with fertility, it is correlated with dominance status in between-male contacts ($r=0.58$, $p<0.001$). The grandfather's fertility on the maternal side does not influence the male's fertility. The possibility of using these correlations in the selection of males for the next generation is discussed.

Code 5-4-11-F.

Effect of belvitamil additions to the mink diet on the glycogen content of their tissues.

R.U. Vysotzkaya, K.E. Yakovleva, V.S. Sidorov.

A comparative study of glycogen content in muscles, liver and blood of kits and adult mink which received a feed additive of various doses of belvitamil (activated sludge obtained in the purifying works of a papermaking plant) was carried out. It is shown that the glycogen level in mink tissues depends largely on the season, animal age, their physiological conditions and additive dose. As a rule, some decrease in glycogen reserve in adult muscles and liver and some increase of its content in kit livers are observed. Reliable differences of glycogen content in blood of adult animals and kits receiving belvitamil were not observed but a tendency towards a decrease in this carbohydrate level. The most noticeable decrease in blood glycogen takes place in young females in the autumn. It is interesting to note that in the control the blood glycogen content both in kits and adults in autumn is considerably less than in summer. It is supposed that the tendency towards the decrease in glycogen content in mink organs can indicate liver dysfunction under the influence of belvitamil.

Code 6-3-9-M.

Homeostatis and reproduction rate in raccoon dogs, and blue and silver foxes during winter starvation.

Yu. S. Zabolotskikh.

The ability of animals to endure starvation represents species ecology, and its interrelations with the environment. The situation of winter lack of food in caged raccoon dogs, blue and silver foxes has been simulated for a number of years at our institute research station. Homeostatic blood function, behaviour and resistance of the animals' reproductive system to enduring absolute alimentary starvation were studied. Specific and individual variability of morphologic and biochemical blood composition in experimental animals during winter starvation and regular feeding was determined. Behavioural characteristics and resistance levels to starvation were noted. The results of our studies suggest that animals of the Canidae family have quite a perfect adaptation mechanism maintaining a homeostatic blood function and a high reproductive potential under the conditions of enduring lack of food. A wide specific and individual range of threshold limits of those animals' resistance to starvation characterizes an ecological plasticity level of raccoon dogs, blue and silver foxes and gives additional opportunities

for improving technology of feeding, breeding qualities and herd productivity rate, for reducing expenses and increasing profitability of cage fur farming.

Code 6-2-3-5-F-O.

Diet improvement in raccoon dogs during a reproduction period.

Yu. S. Zabolotskikh, I.A. Plotnikov, Prof. B.M. Zhitkov.

Raccoon dog feeding has been studied insufficiently up to the present. This has an adverse effect on these animals' reproduction rate and fur quality. In the spring of 1989 and 1990 the experiments on raccoon dogs' diet optimization were carried out at a research station of our institute. 60 females and 15 males were observed. The animals in a control group were fed a standard blue fox diet consisting of 77-79% meat and fish feeds as to calorie content. In raccoon dogs of an experimental group 20% of the standard diet was replaced by grass meal and a green coniferous needle paste. Appetite for the experimental diet, body weight dynamics, changes in blood composition and reproduction rate of experimental animals were studied. During the very first days of our study the appetite in the experimental animals was less. Their body weight decreased more intensively than in the control group. The number of erythrocytes and leukocytes and a hemoglobin level fell slightly. The above-mentioned changes in the physiological state of raccoon dogs in the experimental group did not have an adverse effect on the reproduction rate of females and males. The adding of grass granules and a green coniferous needle paste to the diet makes it possible to increase profitability of raccoon dog farms.

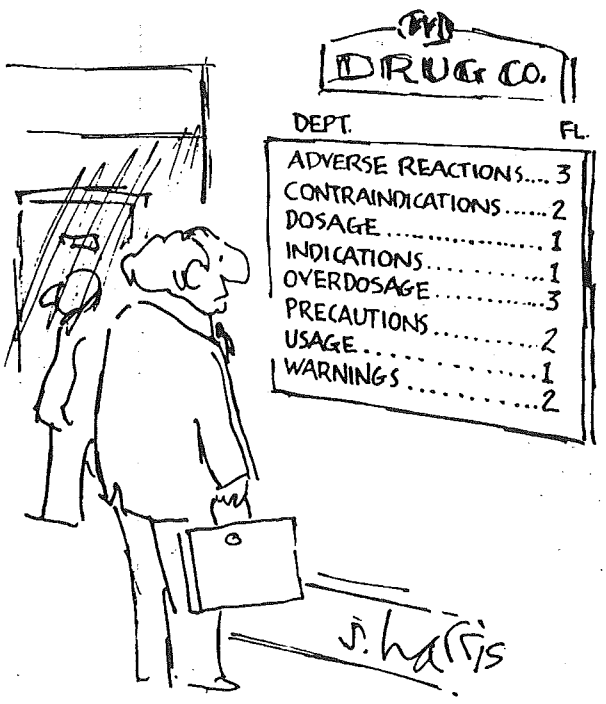
Code 6-5-O.

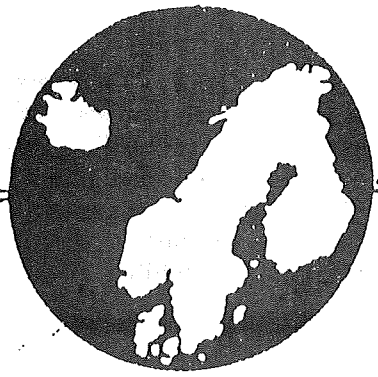
Using biotechnology in converting fish and slaughter offals into valuable feed.

T. Juokslahti.

Extruded pellet feeds containing biotechnically prepared herring, slaughter offal and chicken offal were tested on brown mink and blue foxes in maintenance, breeding, lactation and growing periods. The biotechnical process used lactobacilli fermentation of offals and fish in combination with cereals treated with amylolytic industrial enzymes. The amount of wet raw material in pellet manufacturing was 20-30%. The mink whelping result was best in the chicken offal feed group and loss of kits was lowest in slaughter and chicken offal feed groups. Fox whelping results were best in the experimental feed groups. The kit growth was equal and normal in all groups; fur quality and density tended to be better in the experimental groups. The technology provides an economical way of preparing and storing feed raw materials.

Code 7-6-M-F.





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Effect of vitamin E and A high dietary level of unsaturated fatty acids on mink in the reproduction period.

Anne-Helene Tauson.

The effects of dietary level of unsaturated fatty acids and, for animals fed high levels of those, the effects of varied dietary level of vitamin E on reproductive performance, kit survival rate, animal health, kit growth performance and some physiological parameters, have been investigated in mink. The experiment was carried out from mid March until late June and comprised 4 groups of each 10 standard mink females aged 2 to 4 years. The control group was fed a diet in which less than 50% of the fat was derived from fish and fish products and the rest derived from slaughter house offal and poultry wastes. The treatment groups were fed a diet in which the main part of the fat derived from a fish-oil of fur animal quality, and more than 95% of the fat derived from fish fat. In the treatment groups, the dietary level of vitamin E was varied from 1.5 mg per female and day (the NRC minimum recommendation level, 27 mg per kg feed dry matter), to 6 mg per female and day (the same level as the control group) and 18 mg per female and day (considered as a high but harmless overdosage).

The feed consumption was lower in the treatment groups than in the control group, and the intake of ME during the total experimental period was about 75% of that in the control group. However, there were no significant differences in female live weights between groups. The reproductive performance was normal and similar in all groups, and there were no significant differences in kit mortality but there was a tendency for an increased rate of stillborn kits in groups on high levels of unsaturated fatty acids. The total kit mortality tended to be highest for animals on the highest vitamin E level. Kit live weights at 21 days of age (male kits) and the termination of the experiment at an average kit age of 42 days (male and female kits) were significantly lower in the groups fed diets with 1.5 and 6 mg vitamin E per female and day compared to the control group. Two females in the group fed 1.5 mg vitamin E per female and day died during the course of the experiment, and the females of this group generally appeared to be in a worse condition than the females of the other groups. There was also a tendency for greater weight losses in these females in the lactation period.

In the females neither hemoglobin nor hematocrite values were affected by the experimental treatment, but at the end of the experiment the levels of the kits were significantly higher in the control group compared to the treatment groups. Further, the experimental treatment did not affect plasma vitamin E significantly. In the females, however, the levels decreased in all groups from the start to the end of the experiment. The vitamin E levels of the kits in the treatment groups tended to be below those of the control group regardless of level of vitamin E supplementation. TBA level in liver from kits was not significantly affected by experimental treatment but tended to be lowest in the control group indicating the best vitamin E status in this group.

Cholesterol and triglycerides were significantly affected by the experimental treatment both in females and kits, the levels being lower for groups in which fish oil was the main fat source. There was also a tendency for further decreased levels with increased dietary vitamin E supplementation. The plasma levels of cholesterol and triglycerides of the females increased in all groups during the experimental period, which was probably due to physiological stage and not experimental treatment.

