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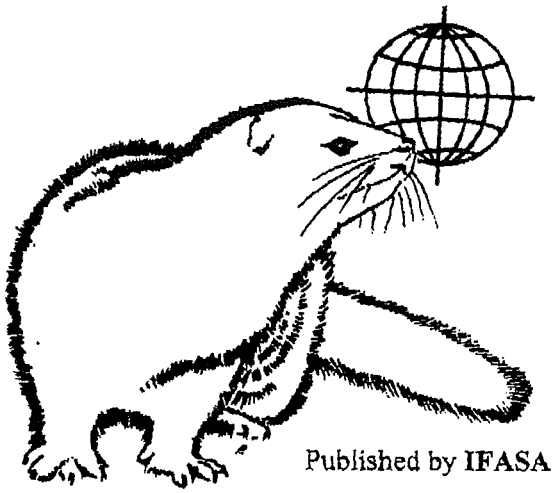

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INTERNATIONAL FUR ANIMAL SCIENTIFIC ASSOCIATION

ADVANCES IN DOG, CAT AND EXOTIC CARNIVORE REPRODUCTION

7th Symposium

Notes

Scientifur, Vol. 23, No. 1

February 1999

Again this year, it is very important for us to thank our contributors and readers for the many Christmas and New Years greetings we have received.

Last New Year, we were wishing for an enlargement of the Ifasa/Scientifur family - among others things based on the improvement of skin prices. Early 1998 there was reason for a modest optimism. However, at the end of the year our optimism had changed into a hope that any crisis will eventually end. Therefore, our hope here at the beginning of 1999 is that the economic crisis affecting skin prices dramatically in the negative direction will end very soon.

In 1998, the number of subscribers was not increasing, because those who started subscription almost outbalanced those who stopped. The economic support from European Fur Breeders Association (EFBA), the Mink Farmers Research Foundation, USA and Canada Mink Breeders Association is therefore still the economic basis of the activities in IFASA and publication of SCIENTIFUR.

From EFBA it has been proposed that SCIENTIFUR should be upgraded to become a really scientific journal, only with reports reviewed by referees. As advertised in former issues of SCIENTIFUR, we have started up the procedure of reviewing the reports we receive as scientific reports for publication in SCIENTIFUR. In this issue we bring the first reviewed scientific report in the chapter: REVIEWED SCIENTIFIC REPORTS. 3 reports are on the way in the system, and we expect several more based on questions from contributors.

At the same time we have many of Original Reports in stock, so there will be a lot of information in SCIENTIFUR also in 1999. In the next issue we will, among other items, bring abstracts from the II International Symposium in Petrozavodsk, September 1998 regarding the Physiological Basis for Increasing the Productivity of Predatory Animals and from Technical Year Report published by the Danish Fur Breeders Association in February of this year.

All subscribers have now received their invoice covering 1999. We hope, of course, that everybody will pay the invoice. If you, however, wish to stop the subscription, please return the invoice right away with the remark: cancelled. It helps us tremendously to know where to send the journal in May. Here in February, all 1998 subscribers will receive vol. 23, No. 1.

As already advertised, the Subscription price is the same in 1999 as in the years before, i.e. 500 NOK/year for IFASA members and NOK 600 NOK/year for others. Even in this electronic age it will be very difficult and costly to find so much special information on fur animals as in SCIENTIFUR.

In 1998, we gave the personal IFASA members the possibility to pay the membership fee for 4 years with a 25% discount. The majority preferred to do that, but a few did not react. Therefore, we have in January sent these members a letter asking them to answer us, how they want to pay the membership fee or if maybe they want to cancel the membership which is a poor deal, if you want to participate in the IFASA congresses, where discount given to members more than pay the membership fee.

Start to prepare you for the IFASA scientific congress in Kastoria, Greece in the year 2000. It is the VII International Scientific Congress and therefore the natural occasion to celebrate the 25th anniversary for starting up the international congresses and thus SCIENTIFUR which was a child of the first congress.

See you in Greece in 2000, but before that we wish you pleasant and informative reading of the coming issues of SCIENTIFUR .

PS. VERY IMPORTANT INFORMATION FOR YOU WHO WISHES TO CONTACT SCIENTIFUR VIA THE INTERNET. THE E-MAIL ADDRESS IS:
ifasa-scientifur@oslo.online.no

Thank you for your support as subscribers and/or contributors.

Your Editor
Gunnar Jørgensen

NEWS FROM IFASA

On November 19, 1998 the IFASA board meeting was held as advertised in St. Hyacinthe, Canada, where, among others, the following decisions were made.

1.The Board finally approved the referee system. It was decided to establish an editorial board to maintain the referee system for scientific reports and to direct further development of SCIENTIFUR as an electronic publication via the Internet. Bruce D. Murphy was elected chairman of the editorial board, and he will as soon as possible establish the editorial board mentioned.

2. The Internet project which was earlier mentioned in SCIENTIFUR was discussed in detail, and the content of the IFASA web site was agreed. It was also agreed to place the web site on a private web server as soon as possible. Bruce D. Murphy and Odette Hélie are responsible for the further development. It was confirmed to establish a regular internet communication between the board members.

3. The VII International Scientific Congress in Kastoria Greece was discussed, and it was concluded that IFASA sets up the scientific committee of the congress and will be represented in the Organising Committee in Kastoria. The scientific committee will be established by Bruce D.Murphy and Marian Brzozowski who will together with the president be in current contact with Pascalis Iconomidis in Kastoria.

4. The importance of finding candidates for the IFASA-board to be elected at the congress in the year 2000 was underlined.

5. The place for the VIII congress in 2004 was mentioned, and invitations have to be ready before the VII congress.

6. The next board meeting was suggested for the end of May 1999 and will be held in connection with a meeting in the Greek Organising committee.

For easier contact to the board of IFASA with the President or Vicepresident, the E-mail addresses are given below:

President, Einar J. Einarsson:
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Vicepresident, Bruce D.Murphy:
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Reviewed scientific report

Analysis of elastin and collagen in fresh and dried skin from mink (*Mustela vison*)*)

Bent Riis

Department of Animal Product Quality, Danish Institute of Agricultural Sciences, Research Centre Foulum, P.O. Box 50, DK-8830 Tjele, Denmark

Received: 7th October 1998 **Accepted: 19th January 1999**

Keywords
Mink skin, collagen, elastin, dried skin, fresh skin, skin biopsies

Summary

The customers may want to buy mink skins with special leather properties like very elastic skin. Here it is shown that fresh skin samples can be used to estimate the content and distribution of soluble collagen in dried mink skins, which are the basis for producing garments.

Introduction

In modern mink production it is of importance to be able to identify skins and animals with specific leather qualities. After clarifying such relations, it is important to be able to select breeding animals with these specific traits. Obviously, analyzing dried mink skins cannot provide any data for use in a breeding program. It is therefore of importance to clarify whether fresh and dried mink skins contain the same amount and distribution of structural proteins. If no or only minor changes are found, it should be useful to take biopsies from live animals and deduce the distribution of structural proteins. If this is possible, analysis of skin biopsies will be a useful tool for the judgement if the end goal of a breeding program is specific skin properties. This is the background for testing whether the content and distribution of soluble collagens and insoluble elastins are the same in dried and fresh skin.

Biochemically, the skin is a very complex structure, built from many different cells and molecules (Riis, 1997). Two families of structural proteins are of immense importance in determining the physical properties of the skin. These are the collagens and the elastins. The collagen contains at least 19 different proteins. The most abundant collagen found in the skin is of the type I. It is a heterotrimer composed of two $\alpha 1(I)$ subunits and one $\alpha 2(I)$ subunit. The skin also contains other collagen components (*Prockop and Kivirikko, 1995*). Most collagen molecules are carrying post-translational modifications. Elastin is a family of non soluble structural proteins giving the skin its elastic properties. Elastins are heavily cross-linked, making biochemical characterization difficult. In skins the insoluble elastin accounts for more than 90% of the total *elastin (Perrin and Foster, 1997)*.

Materials and methods

The tested skin sample was collected from 14 scanblack mink raised at the Experimental Fur Animal Farm localized at the Danish Institute of Agricultural Sciences, Research Centre Foulum, Denmark. The animals were treated and fed according to the standard for the farm, until they were anesthetized and killed, complying with all legal and ethical rules. The skins were removed shortly after the death of the animals, and stored at -80°C, until the described manipulations were performed (*Riis, 1998*).

The skins where thawed and fleshed using a fleshing machine after which the skins were cut into smaller samples. The dried samples were prepared by using the drying facilities of the Experimental Fur Farm. The subcutaneous fat was extracted chemically as previously described (*Riis, 1998*). In each case approximately 5 g of skin sample were degreased.

The collagens were extracted for 24 h at room temperature with 8-10 times vol. buffer A (50 mM Tris/HCl pH: 7.6, 1M NaCl, and Complete™ protease inhibitor from Boehring-Mannheim). The samples were in constant motion during the extraction. The protein content was estimated using the Bradford-method (*Bradford, 1976*) employing a Bio-Rad protein assay™ kit and setting the protein standard with bovine serum albumin. All samples were brought to the same concentration of proteins by dilution with buffer A.

The spectrophotometrical analysis was performed using a Hewlett Packard 8453 spectrophotometer and collecting data from 190 to 300 nm with a resolution of 1 nm. The sodium dodecyl sulfate gel electrophoresis (SDS-PAGE) was performed as described (*Laemmli, 1970*), followed by silver staining of the gels (*Ansorge, 1985*).

Briefly, capillary zone electrophoresis (CZE) was performed using an Applied Biosystems 270-A HT system equipped with a 50 cm long capillary with an internal diameter of 50 µm. The samples were injected for 1 second in buffer B (0.1 M NaH_2PO_4, pH: 2.5), and the capillary was kept constantly at 30°C. The applied voltage was 8 kV, and the detection was done at 200 nm. This method has previously been described in more details (*Riis, 1997*)

Elastin analysis was performed by transferring a skin sample of 1 to 3 g to 100 ml boiling 0.1 M NaOH. After the boiling temperature was reached again, the boiling was continued for 45 minutes. The samples were filtered through a paper filter, which was washed and rinsed in alcohol, before they were dried at 70°C for 16 hours. The non-dissolved remainder found on the filter was taken as being insoluble elastin (*Soskel et al, 1987*).