In conclusion, the results of the investigation indicate that reproductive performance and kit survival rate can be maintained at a normal level also under rather harsh dietary conditions. It seems, however, that priority is given to the kits' requirement for vitamin E and that the females' depots are depleted. By substituting slaughter house offal and poultry wastes with fat from fish, a decrease in plasma levels of cholesterol and triglycerides was achieved. In the females, changes in vitamin E, cholesterol and triglycerides were found from the start to the end of the experiment regardless of experimental treatment. These changes probably were due to physiological stage.

In SWED, 5 tables, 4 figs., 11 references. Author's summary.

Early embryo development in the silver fox.

Liisa Jalkanen.

Introduction

In Finland, the silver fox pup production is about 3 pups per female when natural mating is used and the corresponding figure for inseminated females is about 0.3 pups less. These results are considerably lower than those of the blue fox, which gives respectively 6 pups with natural mating and 0.5 less in artificial insemination. As silver fox skins have increased in proportion in 1990 Finnish fur production to 40%, all contributions aiming at improvement of the breeding results are indicated. Many studies on reproduction in foxes have been made, but the majority of the work concerns the blue fox. The aim of this study was to obtain information about the reproductive events in the silver fox female during estrus and early pregnancy.

Material and methods

Twenty young silver fox females were inseminated after daily oestrus detection in 1991. On days 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14 and 16 after insemination 18 of the animals were euthanised. The dimensions of the ovaries and the uteral horns were measured. The number and the size of corpora lutea and follicles were registered. Oocytes and embryos were collected from the oviducts and the uteral horns by flushing and examined microscopically.

Results

There were corpora lutea in the ovaries of each female sacrificed. The ovary size was correlated to the number of corpora lutea, the mean number of which was 5.9 per female. The diameter of the corpora lutea varied from 5 mm to 9 mm with a mean of 6.5 mm. Their size reached a maximum on days 7 - 9 after insemination and began to decrease after that. Either oocytes or embryos were found in the oviducts or uteral horns of each female. The mean number was 4.9 per female, the range being 1 to 7. Total number of embryos found was 89. The embryos were evaluated according to their appearance and developmental stage and they were classified as "viable" (73%) and "degenerating" (27%). During the first two days after insemination only oviductal oocytes surrounded by a thick mass of cumulus cells were found. In the uterus the first embryos were detected on day 3. On days 3 - 5 all stages of development from 2-cell to morula were observed. The majority of the "viable" embryos found on days 6 - 8 were developing from morula to blastocyst. The first expanded blastocysts could be seen on day 7, and during days 8 - 10 extremely expanded blastocysts with very thin zona pellucida were observed.

The first hatched blastocysts were found on day 11. After hatching, the blastocysts grew in size very rapidly up to implantation on day 16.

Discussion

The reproductive events during oestrus, fertilization and early embryo development seem to proceed faster in the silver fox than in the blue fox. The cell division speed in the embryos is higher and the embryos leave the oviducts and enter the uterus earlier in the silver fox than in the blue fox. In this work, oestrus and preimplantation period of the silver fox were studied. The normal embryonal development is described and the proportion of degenerating embryos evaluated. The factors causing embryo losses haven't been examined, but even in a limited material as this the right timing of insemination seems to be of importance. This study will be continued by relating the embryo findings to hormonal and histological parameters.

In SWED, 3 tables, 1 fig., 11 references. Author's summary.

Inheritance of some reproduction traits in foxes.

Kerstin Smeds, Matti Ojala.

The material in this study consisted of 1 years' (1987-1990) artificial insemination results from the eastern parts of Finland. The material was obtained from a total of about 250 farms, but on many of the farms only a few foxes were inseminated. The data were divided into three groups: silverfox * silverfox 10794 observations (10 days after delivery there were 56.3% successful females, 28.6% barren females and 15.1% cub killers), silverfox (male) * bluefox (female) 10471 observations (61.0%, 22.3%, 16.7%) and bluefox * bluefox 3238 observations (61.6%, 26.1%, 12.3%). Heritabilities for litter size, whelping rate, nursing rate and date in heat (insemination date) were estimated using two sib-correlations: daughters nested within dams nested within sires and daughters nested within sires. The heritabilities were estimated only in silverfoxes, all coming from the same farm. The repeatability of litter

size was 0.14 in silverfoxes, and 0.16 in bluefox females in interspecies production. The bluefox (within species) material was too small to get a reliable estimate. The estimated heritability of litter size in silverfoxes was on average 0.08. Repeatabilities for whelping rate and nursing rate were about 0.10 both in bluefox in interspecies production and in silverfox. The estimated heritabilities of the respective traits were 0.13 and 0.03 in silverfoxes. The repeatability for date in heat was 0.57 in silverfoxes and 0.58 in bluefoxes. The estimated heritability for date in heat was 0.18 in silverfoxes.

In SWED, 7 tables, 8 refs. Authors' summary.

Blue fox milk composition.

Maria Rusanen, Maija Valtonen.

Review of literature has revealed little information on blue fox milk. Knowledge about the influence of lactation stage and nutrition is lacking. Gross composition of blue fox milk was studied in an energy level experiment, where animals were divided into a low and high energy group receiving 14.6 and 19.5 MJ of ME/kg dry matter respectively. Distribution of fatty acids in milk were studied on a diet with high content of polyunsaturated fatty acids. In the high PUFA experiment vixens in two groups were given commercial fur animal feed except that the fat sources in one group were exchanged for an addition of 4% fish oil. Milk samples were obtained from 3 to 17 females per treatment group 4 times presenting stages: 3 - 4 days, 1, 2, and 3 weeks post partum.

There were no significant differences in the mean litter size or the survival rate of the pups between the groups within the energy level experiment or the high PUFA experiment. The mean values for all milk samples were 20.7% dry matter, 10.4% fat, 6.7% protein, 2.98% lactose and 1.0% ash. There was a very slight increase of the general nutrient content in the milk during the sampling period. During early lactation, the average distribution of fatty acids as saturated, monounsaturated and polyunsaturated was 27, 50 and 14%, respectively. As the lactation proceeded, the lipid composition changed towards higher saturation. Similar to other carnivorous animals, milk fat of the blue fox was characterized principally by C16 and C18 fatty acids. Compared to mink milk, blue fox milk contained less palmitic and stearic acids and more oleic acid. The fat source altered the fatty acid pattern in blue fox milk. On the high PUFA diet containing fish oil the content of C20:1, C20:5 fatty acids in the milk were significantly higher than on the control diet.

In ENGL, 5 tables, 23 refs. Authors' summary.

Depigmented Furcoat and Related Problems in Newborn Bluefox (Alopex lagopus) Kits.

Erik Smeds.

On about 60 fur animal farms receiving fresh feed from a central feed kitchen, 20 % of the blue fox females which had been mated in the period March 11th to April 15th aborted. In two thirds of the the litters born in the period May 1st to 10th kits appeared, which had a light grey furcoat instead of the normal dark grey one. The hind legs of many of these kits were curvy and bent inward at the hip joint. Especially the light grey kits, but also kits looking quite normal, had a poor survival rate.

The mink and silverfoxes, which were fed with the same feed as the blue foxes, had a normal rate of whelping and litter survival. The feed mixture consisted of slaughterhouse byproducts, fishery byproducts, fishmeal and cereals at a rate making an acceptable feed mixture. Until March 31st were added all vitamins in accordance with the Finnish recommendations. From April 1st to May 6th there were not added B-vitamins except for B_1. From May 7th about 1,5 times the whole vitamin complex recommendations were added and, in addition, 1% brewer's yeast.

Two weeks after the beginnig of the addition of vitamins and brewer's yeast the prevalence of litters with light grey kits began to diminish and two weeks later the prevalence was only about 2 %. The whelping rate increased from 60 to 70 % toward the end of the whelping period and the survival rate of the litters (at least one kit left in the litter) gradually increased to 90 %.

The lack of supplementation of the feed with B-vitamins during the pregnancy of the blue fox vixens seems to have contributed to the high rate of light grey kits.

In SWED, 1 fig. Author's summary.

Plasma progesterone concentration correlated to fetal death in the blue fox vixen.

N.M. Valberg, W. Farstad.

An animal model was used to analyse the variation in progesterone secretion during the luteal phase and pregnancy in blue fox vixens. The material was allocated into three groups; 5 mated, but non-fertile blue fox vixens, 6 mated vixens with implantation zones in uterus, but no cubs at parturtition and 26 whelping vixens.
The progesterone profiles for the three different groups of females showed a steady increase in progesterone immediately after mating. Maximum values were observed on days 8-12 of pregnancy. The progesterone levels then decreased gradually until delivery. The levels of progesterone were found to be statistically significantly different ($p<0.05$) between non-pregnant and pregnant females from day 22 after mating and, although not statistically significant, also between vixens experiencing fetal death and whelping vixens in the latter part of gestation. The plasma progesterone level seems to be affected by the presence of conceptuses, and an unknown "factor" which can be proposed to be a luteotrophin which may be present in the pregnant female. Further studies are necessary to elucidate the control mechanisms of luteal function with respect to embryonic survival and maintenance of pregnancy in the blue fox vixen.

In NORG, 1 table, 1 fig., 10 refs. Authors' summary.

Some suggestions for acceptable physical characteristics.

Marja Marjoniemi, Marianne Eskolin, Esa Mäntysalo.