Results and discussion

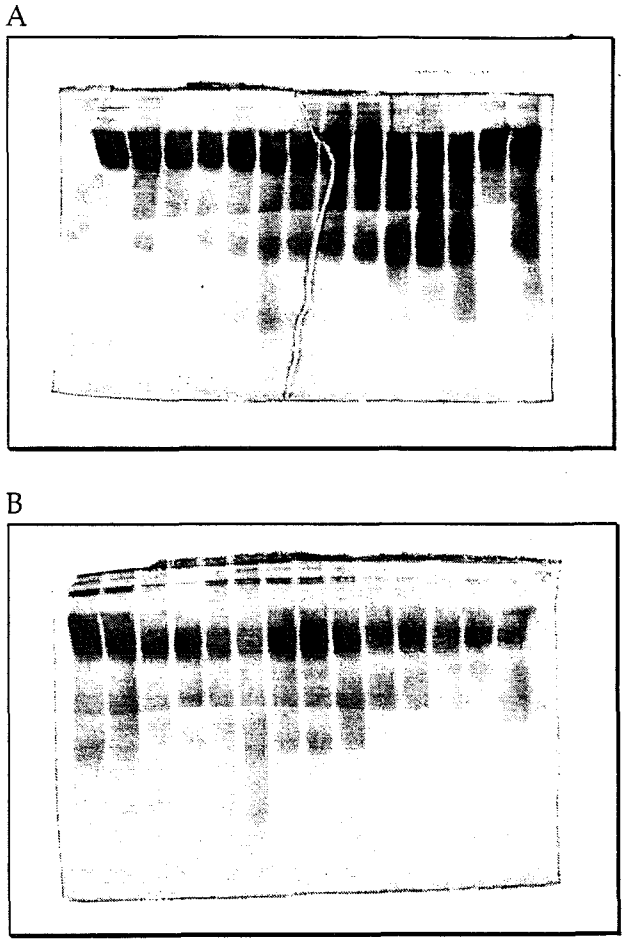

Figure 1. SDS-PAGE analysis of collagen extracted from fresh samples (A) and from the dried sample (B). The gels were silver stained.

This experimental series analyzed the proteins that were dissolved in a neutral salt buffer. It has previously been shown that this method extracts proteins of collagenous origin *(Riis, 1997)*. The following SDS-PAGE gel electrophoresis analysis found no significant difference in the pattern obtained from fresh skin (Fig. 1A), compared to the pattern obtained from dried skin (Fig. 1B). This shows that the extracted proteins are essentially the same, and that no substantial degradation of the collagens takes place during the standard drying procedure used by the Danish farmers. Very careful analysis, using highly sensitive capillary zone electrophoresis techniques, reveals an extra collagen peak shown in figure 2. These collagen molecules are not seen in samples taken from fresh skin. Therefore, it is most likely a degradation product appearing when the skin is dried. Further spectrophotometrical analysis of the samples, diluted 10 times in water, found no significant differences in the patterns (Fig. 3). Although the peaks cannot be identified, this supports the known knowledge that very little change of these important structural proteins takes place during the drying process of the skin.

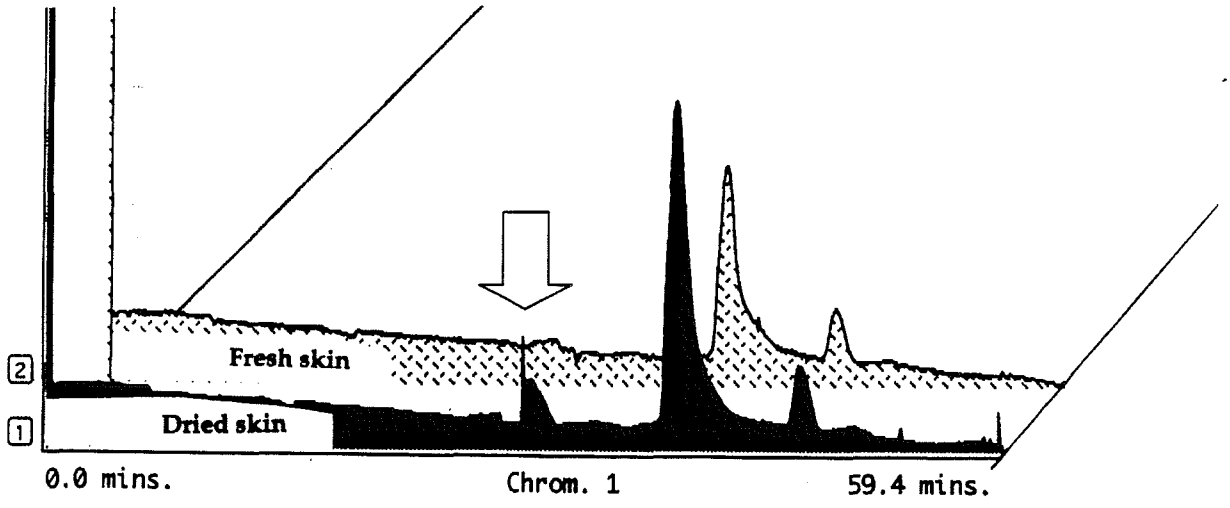

Figure 2. Capillary electrophoresis analysis of collagens extracted from the same animal's skin. [1] is CZE analysis of collagens extracted from dried skin and [2] is CZE analysis of collagens extracted from fresh, non dried skin. The arrow indicates the degradation products in the dried sample.