In this research the tensile strength TEN (N/mm^2) and the percentage elongation at break PEB (%) of blue fox (*Alopex lagopus*) were studied statistically. The minimum acceptable values of these characteristics for evaluating the leather quality in different applications were estimated. The minimum values were estimated using an equation, PVALL = MEAN - k*SDV, where MEAN is a mean value, k a constant and SDV a standard deviation. When the samples were taken longitudinally along the line of backbone using orientation angles of 0° and 90°, the minimum values were 12 and 9 N/mm^2 for the tensile strength and 15 and 114 % for the elongation at break. Values for the tensile strength and the percentage elongation at break from the ventral part of the skins at an orientation angle of 90° were 8 N/mm^2 and 95%.

In SWED, 2 tables, 1 fig., 7 refs. Authors' summary.

Acute toxic effects of ethoxyquin in the blue fox.

Kirsti Rouvinen, Taina Laine.

Blue foxes were fed ethoxyquin (Rexoquin Feed Liquid™, GRACE Rexolin) supplemented wet feed for 12 days in order to identify the acute toxic effects of this antioxidative agent. The supplemented levels were 0 (control), 200, 500, and 1000 ppm in the diet, with each treatment fed to 3 male foxes of 7-8 months of age. The highest dosage reduced the appetite of the animals dramatically ($p<0.01$) and in this group body weight loss was the greatest ($p<0.01$). The respective amounts of ethoxyguin received daily were 0, 17±1, 39±1 and 39±7 mg per kg body weight. 1000 ppm ethoxyquin in the diet was shown to decrease heart weight of the animals (36.1±1.3 g) compared to the control group (42.9±3.1 g) ($p<0.05$). Alanine aminotransferase (ALAT) levels in the blood serum were found to be higher ($p<0.001$) in the 500 and 1000 ppm groups, 1234±223 U/l and 1068±266 U/l, compared to the control and 200 ppm group values, 130±37 U/l and 237±42 U/l, respectively. Based on these results, adding ethoxyquin to blue fox diets should be avoided. Addition of ethoxyquin is of special concern if the diet contains high levels of fish products which are already supplemented with this particular antioxidant.

In ENGL, 1 table, 1 fig., 5 refs. Authors' summary.

Social behaviour in Arctic blue fox.

Hannu Korhonen, Sakari Alasuutari, Paavo Niemelä.

The Arctic blue fox (*Alopex lagopus L.*) is a medium-sized carnivore which normally leads a rather solitary life, except during the breeding season and when nursing. If raised in groups in

captivity, however, Arctic blue foxes are able to form social organization with more or less superficial hierarchies. Normally, males are dominant to females, but the heaviest individuals are not necessarily of the highest rank. The male hierarchies tend to be rather linear but in females hierarchies are often more ambiguous. During mating season and feeding times, hierarchies are most pronounced. Dominance hierarchies have probably evolved as a social interactive strategy in an environment where the abundance of resources is variable and unpredictable.

In February, just before mating season, the competition for leadership between males is most pronounced. Since coming on heat, the aggressions between females often increase. At this time, social status of females also could easily change, being dependent on their sexual state. Aggressions between the animals originally coming from same litter seems to be less in comparison to those originating from different litters.

Induced changes in social relationships by adding extra animals into the original group are often difficult. Possible changes seem to be independent of sex and age of added individuals.

In ENGL, 4 tables, 4 refs. Authors' summary.

Morphological determination of fur priming in the fur rabbit Castor Rex.

Palle V. Rasmussen.

This poster deals with the study of two groups of the fur rabbit Castor Rex. The objective of the study is, through histo-morphological examinations, including electronic image analysis, to determine the best age for pelting, when the rabbits are pelted at the age of 5 or 6 months. Both groups were pelted at the beginning of December, as the 6-month old group was put into trial first.

At pelting, the youngest animals have a relatively higher number of under hairs in the anagene phase on the area of the back connected with the hip. On the hip the same tendency cannot be demonstrated. The oldest animals have a significantly larger prime area on the back: 85% compared to 54%.

The youngest animals have a significantly larger prime area on the belly, probably due to the fact that they have not moulted the intermediate coat of the belly at the time of pelting.

The largest hair quantity (mg/cm^2) on back and hip was found in the oldest animals: for back and hip 52 and 49 compared to 45 and 43, respectively. With regard to hair length there was only a slight difference with the longest hair length found on the oldest animals.

The results indicate that the 6-month old group is more prime, has a higher quantity of hair and thus a generally better quality. It must be assumed, however, that an even higher pelting age may optimize the fur quality.

In DANH, 4 figs., 7 refs. Author's summary.

Reflection of light from abnormal guard hairs of mink.

Palle V. Rasmussen.

This poster deals with a pilot examination of some types of individual, abnormal (i.e. bent) guard hairs from mink. These hairs show a modified reflection of light which is unwanted.

By means of a microscope-photometer it has been tried to characterize and explain this phenomenon based on an optical, theoretical approach in the form of reflection curves.

The hairs in question have been fixed individually in their natural position, and reflection of light from the obverse part of the hair was recorded in distal-proximal direction.

Straight guard hairs have reflection curves which are more or less horisontal. Moderately bent guard hairs show a gradually declining reflection curve. Extremely bent guard hairs show a more or less bell-shaped reflection curve.

The results indicate that a guard hair can be regarded as a so-called Lambert source which when illuminated emits diffuse light. The size of the

luminous power received by the detector of the photometer depends on the angle of incidence of the light on the hair, i.e. $\cos^2\theta_1$. When guard hairs are bent, the angles of incidence are relatively small, and the luminous power of the incident beam is distributed over a relatively small surface area. Furthermore, a smaller part of the luminous power is reflected, so that a larger part penetrates into the hair where the diffuse reflection occurs. For bent guard hairs, the diffuse reflection will be rather large.

Altogether, this means that sparse, bent guard hairs in the mink fur will "light up" individually, where extreme cases will at the same time show a specular reflection.

In DANH, 3 figs., 6 refs. Author's summary.

Influence of a biologically active preparation on the skin quality and physiological condition of farm mink.

L.K. Kozhevnikova, N.N. Tyutyunnik, V.M. Olejnik.

The purpose of the present communication is to demonstrate that mebicar - a medical preparation - has an effect on the organism of farm-bred mink, particularly on the level of plasma corticosteroid hormones, activity of blood serum enzymes (LDH, AP, ChE, GOT, GPT), fertility and fur quality. The experiments have shown that the weaning of young animals is a stress factor for both mink mothers and their kits. The injection of mebicar (0.25 g/kg) has pronounced anti-stress effects: the level of plasma corticosteroids decreased significantly in females and kits. The preparation prevented on excessive increase of activity of transaminases and a decline of LDH and AP. Mebicar injection normalised both the level of corticosteroids and activity of blood enzymes in mink stressed from transportation (30 and 180 km).

0.1 g per kg body weight Mebicar added from March 23 to June 20 had a positive effect. The fertility of females was the same both in the experimental group and in the controls. The price for a skin from the experimental group was higher than that from the controls.

Thus, mebicar, when fed (or injected) to minks for a long or short time, had a positive effect on their metabolism, fertility and fur quality.

In ENGL, 4 figs., 9 refs. Authors' summary.

Raccoon dog: The structure and growth phases of the pelt.

Leena Blomstedt.

The raccoon dog (*Nyctereutes procyonoides*) is a long haired fur animal, which in Finland has been farmed from the beginning of the seventies. No histological study on fur growth cycle of the raccoon dog has been reported previously. There are some publications concerning hair growth of this species.

Pelt development of a brown male raccoon dog was followed from the age of 11 weeks to the age of nearly 36 months. A series of skin samples was collected, mostly from the hip and some from the shoulder. The average number of mature and growing down per hair bundle was counted with light microscope from histological skin preparates. The percentage of bundles, containing a growing guard hair, a mature guard hair, or a guard hair of both types, was registered.

Guard hairs and down have different development cycles. In the beginning of July, when the experiment started, the 11 week-old raccoon dog pup was shedding guard hairs. The shedding continued to the age of 17 weeks. During this time, there were only a few growing, and a few mature down hairs per bundle. After that, more and more growing down appeared in the bundles, reaching a maximum at the age of 26 weeks. The guard hairs matured by mid-November at the age of 31 weeks. Four weeks later the whole pelt was mature.

The down of this raccoon dog, when adult, was shedding in spring, heaviest in April, leaving only guard hairs in the pelt. The first new guard hairs

ber grew till mid September. The guard hairs and the down were mature in the beginning of December, this year about two weeks earlier than the year before. All hair bundles of a mature pelt contained a guard hair, but the size of it did not affect the number of hairs in a bundle. The first year the bundles contained more hair than the second year.

In SWED, 2 tables, 9 refs. Authors' summary.

Hair length and leather thickness in mink. Genetic and environmental sources of variation.

Peer Berg, Outi Lohi.

Sources of variation in absolute and relative length of guard hair and wool hair on dried skins of dark mink are estimated in an Individual Animal Model (IAM) using a REML-algorithm. A total of 6 datasets from 1983 to 1990 were analyzed, 2 including animals from several populations. Significant genetic and environmental differences between populations were found. Heritability varied between 0.2 and 0.6 for hair length and between 0.1 and 0.2 for relations between guard hair and wool hair length. Common litter effects were generally a minor source of variation.

It was found that Scanblack Velvet had a shorter guard hair length but not a shorter wool length compared to traditional types. A consistent correlation (0.1 to 0.2) between wool hair length and quality on dried skins was found.

Leather thickness on dried skins was analyzed using the same methods in three datasets from 1987 to 1990. Leather was thicker in the backline than on the hips and males had a thicker leather than females. Estimates of heritability varied between 0.14 and 0.23 with common litter effects explaining up to 20% of the variation in some datasets. A consistent positive correlation was estimated between length of the dried skin and leather thickness (0.11 to 0.43). In most datasets a negative correlation between quality of dried skins and leather thickness was observed (0.03 to -0.23).

In SWED, 6 tables, 5 refs. Authors' summary.

Protein and amino acid composition of mink skin: Topographic variations and relation to fur quality.

S. Michaelsen, P. Møller, M.-B. Schrøder, H. Sørensen.

Pelt proteins and their amino acid composition have been studied owing to a special interest in this subject in relation to the quality of mink fur. A relatively simple method of analysis for the amino acid composition of pelt proteins has been developed. It is a sensitive method based on group separation of protein hydrolysates followed by a combined HPLC technique, allowing quantification of the individual protein amino acids in even small biopsies from the pelts.

The technique has been used for evaluation of the variations in pelt protein amino acid compositin caused by topography. This investigation has comprised biopsies from 25 places on a single mink skin as well as from six and two places on pelts from one and ten animals, respectively. Relations between results obtained by use of fresh and dried skin has also been investigated using six samples of each type from one animal.

Data obtained from determination of pelt protein amino acids can be presented as: (1) μmol/g skin, (2) μmol/cm^2 skin and (3) relative values in mol percent. Advantages and disadvantages of (1), (2), and (3) have been evaluated and procedures for calculation of specific pelt proteins from knowledge of the protein amino acid content can be used as well.

The results obtained from the investigations of topographic variations in pelt protein amino acid composition have revealed that it is important to use biopsies from the same place on the animals, if comparison of different pelt qualities is the purpose. Considering these facts, the content of protein amino acids in biopsies from well defined places on back and hip from ten animals with and without the fur quality reducing problem "flat-hips" has been determined and evaluated.

In ENGL, 5 tables, 4 figs., 8 refs. Authors' summary.

Prevention of storage aging in dried raw blue fox skins.

Kirsti Rouvinen, Marja Marjoniemi, Marianne Eskolin, Esa Mäntysalo, Seppo Nummela.

Ninety dried raw blue-fox skins having two different dietary backgrounds, saturated fat and fish fat feeding, were submitted to the following experimental treatments: dressing after pelting; control storage at +18°C; control storage at -20°C; antioxidant diet, storage at +8°C; antioxidant diet, storage at -20°C; butylhydroxytoluene (BHT) drumming, storage at +8°C; BHT drumming, storage at -20°C; nitrogen gas, storage at +20°C; and pickling, storage at +8°C. Each storage group contained five skins from both dietary groups. Storage duration of the dried raw skins was approximately one year, during which the changes in their fatty acid compositions were analysed. After the storage period the skins were dressed and the physical characteristics of the leathers were determined.

The dietary background of the animals had a significant influence on the fatty acid profiles of the dried raw skins, but it did not affect their fat peroxidation during storage. Moreover, neither freezing at a temperature of -20°C nor the antioxidant treatments employed prevented lipid peroxidation in the skins. In the pickle-treated skins the changes in the fatty acid profiles were even more profound than in the other groups. The only skins whose fatty acid composition stayed constant during the whole storage period were those stored in nitrogen gas.

The dietary background affected the breaking load and the elongation at break of the leather. Moreover, according to the measured physical characteristic of elongation at break, the quality of the leather decreased when the skins were stored in circumstances involving oxygen. The storage period is recommended to be kept down to a minimum time and storage temperatures above ±10°C should be avoided. The results also emphasize careful conservation and proper handling of the dried raw skins.

In ENGL, 5 figs., 7 refs. Authors' summary.

Effects of straining on physical characteristics of male and female blue foxes.

M. Eskolin, M. Marjoniemi, E. Mäntysalo, K. Rouvinen.

Extensive studies were carried out to determine the effect of uniaxial straining along the line of the backbone in the conservation of bluefox (*Alopex lagopus*) skins on their length, contraction in dressing, and general fur characteristics. The skins were divided into four groups and each group was subjected to the following experimental treatments before they were mounted onto stretching boards and underwent drying: no straining, straining by muscle power, straining with a load of 200 N, and straining with a load of 400 N. The samples were then divided into two subgroups according to sex.

The effects of the uniaxial strain of varying magnitude along the backbone line on the physical characteristics was studied. The length of the raw skins increased with increased straining load both in the male and the female subgroups. Contraction of the skins in the dressing process was also more clearly evident as the degree of straining was reduced. All skins in both subgroups, however, returned to their initial fresh length. Fur characteristics were significantly affected by straining. Color purity, as well as mass and quality class deteriorated as the straining load was raised. Deterioration of color purity in blue fox skins shows that excessive straining causes permanent damage to the fibre structure of fur skins. The loss in fur mass was most obvious in the female subgroup at the highest straining loads as the same number of hairs were spread over a larger area.

The tensile strength and the elongation at break were studied for a large number of selected leather samples by using a previously reported special sampling set system. The mechanical strain has a considerable effect on the physical characteristics of blue fox leather for both sexual subgroups.

On the basis of the results obtained in this work, it can be concluded that skins of male blue fox leathers can be strained with a load of 400 N which, to some extent, homogenized the tensile and the elongation behavior of the leather with respect to the transverse direction. The skins of female blue fox leathers cannot be strained with a load of 400 N because the results show too great a permanent loss in elasticity behavior.

In SWED, 16 figs., 5 refs. Authors' summary.

Morphological description of American short nap mink and normal Danish mink.

Palle V. Rasmussen.

For several years, breeders, especially in North America, have bred mink with a hair type maintaining the fur density but with extremely short guard hairs. Such mink are named American short nap.

This paper states some preliminary hair morphological examinations with the purpose of characterizing the winter coat of the short nap type in relation to the normal Danish type (scanblack) by comparing parameter values of standardized, sagittal areas.

Hair length: By means of length measurements of under hairs and guard hairs on individual pelts, absolute and relative nap-values of 5-7 mm and 0.65-0.75 have been found for the short nap type. For normal types the values are 10-13 mm and 0.43-0.60. With regard to the length of the under hairs there is no difference between types.

Guard hair morphometry: The guard hair fibres of the short nap type are clearly shorter compared to the normal type. By means of microscopic image analysis, intermediary and long guard hairs have been measured with regard to length of shaft and the combined length of lancet+top. If compared to the normal type, it is suggested that the intermediary guard hairs may have a relatively longer lancet+top part, and that the long guard hairs may have miniature shapes of especially long, normal guard hairs.

Hair quantity/area: The ratio between the hair quantity of guard and under hairs on pelts is significantly lower in the short nap type: 0.25 ± 0.03 as compared to 0.40 ± 0.04 in the normal type.

Number of under hairs/area: An analysis of skin biopsies shows that there are significantly more under hairs in the short nap type. No difference is found as regards number of hair groups/area. On the other hand significantly more under hairs/hair group are found in the short nap type: 28.5 ± 6.0 as compared to 21.9 ± 2.0

In general, there is a significant correlation between number of under hairs/area and 1) quantity of under hairs/area ($r = 0.7$) as well as 2) number of under hairs/hair group ($r = 0.6$). Therefore there is also a significantly larger quantity of under hairs (mg/mc^2) on the short nap pelts examined: 39.9 ± 6.0 as compared to 31.9 ± 4.8.

The preliminary results indicate that in relation to normal mink, short nap mink have shorter guard hairs, perhaps with modified proportions, and that the under hairs are of normal length but that the number of these is increased.

In DANH, 4 tables, 1 ref. Author's summary.

Effect of age on priming and fur quality of the rabbit Castor Rex.

Aage Petersen.

Little work has been done in Denmark and abroad concerning prime and fur quality of the rabbit Castor Rex (*Taylor and Johnston, 1984; Vrillon et al. 1988; and Petersen and Rasmussen, 1991*). An investigation utilizing 106 Castor Rex rabbits was therefore conducted to study these traits.

The rabbits were pelted at an age of 6, 7, or 8 months. An earlier investigation (*Petersen and Rasmussen, 1991*) showed that at the age of 5 and 6 months none in the group of 5 months and only 40% of the 6 months old rabbits were in prime condition.

The rabbits were fed a normal pellet diet for rabbits and it was restricted to an amount of 75% of ad libitum feeding.

The investigated traits were body weight at pelting, weight of raw pelts, skin length, priming of back, hip, and belly, hairlength, hair density, colour and density of guard hair. Dried pelts were estimated for quality and colour and skin length was measured.

Most of the traits showed significant difference in favour of the two oldest groups of animals and therefore it was concluded that Castor Rex rabbits should be older than 6 months at pelting and the optimal age is between 7 and 8 months and probably 8 rather than 7 months.

In DANH, 6 tables, 1 ref. Author's summary.

Stickiness of mink pelts caused by suboptimal storage conditions.