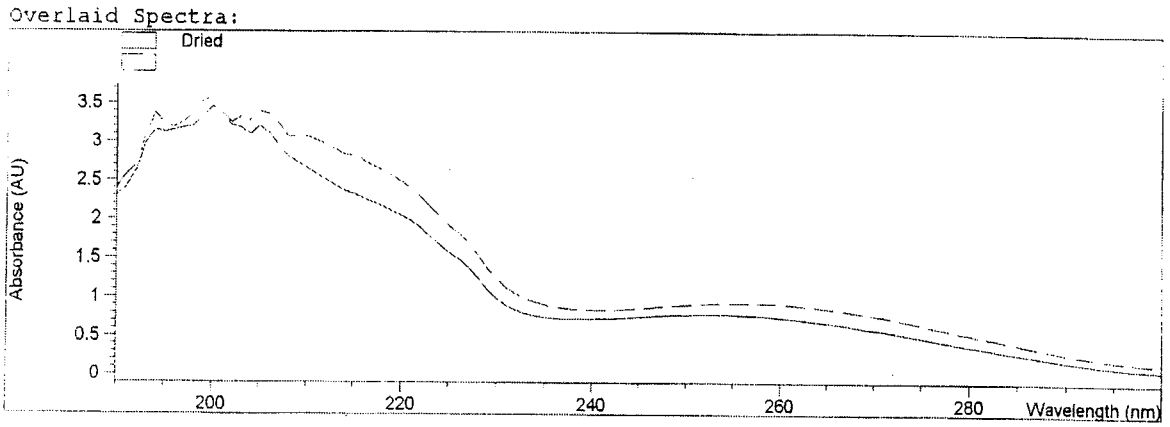

Figure 3. Spectra from 190 nm to 300 nm of salt-extracted collagen from fresh skin (unbroken line) and from dried skin (broken line) from the same animal. 100 µg of collagen was used in each test.

Comparison of the insoluble elastin content found no significant difference between the two series (Fig 4). This shows that the insoluble elastin fibres are not degraded when the skin is dried. This is no surprise, because it is well known that this insoluble protein generally is very resistant to proteases and other degradations.

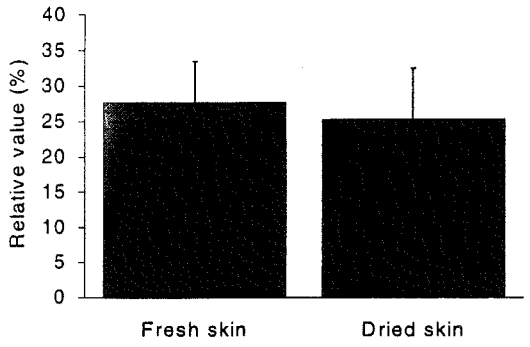

Figure 4. Amount of insoluble elastin. The value is relative to the weight of the skin sample.

These data show that results obtained from fresh skin are the same as those from dried mink skin. Therefore it should be possible to use skin biopsies, if the aim is to test for specific soluble collagens or insoluble elastins. However, the biopsy methods still have to be developed, and currently such biopsies are too small to provide reliable collagen and elastin data. Development of such methods are continuing where the ultimate goal is to develop methods, where it will be possible to analyze very small samples from a breeding population and get similar result as when analyzing dried skin. Consequently, it should become possible to select animals with specific quantities and distribution of structural proteins in the skin, and use these animals for breeding purposes.

Conclusions

The data obtained during these experiments show that the distribution and amount of the two structural protein families, elastin and collagen, are similar in dried and fresh skins. It was concluded that virtually no degradation of these proteins is taking place during the drying process. The implications are that it is potentially possible to test skin biopsies from living animals in order to obtain information on the structural proteins crucial for the mechanical properties of the dried skin. This knowledge may contribute to the future breeding work, if the purpose is to obtain an improved or changed leather quality.

Acknowledgments

I thank Mrs. Anne-Grete Dyrvig Petersen and Mr. Anders E. Østergaard of the Danish Institute of Agricultural Sciences, Research Centre Foulum, Denmark, for excellent technical help.

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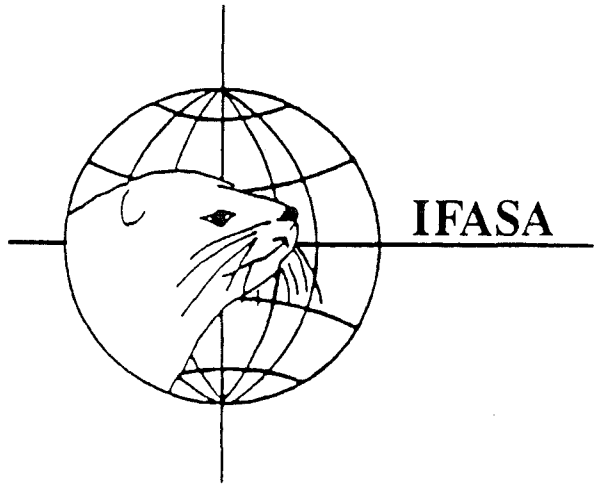

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Multigenerational study of the effects of consumption of PCB-contaminated carp from Saginaw Bay, Lake Huron, on mink.
1. Effects on mink reproduction, kit growth and survival, and selected biological parameters

Janelle C. Restum, Steven J. Bursian, John P. Giesy, James A. Render, William G Helferich, Elizabeth B. Shipp, David A. Verbrugge, Richard J. Aulerich

This study was conducted to determine the multigenerational effects of consumption of PCB-contaminated carp (*Cyprinus carpio*) from Saginaw Bay (Lake Huron) on mink (*Mustela vison*) reproduction and health and to examine selected biomarkers as potential indicators of polyhalogenated hydrocarbon toxicity in mink. The mink were fed diets formulated to provide 0 (control), 0.25, 0.5, or 1.0 ppm polychlorinated biphenyls (PCBs) through substitution of Saginaw Bay carp for ocean fish in the diets. To determine whether the effects of PCB exposure were permanent, half of the parental (P_1) animals were switched from their respective treatment diets to the control diet after whelping the first of two F_1 generations. Effects of in utero and lactational exposure to PCBs on subsequent reproductive performance of the F_1 animals were examined by switching half of the first-year F_1 offspring (kits) to the control diet at weaning, while the other half was continued on their parental diet (continuous exposure). Continuous exposure to 0.25 ppm, or more, of PCBs delayed the onset of estrus (as determined by vulvar swelling and time of mating) and lessened the whelping rate. Litters whelped by females continually exposed to 0.5 ppm, or more, of PCBs had greater mortality and lesser body weights than controls. Continuous exposure to 1.0 ppm PCBs had a variable effect on serum T_4 and T_3 concentrations. Compared to the controls, there were significant differences in kidney, liver, brain, spleen, heart, and thyroid gland weights of the mink continually exposed to 1.0 ppm PCBs. There was an increase in the incidence of periportal and diffuse vacuolar hepatocellutar lipidosis in the P_1 mink with continuous exposure to increasing concentrations of PCBs. Plasma and liver PCB concentrations of the adult and kit mink were, in general, directly related to the dietary concentration of PCBs and the duration and time of exposure. Short-term parental exposure to PCBs had detrimental effects on survival of subsequent generations of mink conceived months after the parents were placed on "clean" feed. The lowest observed adverse effect level (LOAEL) for dietary PCBs in this study was 0.25 ppm.

Journal of Toxicology and Environmental Health, part A, 54:343-375, 1998. Address correspondance to Richard J. Aulerich. 16 tables, 73 refs. Authors' summary.

Multigenerational study of the effects of consumption of PCB-contaminated carp from Saginaw Bay, Lake Huron, on mink.
2. Liver PCB concentration and induction of hepatic cytochrome P-450 activity as a potential biomarker for PCB exposure

Elizabeth B. Shipp, Janelle C. Restum, John P. Gie, Steven J. Bursian, Richard J. Aulerich, William G. Helferich

This study examined the effect of polychlorinated biphenyls (PCBs) from Saginaw Bay (Lake Huron) carp on the hepatic cytochrome P-450 activity in mink (*Mustela vison*). Hepatic cytochrome P-450 activities are of interest for their possible use as biomarkers to indicate consumption and biological effects of PCBs in the environment. Adult mink containing ocean fish (control diet, 0.0 ppm) or Saginaw Bay carp to provide 0.25, 0.5, or 1.0 ppm PCBs. Mink were bred after 3 mo of exposure, and half of the parental mink (P_1) and kits (F_1-1) previously consuming diets containing Saginaw Bay carp were switched to control diet at weaning of the F_1- 1 kits. P_1 and F_1- 1 mink were then bred within their age and dietary groups after 15 mo of exposure, to produce the second-year F_1 (F_1-2) and F_2 kits. Mink were killed when the new kits were weaned. Transfer of half the animals to the control diet examined whether the effects of the PCB-containing diet on hepatic cytochrome P-450 activity were permanent. Con-

tinual exposure to diets containing PCBs from Saginaw Bay carp induced cytochrome P-450 activity in a generally dose-dependent manner. Cytochrome P-450 activity was not different from untreated controls in animals switched to the control diet from the PCB-containing diet. The response of cytochrome P-4501A1 (EROD) activity in a dose-dependent manner and the lack of induction after transfer to noncontaminated diets suggest that this hepatic enzyme activity is a potential biomarker for current exposure to PCBs and other similar cytochrome P-450 inducers.

Journal of Toxicology and Environmental Health, part A, 54:377-401, 1998. Address corrspondance to Dr. W.G. Helferich. 2 tables, 8 figs., 29 refs. Authors' summary.