S. Michaelsen, K. Mortensen, M.-B. Schrøder, H. Sørensen.

Storage of mink pelts at different conditions with respect to humidity and temperature have been performed. It has been observed that some of the storage conditions lead to unwanted stickiness of the pelts. The present study has comprised systematic chemical-biochemical investigations of the changes of mink fur which occur as a result of changes from normal type of mink pelts to mink pelts with some stickiness. Compounds included in the analyses were carbohydrates, lipids, carboxylic acids, amino acids, biogenic amines, and protein, using chromatographic, GLC, HPLC, and spectroscopic methods of analyses. The results obtained with especially fatty acids and biogenic amines revealed that the stickiness was caused by microbial activity in the mink pelts, when suboptimal storage conditions, too high temperature, were used.

In ENGL, 2 tables, 4 figs., 5 refs. Authors' summary.

Acid preserved and frozen scrap from fish farming as feed for fur animals.

Øystein Ahlstrøm, Anders Skrede.

Fish farming in Norway produces ca. 40000 tons of scrap every year. This includes viscera, filleting scrap and whole fish, mainly of salmon (*Salmon salar*), and may be suitable as feed for fur animals. Factors limiting the use is the high level of polyunsaturated fatty acids, and possibly artificial colouring agents.
The experiment was done in the growing-furring period. The scrap was preserved with formic acid, sulphuric acid or by frozen storage. The salmon scrap accounted for 14% or 28% of the feed for mink and 28% for the blue fox. The pH of the feed was 4.6-5.3 (formic acid), and 4.5-4.6 (sulphuric acid) when the highest level of salmon silage was used.
In mink the highest level of acid preserved scrap produced a slight reduction in growth rate. This was probably caused by the low pH in the feed and the poor palatability. The health conditions were satisfactory in all groups. Fur characteristics were not influenced by the diet.

The growth rate of blue fox was normal in all experimental groups. Skin size and fur quality were unaffected by the treatment except that the sulphuric acid preserved salmon scrap caused significantly reduced hair quality and texture. No fur miscolouring was detected in any of the groups.

In NORG, 6 tables, 5 refs. Authors' summary.

Short term preservation of fish.

Bente Lyngs, Georg Hilleman.

In the article the concept of preservation is defined. A number of conditions influencing the microbiological activity are described. Different methods of preservation are mentioned and their effect on the microorganisms briefly described. The article goes on to give a brief description of methods of industrial short term preservation as practised in Denmark. Finally, the Danish criteria for the quality of short term preserved trawl fish is stated.

In DANH, 2 tables, 4 figs., 14 refs. Authors' summary.

Preservation of feed for fur animals.

Anders Skrede, Egil Kjos, Øystein Ahlstrøm, Gudbrand Loftsgaard.

Acid preservation of central kitchen feed for mink and foxes was investigated in an effort towards prolonged storage and improved hygienic quality. The control feed was preserved with 0.3% acetic acid, the pH being 5.9. The four experimental diets were in addition supplied with formic acid (0.3 or 0.6%) or lactic acid (0.6 or 1.2%). Maximum storage time at ca. +3°C was 6 days for the control diet and 13 days for the experimental

diets. The effects of supplementary formic acid and lactic acid were evaluated by studies of hygiencal quality of the feed, and experiments with mink and blue fox kits in the period from July 27 (mink) or August 2 (foxes) until pelting in November.

Formic acid and, to a lesser extent lactic acid as preservatives promoted an improvement of microbiological quality of the feed. There was no indication of hazardous microbial growth during the storage period. The experiments with mink and foxes indicated that the preservation with formic acid or lactic acid, and prolonged storage of the feed, had no detrimental effects on health, feed consumption, growth or fur quality. It was concluded that preservation with formic acid or lactic acid should be considered when extended storage of wet feed is necessary.

In NORG, 3 tables. Authors' summary.

Digestibility of some industrial by-products in mink.

Tuomo Kiiskinen, Jaakko Mäkelä.

Several experiments were conducted to study digestibility of some industrial wastes and by-products in mink. Many of these products are as such insignificant in their nutritional value for the furbearing animals but are, however, used in low concentrations in order to increase fibre content of the diet and to restrict feeding. The conventional difference method of total excreta collection was used.

Digestibility of feather protein was very poor (18%) but autoclaving for 40 minutes at 140°C raised it to 64%. Protein digestibility of the hydrolysed feather meal was 68% and the calculated ME values for the processed feather products were 11.5-11.6 MJ/kg dm. Digestibility of the poultry meal was 75% for protein, 86% for fat, and the calculated ME value 14.9 MJ/kg dm.

Barley protein produced in the barley starch process contained 28-30% crude protein, digestibility of which was 75-77%. Digestibilities of carbohydrates of two barley protein samples were 30 (crude fibre 9.7%) and 72% (cf 3.6%) and the calculated ME values 9.3 and 14.2 MJ/kg dm, respectively. For barley bran and barley molasses produced in the same process, digestibility values of carbohydrates of 40 and 94% were ascertained. Their ME values were 7.2 and 15.3 MJ/kg dm, respectively. Digestibility of barley protein obtained from the integrated ethanol starch process was 68% (11.1 MJ/kg dm).

Potato pulp from the potato starch industry was found to be totally non-digestible but heating (1 hour at 60°C) increased digestibility of carbohydrates to 38-58% (5.4-9.2 MJ/kg dm). For brewers grains and dried malt sprouts from the malt drink industry the following digestibilities of the organic components and the ME values were obtained: 67%, 10.5 MJ/kg dm and 15%, 3.0 MJ/kg dm.

In SWED, 2 tables, 7 refs. Authors' summary.

Effect of spot heater on temperature regulation and behaviour in newborn foxes and raccoon dogs.

Mikko Harri, Ryszard Cholewa, Jaakko Mononen.

Pups of all our farmed furbearers are born practically without any thermoregulatory capacity. Since the nest box they are born in neither can produce nor store heat, pups are totally dependent on the heat they receive from their mother (*Harri et al. 1990*). Under practical farm conditions the pups are often born early in spring when the temperature can be and also is cold. It is thus possible that the pups do not receive enough heat from their mother but gradually develop hypothermia (*Mononen et al. 1989*), and, as a result of this, succumb. All dead or dying pups are hypothermic, but it is difficult to conclude whether hypothermia is the reason for or the result of death. Dr. D. Onderka, University of Alberta, Canada, in his study mapped pup mortality in silver foxes. He found that hypothermia was the main or major reason for death in 40% of cases (unpublished). Assuming that hypothermia is responsible for pup mortality then an extra heat source in the nest box should prevent development of hypothermia and, as a result of this, reduce pup mortality in farmed fur animals.

To test this hypothesis we installed a spot heater, commonly used in cars, below the floor of a wooden nest box. A thermostat kept the floor temperature above the heater constant at 32-36°C. The heater produced a warm circle, diameter 17 cm, on the floor. Otherwise tempera-

tures in heated and unheated boxes were idential and only a couple of degrees higher than outside.

The pups huddled together onto the warm area. If one pup was isolated from its littermates it tried to crawl back. If the other group was isolated behind a wire mesh screen, the solitary pup lied motionless on the hot spot while the group tried to crawl to it, never vice versa.

Measurements under farm conditions revealed that the spot heater roughly halved the cooling rate of the pups in comparison with their cooling rate in an unheated box. It is concluded that the pups prefer a heated floor to an unheated one and that the spot heater really hampers development of hypothermia under practical farm conditions. However, whether or not the heater really can reduce pup mortality under farm conditions, remains to be clarified by future follow-up studies.

In SWED, 1 table, 3 figs., 5 refs. Authors' summary.

The use of resting platforms for young silver foxes.

Jaakko Mononen, Mikko Harri, Kirsti Rouvinen, Hannu Korhonen.

The use of resting platforms for young silver foxes was studied in Kannus in the west coast of Finland from September 1990 to January 1991. There were 10 female and 10 male foxes in the experiment. Half of the animals were born in cages with a platform and the other half got platforms in August. Half of the animals were raised in big (107 cm x 180 cm) cages and half in smaller (107 cm x 112 cm) cages after weaning in June. The platforms were made of wood and they had two walls. The floor of the platform was 20 cm from the cage ceiling. The use of the platforms was recorded in total for 120 24-hour days with a temperature recorder (see Harri et al. 1991).

Silver foxes used the platforms 70 ± 10 (x ± SE) min/d. The use decreased sharply towards winter: 146 ± 21 min/d in September and 9 ± 4 min/d in January. The colder the weather was, the less the animals used the platform. The platform was used more during the evening and night (6.5 ± 1.0 % of time) than during working hours (1.6 ± 0.3 % of time). Foxes in bigger cages used the platform 38 ± 8 min/d and foxes in smaller cages 101 ± 18 min/d. It may be that the size of the cage was not the only reason for this difference; there was better view towards the entrance of the shed house from the platforms in the smaller cages than in the bigger cages. There were no differences in use between animals that were born in cages with or without platforms. Sex had no effect on platform use. Interindividual differences were large: the most eager animal lay on the platform 247 ± 103 min/d and the least eager 2 ± 2 min/d. These results are quite similar to those which we have earlier found in blue foxes (*Harri et al. 1991*).