Multigenerational study of the effects of consumption of PCB-contaminated carp from Saginaw Bay, Lake Huron, on mink.
3. Estrogen receptor and progesterone receptor concentrations, and potential correlation with dietary PCB consumption

Elizabeth B. Shipp. Janelle C. Restum, Steve J. Bursian, Richard J. Aulerich, William G. Helferich

Mink (*Mustela vison*) were fed diets containing ocean fish (control diet, 0.0 ppm polyhenyls, PCBs) or Saginaw Bay carp to provide 0.25, 0.5, or 1.0 ppm PCBs to examine the effect of PCBs on homeostasis of binding sites for ovarian steroid hormones. Ranch-raised mink fed Great Lakes fish contaminated with PCBs, or treated with PCBs directly, have demonstrated reproductive impairment including anovulation, fetal resorption, delayed ovulation, increased gestation, and decreased litter size. Previous studies have demonstrated that estrogen and progesterone levels are unaltered in mink treated with PCBs, suggesting that the effect of PCBs on reproduction is not mediated through alterations in hormone homeostasis. In vitro studies have demonstrated that the most likely means by which PCBs exert antiestrogenic ability is through a downregulation of the estrogen receptor in normally estrogen-responsive tissues such as liver and uterus. Hepatic and uterine estrogen binding site concentrations were measured in female mink consuming diets containing PCBs for up to 18 mo at up to 1 ppm. Hepatic estrogen binding site concentrations generally decreased with increasing dietary PCB concentrations. Uterine estrogen binding site concentration did not decrease in these animals. Uterine progesterone receptor concentration also did not change with increasing PCB consumption. In total, the response of hepatic and uterine estrogen and uterine progesterone binding sites in mink fed diets containing Saginaw Bay carp suggests that concentrations of PCBs available to uterine tissue may not have been sufficient to decrease uterine estrogen receptor, despite their effect on hepatic estrogen receptor.

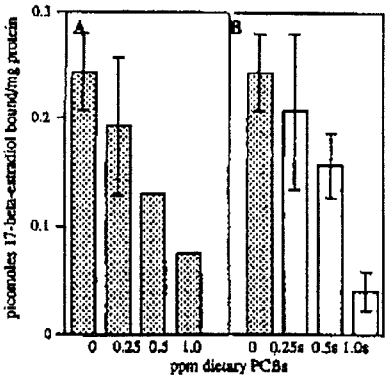


FIGURE 3. Hepatic estrogen binding site concentrations in female F_1-2 mink fed diets containing nominal doses of 0.0, 0.25, 0.5, or 1.0 ppm total PCBs. (A) Estrogen binding site concentrations in liver from mink fed PCB-containing diets continuously for 6 wk. (B) Estrogen binding site concentrations in livers from mink whose dams were switched to the control diet after 6 mo of consumption of PCB-containing diets.

Journal of Toxicology and Enviornmental Health, Part A, 54:403-420, 1998. Address correspondance to Dr. William G. Helferich. 2 tables, 4 figs., 29 refs. Authors' summary.

Topography and morphology of the liver in the hedgehog *(Hemiechinus auitratus)*, ferret *(Mustela furo)* and fruit eater bat *(Rousettus aegyptiacus).*

G.A.E. Youssef, M. Abd-Elgwad, Z.A. Yadam

The liver of the hedge hog extended as far back as the 3rd lumbar vertebra, whilst that of the ferret approached the 2nd one. In the bat, on the other hand, the liver showed no extension

into the sublumbar region. The liver of the hedgehog and ferret possessed all the conventional ligaments anchoring it with the neighbouring structures except the triangular ligament in the former and the falciform ligament in the latter. Furthermore, the liver of the bat has no sort of fixation with the diaphragm. The liver of the hedgehog and ferret divided into six main lobes, however that of the bat was composed of three lobes. According to their dimension and weight, the hepatic lobes of the hedgehog and ferret were classified into seven parts, whilst those of the bat, into merely three. The liver was extended into 66% of the total length of the abdominal cavity in the hedgehog, about 41.6% in the ferret and about 44.7% in the bat. On the other hand, it accounted for 4% of the total body weight in the hedgehog; 3.45% in these animals was simply formed of 2 to 3 small hepatic ducts which independently joined the cystic duct to constitute the common bile duct which consequently opened into the duodenum, 7.5 cm from the pylorus.

Zag. Vet. J. Vol. 22, No. 4, pp. 111-122, 1994. 3 6tables, 4 figs., 11 refs. Authors' summary.

Some anatomical observations on the trachea; bronchial tree and lungs in ferret (*Mustela furo*)

G. A. E. Youssef

The thoracic part of the ferret's trachea is comparatively long to meet the relatively long thoracic cavity. This part of the trachea extends from the level of the thoracic inlet to the level of the 7th intercostal space where it bifurcates into two bronchi principales dorsal to the base of the heart. The bronchus principalis sinister gives off bronchus lobaris cranialis and continues as bronchus lobaris caudalis. While the bronchus principalis dexter gives off bronchus lobaris (cranialis, medialis and accessorius) and continues as bronchus lobaris caudalis. Each bronchus enters the corresponding lobe at its hilus which is located in the craniodorsal aspect of each lobe. The lungs of the ferret are relatively large and the left lung has two lobes a (cranial and caudal) while the right lung has four lobes (cranial, middle, accessory and caudal). Generally, all the lobes of ferret lungs are completely separated except for their attachment through the bronchi and blood vessels.