In SWED, 2 tables, 5 figs., 2 refs. Authors' summary.

Stereotypes and stress in mink.

Leif Lau Jeppesen.

In adult mink, a high frequency of stereotyped behaviour was significantly correlated with low levels of cortisol in the urine, low base levels of plasma cortisol and rapid increases in plasma cortisol in response to an acute stressor. Whether this correlation between stereotypes and physiological stress is based on any close causal relation between the two phenomena is not yet known. If there is a causal relation between stereotypes and experienced stress it is certainly not simple. This will appear from the following observations: Stereotypes developed slowly in mink coming from small litters or housed in groups of 2 from weaning until pelting. Accordingly, stereotypes developed faster in mink, which were born and raised until weaning in large litters, and in mink, which were kept alone or in groups of 3 from weaning until pelting. Generally, the level of stereotypes was low in young animals. Once established in adult animals, stereotypes showed an astonishing stability. Some adult animals performed stereotypes at very low levels, from 0 to 1% of the time, and continued to do so for years; other adults consistently performed stereotypes at levels between 1 an 10% of the time. During exposure to long-term stress, frequency of established stereotypes was reduced; after such stress it was increased. Starvation increased the frequency of stereotypes, both during and after the period of starvation. Just using generally occurring frequencies of stereotypes as a measure of experienced stress is certainly not justified.

In DANH, 7 refs. Author's summary.

VIRAL HAEMORRHAGIG DISEASE OF RABBITS AND THE EUROPEAN BROWN HARE SYNDROME

OIE Scientific and Technical Review
Volume 10, No. 2, June 1991

Rabbit farming is of steadily increasing importance in many areas of the world. To the extent that rabbits are fed plants which are not used for human consumption, these animals provide a particularly interesting source of animal protein for the developing world.

For hunting purposes, both wild and domestic hares represent an important economic stake; they also have a significant social and sporting value.

For several years, the two species have been affected by viral haemorrhagic disease (VHD) of rabbits and the European brown hare syndrome (EBHS). These diseases are important for various reasons:

- **severity**: 50 to 80% of adult animals die within a few days of infection
- similarity between the lesions they induce and those of certain **viral human hepatitis**
- **rapidity of spread**: in only a few years, VHD of rabbits has affected over forty countries on four continents.

The newness of these conditions, and the recent recognition of a viral origin in the case of hares, explains the fragmentary - even paradoxal - nature of certain research results. Whether the diseases are caused by a calicivirus or a parvovirus, or whether they are hepatitis of multiple and complex viral origin, as in the case of Man, is still undetermined.

This issue of the *Scientific and Technical Review*, designed and coordinated by J.-P. Morisse of the Centre National d'Etudes Vétérinaires et Alimentaires (National Centre for Veterinary and Food Research) in Ploufragan, France, aims to provide current knowledge on these two disease. The reader will find:

- a highly detailed **clinical and pathological study**,
- a presentation of the **epidemiological situation** in most of the affected countries,
- the results of work on the **characterisation of the viruses** as well as the different hypotheses formulated by Chinese, American and European research workers principal **diagnostic methods**,
- the practical results obtained from **control** and, in particular, **vaccination measures**.

This issue of the *Review* also contains a description by the Chinese research workers Chuan-Yi Ji, Nian-Xing Du and Wei-Yan Xu of the first successful attempt to cultivate the VHD virus in cell culture.

Despite the changing knowledge of these disease, the Office International des Epizooties has undertaken the task of providing an update in the hope of encouraging international cooperation on a subject with consequences on such varied domains as the health of wild and domestic animals, ecological balance and medical research.

Fifteen papers by eminent scientists are presented on the identification of the virus, diagnosis, clinical symptoms, epidemiology, the immune response and control measures. Also included is the first world report on the adaptation of VHD virus to cell culture which will provide an exceptional tool for **research workers in animal and human virology** and will open the way for second generation vaccines. This issue should provde a useful guide to all countries where the diseases exist and to all other countries which wish to have the latest information available to ensure that their disease-free status is maintained.

In ENGL. 273 pp. Many tables, illustrations and references. From book presentation.

List of addresses

Adigamov, L.F. Institute of Feeding, Academy of Medical Sciences, Moscow, USSR.
Ahlstrøm, Øystein. Department of Animal Science, Agricultural University of Norway, P.O. Box 25, N-1432 Ås, Norway.
Anikanova, V.S. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya 11, USSR.
Aulerich, Richard J. Department of Animal Science, Anthony Hall, Michigan State University, East Lansing, MI 48824-1225. USA.
Awad, A. Department of Anatomy, Histology and Embryology, Faculty of Veterinary Medicine, Zagazig University, Arab.
Badovskaya, L.A. Krasnodar Polytechnic Institute, Krasnodar, Moskovskaya, 2, USSR.
Balakirev, N.A. The V.A. Afanasiev Research Institute of Rodniki, Ramensky District, Moscow Region, USSR.
Bannow, I.Ja. Veterinary Institute, Kazan, Sibirski Tract, 2. USSR.
Barabasz, B. Agricultural University, Department of Fur Animal Husbandry, Krakow, Al. Mickiewicza 24/28, Poland.
Barta, Milan. Research Institute of Animal Production, Hlohovska 2, 949 92 Nitra, Czechoslovakia.
Baum, M.J. Department of Biology, Boston University, Boston, Massachusetts, 02215, USA.
Behnke, H.
Berestov, V.A. Odessa Agricultural Institute (Nikolaev Branch), Nikolaev, Parizskaya Kommuna St. 9, USSR.
Berg, Peer. National Institute of Animal Science, Dept. of Research in Fur Animals, P.O. Box 39, DK-8830 Tjele, Denmark.
Bieguszewski, H. Katedra Fizjologii i Anatomii Zwierzat ATR 85-084 Bydgoszcz, ul.H.Sawickiej 28, Poland.
Birg, M.L. USSR.
Bjerkås, I. Norwegian College of Veterinary Medicine, Dept. of Pathology and Anatomy, POB. 8146, Oslo, Norway.
Blomstedt, Leena. Zoological Institute, Department of Physiology, Arkadiank. 7, SF-00100 Helsinki, Finland.
Boyarintsev, L.Ye. All-Union Research Institute of Game Management and Fur Farming, 79 Engels Street, Kirov.
Buyanov, A.A. Leningrad Veterinary Institute, Leningrad, Moskovsky Prospect, 112. USSR.
Børsting, C.F. National Institute of Animal Science, Department of Research in Fur Animals, Foulum, P.O.Box 39, DK-8830 Tjele, Denmark.
Ellis, LeGrande C. Department of Biology, Utah State University, Logan, Utah 84322-5305, USA.
Ermolaev, V.I. Institute of Cytology and Genetics, Siberian Branch, Academy of Sciences of the USSR, Novosibirsk 630090, USSR.
Ernst, L.K. Lenin All-Union Academy of Agricultural Sciences, Moscow, USSR.
Eskolin, M. Tampere University of Technology, Laboratory of Fur and Leather Technology, P.O. Box 527, SF-33101 Tampere, Finland.
Farstad, W. Department of Reproduction and Forensic Medicine, Norwegian College of Veterinary Medicine, POB 8146, N 0033 Oslo 1, Norway.
Fix, A.S. Department of Veterinary Pathology, College of Veterinary Medicine, Iowa State University, Ames, IA 50011, USA.
Fomicheva, I.I. Institute of Cytology and Genetics, Academy of Sciences of the USSR, Siberian Branch, Novosibirsk 630090, USSR.
Galantsev, V.P. Institute of Physiology, Leningrad State University, Leningrad, University emb. 7/9, USSR.
Gazizov, V.Z. Central Asian Department of All-Union Hunting and Fur Farming Research Institute, 700000, Tashkent, main a/s 145 post office.
Geisel, O. München Universität, Tierärztliche Fakultät, Germany.
Gladckova, A.T. Kharkov Endocrinology and Hormone Chemistry Research Institute, Ministry of Public Health, Ukrainian USSR, Kharkov, Artioma Street 10, USSR.
Gradov, A.A. Institute of Cytology and Genetics, Siberian Branch of the USSR Academy of Sciences, Novosibirsk 630090, USSR.
Graphodatsky, A.S. Institute of Cytology and Genetics, Institute of Biology, USSR Academy of Sciences, Siberian Division, Novosibirsk 630090, USSR.
Grauvogl, A. Bayer. Landesanstalt für Tierzucht, 8011 Grub P. Poing, Germany.
Grigovich, I.I. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya 11, USSR.
Gulevitch, R.G. Institute of Cytology and Genetics Siberian Division Academy of Sciences of the USSR, Novosibirsk 185610, pr. Lavrentieva, 10. USSR.
Harada, Yasuhiro. Research and Development Division, Kikkoman Corporation, 399 Noda, Noda-shi, Chiba 278, Japan.
Harri, M. Department of Applied Zoology, University of Kuopio, P.O. Box 6, SF-70211 Kuopio, Finland.
Hartmannova, B. Ustredni Statni Veterinarni Nemoenice, Palackeho 1-3, 612 42 Brno, Czechoslovakia.
Hwang, E.K. Rual Development Administration, Anyang, Veterinary Research Inst. Korea.
Iljina, T.N. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya 11. USSR.
Illukha, V.A. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya, 11. USSR.

Ilyutkin, G.N. Leningrad Veterinary Institute, Leningrad, Moskovsky Prospect 112. Trust "Lenzveroporm", Leningrad, Concharnaya Street, 23. USSR.

Ivanova, T.A. Leningrad Veterinary Institute, Leningrad, Moskovsky Prospect, 112. USSR.

Izotova, S.P. Institute of Biology, Karelian Research Centre, USSR Academy of Science, Petrozavodsk 185610, Pushkinskaya, 11. USSR.

Jalanka, Harry H. Clinical Department, College of Veterinary Medicine, Helsinki, Finland.

Jalkanen, Liisa. Veterinary Research Station, University of Kuopio, Finland.

Japparov, A.H. Scientific Institute of Breeding of Fur Animals and Rabbits (NIIPZK), Rodniki, Ramenskogo, Moskovskoj, USSR.

Jeppesen, Leif Lau. Inst. of Population Biology, University of Copenhagen, Universitetsparken 15, DK-2100 Copenhagen, Denmark.

Jiasheng, W.U. Haian County Station for Popularizing techniques of Animal Husbandry and Veterinary Medicine, Jiangsu, China.

Juokslahti, T. Cultor Technology Centre, Department of Animal Nutrition and Feed Technology, SF-02460 Kantvik, Finland.

Kiiskinen, Tuomo. Lantbrukets Forskningscentral, Dept. of Animal Production, SF-31600 Jockis, Finland.

Klotchkov, D.V. Institute of Cytology and Genetics, Siberian Department USSR Academy of Sciences, Novosibirsk 185610, pr. Lavrentyeva 10. Farm "Magistralny" Altay region. USSR.

Koldaeva, E.M. Research Institute for Fur-Bearing Animal and Rabbit Breeding, Rodniki, Ramensky District, Moscow Region, USSR.

Kondo, Keiji. Department of Animal Science, Faculty of Agriculture, Hokkaido University, Sapporo 060, Japan.

Kondrashova, M.N. Institute of Theoretical and Experimental Biophysics, USSR Academy of Sciences, 142292, Pushchino, USSR.

Korhonen, Hannu. Agricultural Research Centre of Finland, Fur Farming Research Station, SF-69100 Kannus, Finland.

Kozhevnikova, L.K. Institute of Biology, USSR Academy of Science, Karelian Research Centre, Pushkinskaya 11, Petrozavodsk 185610, USSR.

Kronauer, H. Germany.

Kuznetsov, A.F. Leningrad Veterinary Institute, 196084, Leningrad, Moskovsky pr. 112. USSR.

Kvartnikova, E.G. The V.A. Afanasiev Research Institute for Fur Bearing Animals and Rabbit Breeding, Rodniki, Moscow Region, USSR.

Lassén, Tor Mikael. Royal Vet. and Agric. University, Chemistry Department, Bülowsvej 13, DK-1870 Frederiksberg, Denmark.

Lehmann, E von. Im Wiesengrund 18, D-5305 Impekoven, Germany.

Loenko, N.N. The V.A. Afanasiev Research Institute for Fur Bearing Animal and Rabbit Breeding, Rodniki, Moscow Region, USSR.

Lutsenko, N.D. Institute of Cytology and Genetics, Siberian Department USSR Academy of Sciences, Novosibirsk 630090, pr. Lavrentyeva, 10. USSR.

Lyngs, Bente. Research Farm "North", Hundelevvej 75, Nr. Rubjerg, DK-9480 Løkken, Denmark.

Mahdy, Ensaf A. Swedish University of Agricultural Sciences, Department of Animal Breeding and Genetics, Uppsala, Sweeden.

Malinina, G.M. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya, 11. USSR.

Marjoniemi, Marja. Tampere University of Technology, Laboratory of Fur and Leather Technology, P.O. Box 527, SF-33101 Tampere, Finland.

Markovich, L.G. The V.A. Afanasiev Research Institute for Fur Bearing Animals and Rabbit Breeding, Rodniki, Moscow Region, USSR.

Melnikov, V.D. Petrozavodsk State University, Petrozavodsk, Lenin Str. 33, USSR.

Mertin, Dusan. Research Institute of Animal Production, Dept. of Fur Animal Breeding, Hlohovska 2, 949 92 Nitra, Czechoslovakia.

Mewicker, M. Institut für Pathologie der Tierärztlichen Hochschule Hannover, Bünteweg 17, D-3000 Hannover 71, Germany.

Michaelsen, S. Chemistry Department, Royal Vet. and Agric. University, 40 Thorvaldsensvej, DK-1871 Frederiksberg C., Denmark.

Mononen, Jaakko. University of Kuopio, Department of Applied Zoology, P.O. Box 1627, SF-70211 Kuopio, Finland.

Muratova, E.E. Central Asian Department of All-Union Hunting and Fur Farming Research Institute, 700000, Tashkent, main A/S 145 post office, USSR.

Musina, E.Yu. Central Asian Department of All-Union Hunting and Fur Farming Research Institute, 700000, Tashkent, main A/S 145 post office, USSR.

Natarov, V.V. Kharkov Endocrinology and Hormone Chemistry Research Institute, Kharkov, Artioma, 10.

Nikitenko, A.M. Agricultural College, Belaja Cerkov, USSR.

Oleijnik, W.M. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya, 11. USSR.

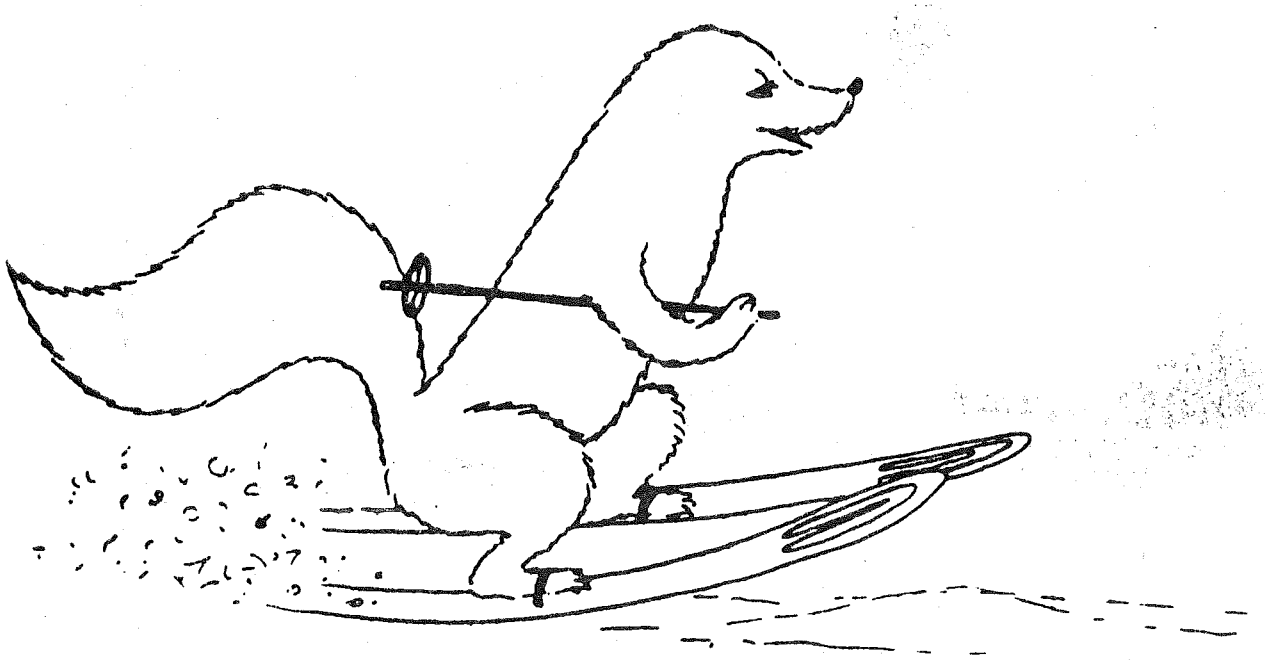
Osadschuk, L.V. Institute of Cytology and Genetics Siberian Division Academy of Sciences of the USSR, Novosibirsk 630090, pr. Lavrentieva, 10. USSR.