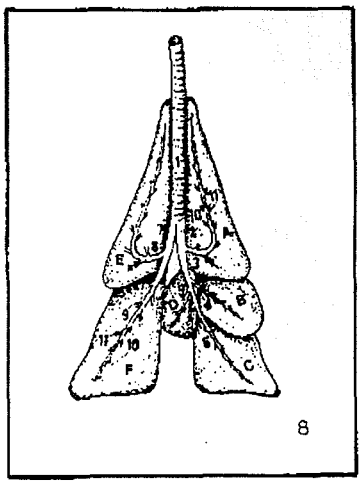


Fig. (8): schematic diagramatic representation of lobation and bronchial tree of the lungs of a ferret (dorsal view)

1- Trachea
2,7- Bronchus principalis dexter and sinister
3,8- Bronchus lobaris cranialis dexter and sinistor
4- Bronchus lobaris medius
5- Bronchus lobaris accessory
6,9- Bronchus lobaris caudalis dexter and sinister
10- Dorsal segamental bronchi
11- Ventral segamental bronchi

A- Lobus cranialis dexter
B- Lobus medius
C- Lobus accessorius
D- Lobus caudalis dexter
E- Lobus cranialis sinister
F- Lobus caudalis sinister
G- Core (heart)

ISSN 110-2047. Alex. J. Vet. Science, Vol. 10, No. 2, pp. 55-65, 1994. 8 figs., 15 refs. Author's abstract.

A computer-assisted method for the determination of hair cuticula patterns in mammals

W. Meyer, Helga Seger, G. Hülmann, K. Neurand

The study describes a rather simple, computer-assisted method for the determination of different mammalian species or groups with the aid of the cuticula pattern of guard hairs (primary hairs) following SEM presentation. The method is based on an image analysis program developed for metallographic investigations, and includes the evaluation of five parameters (scale area, scale perimeter, number of scales per mm^2, ratio of scale width and height, scale index). The scale index as a combination of scale numbers per square unit and the

width/height ratio proved to be most useful for a relevant species or group identification of mammals according to the hair cuticula pattern.

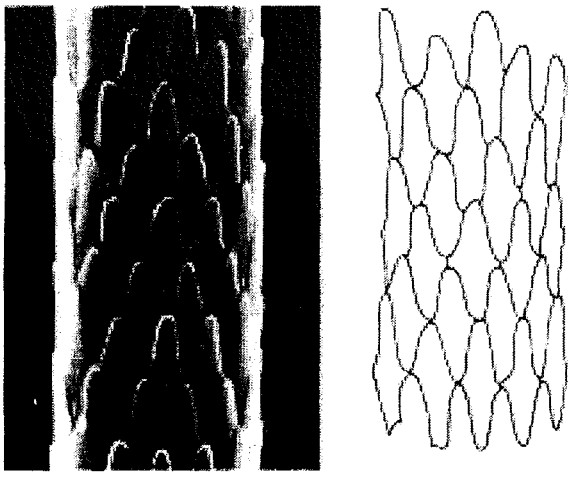


Fig. 2. Drawing of a scale border pattern, as based on a SEM photograph of the hair cuticula of the otter/Fischotter (x 700).

Berl. Münch. Tierärztl. Wschr. 110, pp. 81-85, 1997.4 figs., 16 refs. Authors' summary.

Systematic operation programmes for the improvement of mink management distributed on the WWW

Steen H. Møller

A Systematic Operation Programme (SOP) systematises the management in a production period by describing all relevant management routines as a set of periods in which observed situations release actions. Mink production is characterised by annual cycles of highly different production periods with regard to length, management and labour intensity. Consequently, experience is gained slowly and stepwise. To meet the needs for transfer of knowledge, SOPs for the short labour intensive mating and nursing periods have been developed and tested on commercial farms. In order to distribute the SOPs effectively in terms of availability, updating, tailoring and cost, they have been published on the WWW.

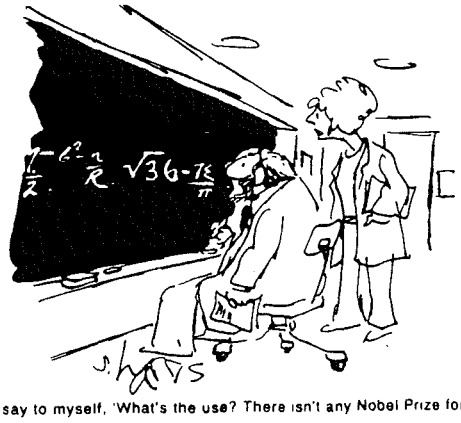
Proceeding: First European Conference for Information technology in Agriculture, Copenhagen 15-18 June, 1997. 1 fig., 4 refs., 4 pp. Author's abstract.