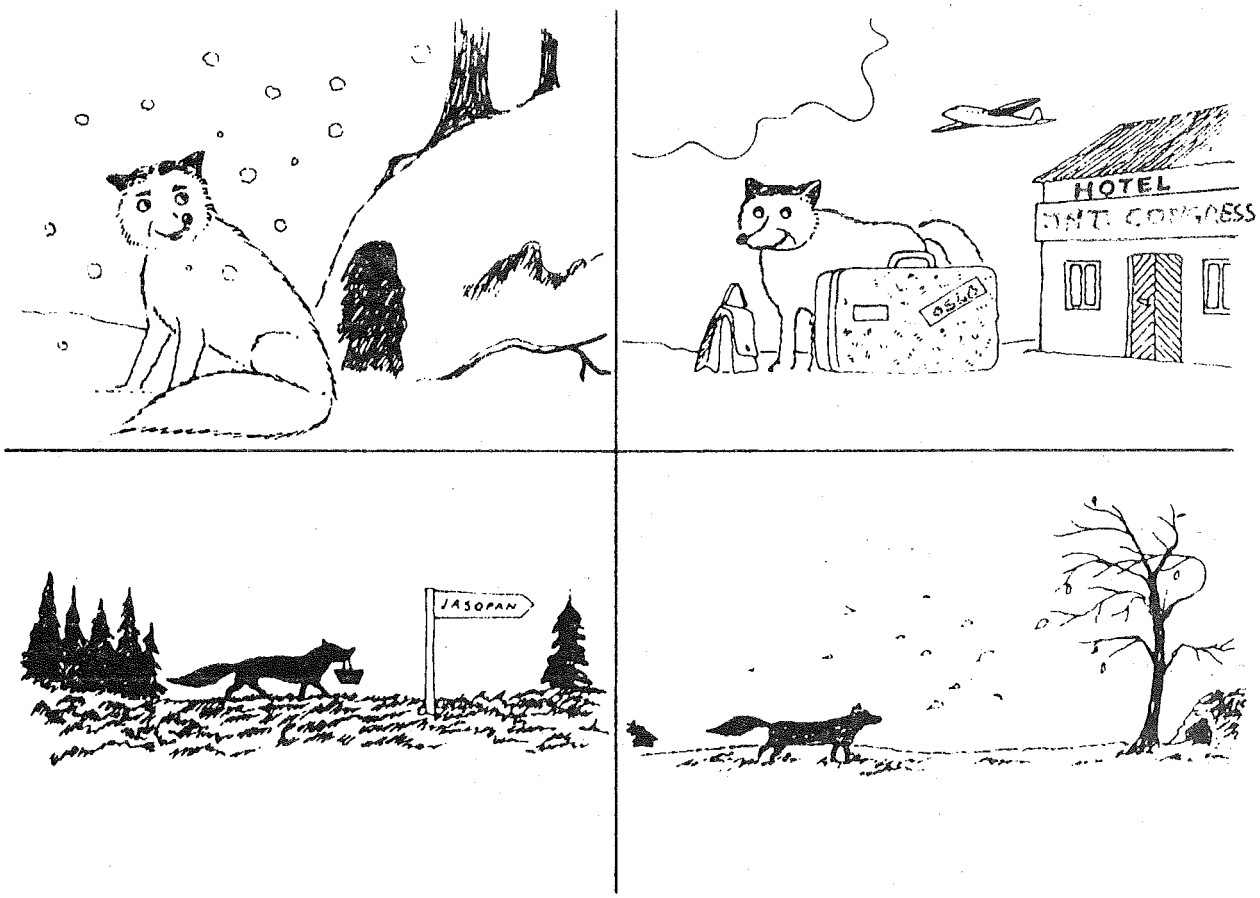
Os'kina, N.N. Institute of Cytology and Genetics, Siberian Branch, Academy of Sciences of the USSR, Novosibirsk 630090, USSR.

Ostashkova, V.V. State University of Petrozavodsk, Petrozavodsk, Lenin Str. 33, USSR.

Oxenham, M. 64, West End Road, Bitterne, Southampton, UK.
Parkanyi, V. Research Institute of Animal Production, Department of Fur Animal Breeding, Hlohovska 2, 94992 Nitra, Czechoslovakia.
Pereldik, D.N. V.A. Afanasiev Research Institute for Fur Bearing Animal and Rabbit Breeding, The Village Of Rodniki, Moscow Region, The USSR.
Petersen, Aage. National Institute of Animal Science, Dept. for Research in Poultry and Rabbits, Foulum, P.O. Box 39, DK-8830 Tjele, Denmark.
Petrova, G.G. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya, 11. USSR.
Petrova, N.A. USSR.
Petrova, I.P. USSR.
Pingel, H. KMU Leipzig, Sektion Tierproduktion und Veterinärmedizin, WB Geflügel- und Kleintierzucht, Germany.
Plyusnina, I.Z. Institute of Cytology and Genetics, Siberian Branch of the USSR Academy of Sciences, Novosibirsk 630090, Lavrentjeva, 10. USSR.
Predtechenskaya, N.V. Karelian Pedagogical Institute, Petrozavodsk, Pushkinskaya, 17. USSR.
Rapoport, O.L. V.A. Afanasiev Res. Inst. Fur Animals & Rabbits, Moscow Region, Rodniki. USSR.
Rasmussen, K. "Het Spelderholt", Beekbergen, The Netherlands.
Rasmussen, Palle V. National Institute of Animal Science, Dept. of Research in Fur Animals, P.O. Box 39, DK-8830 Tjele, Denmark.
Regerand, T.I. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya, 11. USSR.
Rivera, E. Italy.
Rodukov, A.P. Petrozavodsk State University, Petrozavodsk, Lenin Street, 33. USSR.
Rouvinen, Kirsti. Agricultural Research Centre of Finland, Fur Farming Research Station, SF-69100 Kannus, Finland.
Rusanen, Maria. Dept. of Appl. Zoology, University of Kuopio, P.O. Box 1627, SF-70211 Kuopio, Finland.
Savchenko, O.N. Pavlov's Institute of Physiology of Academy of Sciences of the USSR, Leningrad, Makarova Quay, 6. USSR.
Schott, E. Statliches Tierärztliches Untersuchungsamt Aulendorf, Löwenbreitestrasse 18/20, D-7960 Aulendorf, Germany.
Schwartz, T.M. Germany.
Selim, A. Department of Anatomy, Histology and Embryology, Faculty of Veterinary Medicine, Zagazig University. Arabic.
Shaichov, R.T. Central Asian Department of All-Union Hunting and Fur Farming Research Institute, 700000, Tashkent, main A/S 145 post office.
Shulguina, N.K. The V.A. Afanasiev Research Institute for Fur Bearing Animal and Rabbit Breeding, Moscow, USSR.
Shurkalova, T.A. Institute of Cytology and Genetics Siberian Division Academy of Sciences of the USSR, Novosibirsk 630090, pr. Lavrentieva, 10. USSR.
Sirotkina, L.N. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya, 11. USSR.
Skrede, Anders. Department of Animal Science, Agricultural University of Norway, P.O. Box 25, N-1432 Ås, Norway.
Smeds, Kerstin. University of Helsinki, Department of Animal Breeding, Viikki SF-00710 Helsinki, Finland.
Smeds, Erik. Esbo, Korpilampi, Finland.
Snytko, V.S. USSR.
Stanchi, N.O. La Plata Univ. Nacional, Facultad de Ciencias Veterinarias, Argentina.
Stoinska, M. Department of Applied Zoology and Veterinary Research Station, University of Kuopio. P.O.Box 6, SF-70211 Kuopio, Finland.
Stoskopf, Michael K. Department of Radiology, Division of Comparative Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland 21202, USA.
Sudakova, N.M. State University of Petrozavodsk, Petrozavodsk, Lenin Str. 33, USSR.
Taoyan, Men. Chinese Academy of Agricultural Sciences, Yongji, Jilin (China), Inst. of Special Plants and Wildlives Utilization, China.
Taranov, G.S.
Tauson, Anne-Helene. Fur Animal Production, Department of Animal Science and Animal Health, Royal Veterinary and Agricultural University, 13 Bülowsvej, DK-1870 Frederiksberg C., Denmark.
Tolstenko, L.V. The V.A. Afanasiev Research Institute for Fur Bearing Animal and Rabbit Breeding, Rodniki, Moscow Region, USSR.
Tyutyunnik, N.N. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya, 11, USSR.
Umezu, Motoaki. Laboratory of Animal Reproduction, Faculty of Agriculture, Tohoku University, Aoba-ku, Sendai-shi 981, Japan.
Unzhakov, A.R. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya, 11, USSR.
Ushekevich, P.V. Leningrad Veterinary Institute, Leningrad, Moscovsky Prospect, 112, USSR.
Uzenbaeva, L.B. Institute of Biology, Karelian Research Centre, USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya, 11. USSR.
Valberg, N.M. Norges Landbrukshøgskole, Institut for Husdyrfag, Box 25, N 1432-Ås, Norway.
Vasilyeva, L.L. Institute of Cytology and Genetics, pr. Lavrentyeva, 10, Novosibirsk 630090, USSR.
Vysotzkaya, R.U. Institute of Biology, Karelian REsearch Centre of the USSR Academy of Sciences, Petrozavodsk 185610, Pushkinskaya 11, USSR.

Weber, D.
Wohlsein, P. Institute of Pathology, School of Veterinary Medicine, Bünteweg 17, D-3000 Hannover 71, FRG.
Xiuying, Li. Veterinary Coll. of PLA, Changchun (China), Dept of Animal Husbandry, China.
Zabolotskikh, Yu.S. All-Union Research Institute of Game Management and Fur Farming, 79 Engels Street, Kirov, USSR.
Zhang, Cun. Nanjing Agricultural Univ. China.
Zhihong, Zhong. Lanzhou Military Area of PLA, Lanzhou, Inst. of Military Medicine, China.
Zimmermann, H. Gerdingstr. 23, D o-2200 Greifswald, Germany.
Zuyuan, Ji. Lianyun Regional Bureau of Agriculture and Forestry, Lianyungang, Jiangsu, China.





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