Pelt quality statistics in 1996-97. Scan Black male mink and blue foxes

Anonymous

An account is given of the quality, size, colour score of pelts from 222.000 male Scan Black mink and 1.994.930 blue foxes, pelted in Finland in 1996-97, and of the incidence of fur defects. Data are presented by district and feeding centre.

Finsk Pälstidskrift 32 (1-2), pp. 22-24, 1998. In SWED. 1 table. CAB-abstract.



"Then I say to myself, 'What's the use? There isn't any Nobel Prize for math' "

Original Report

Characteristics of thiamine status in mink when modelling an acute B_1-deficiency with oxythiamine

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Summary

The following aspects were studied: the influence of a B_1-vitamin antagonist, oxythiamine, on specific indices of thiamine profile in mink (transketolase activity, value of thiamine diphosphate effect (ThDP effect), level of total thiamine and its phosphate esthers: thiamine diphosphate and thiamine triphosphate; activities of thiamine biotransformation enzymes: thiamine kinase, thiamine diphosphate kinase and thiamine diphosphatase) with different background vitamin provision. The OT injection at the dose of 1.5 mg/kg caused an acute form of thiamine deficiency with considerable biochemical changes in specific indices of thiamine metabolism and characteristic neurological symptoms independently of background provision.

Introduction

To study thiamine metabolism, its antimetabolite oxythiamine (OT), is widely applied in vitamin research. Synthesized OT can selectively block thiamine-dependent reactions. At present, it is sufficiently well-investigated on laboratory omnivorous animals capable of microbial synthesis of vitamin B_1 in the digestive tract.

A series of experiments on modelling B_1-deficiency in carnivorous animals (mink and polar foxes) with OT was initiated at the Laboratory of Animal Ecological Physiology, Institute of Biology, Karelian Research Centre RAS (*Petrova et al, 1992; Izotova et al, 1994*). Mink hypersensitivity to OT was found: doses 100-fold less than those experimentally-grounded (100-400 mg/kg) for laboratory animals (*Ostrovsky, 1971; 1985; Voskoboev & Chernikevich, 1987*) appeared to be lethal for mink but, under the conditions of acute OT-vitamin deficiency, thiamine injections restored the vitamin level in the organism and brought the animals back to life practically before our eyes.

Under the influence of OT, the thiamine diphosphate effect (ThDP effect) in the blood, a thiamine-deficiency index (*Brin et al, 1960; Boston, 1970; Brin, 1980; Kodentsova et al, 1994*), increased in the mink groups: in the conditions of preliminary provision with thiamine; of adequate provision with thiamine; and in animals with slight thiamine deficiency (intact) which seemed to increase. At the same time, the mink with more acute thiamine deficiency could develop chaotic and ambiguous reactions under the effect of OT. High sensitivity of mink to B_1-antivitamin, OT, found at our laboratory, has

made us do more experiments and study a wider range of thiamine-status indices to come to a more complete understanding of possible vitamin-deficiency causes in carnivorous animals. The purpose of the present paper is to describe the research results.

Materials and methods

In a specially-designed experiment, OT was intramuscularly injected at a dose of 1,5 MT/kg, to mink in three groups (6 animals in each group) with various initial levels of vitamin provision. This was reached by feeding the animals for 50 days with raw thiaminase-containing fish (herring Ivasi) making up 70-90 % of the meat-fish feed proteins (Group 1), thus creating a positive background by adding benphothiamine doze, 0,5 mg /animal, into the diet (Group 2), and using intact animals (Group 3).

The following indices characterising the thiamine status were determined by techniques approved at the Institute of Biochemistry, Academy of Sciences, Republic of Belarus: transketolase (TK) activity in the blood and internal organs, ThDP effect, content of thiamine and its phosphoric ethers: thiamine diphosphate (ThDP), thiamine triphosphate (ThTP) in the blood, activity of enzymes of thiamine synthesis: thiamine kinase (Th kinase), thiamine diphosphate kinase (ThDP kinase); thiamine-degradation enzyme thiamine diphosphatase (ThDPase).

Results and discussion

The TK reaction after injecting OT was as follows. Group 1 animals developed lower enzymatic activity in 7 h which grew 24 h after the injection thus causing a smooth increase in the ThDP-effect. Group 2 animals with an adequate vitamin provision showed similar but more pronounced changes: at first, considerable lowering of TK activity ($p < 0,001$), then levelling off and, later, rising of the ThDP effect which manifested a deficiency increase. At the same time, Group 3 animals developed no considerable changes in these indices (Table 1).

Table 1. Activity of TK and value of ThDP effect in the blood of mink during deficiency with OT (M ± m)

Time of testing	Group	TK activity, mkmol/s/l		ThDP effect
		Basal	stimulated	%
Initial date	1	10.90 ± 0.34	12.80 ± 0.65	17.9 ± 3.5
	2	11.50 ± 0.75	12.80 ± 0.73	11.3 ± 1.4
	3	10.70 ± 0.70	13.80 ± 0.57	31.0 ± 6.7
7 h after	1	9.31 ± 0.28*	11.51 ± 0.32	23.8 ± 2.6
OT injection	2	8.82 ± 0.24*	11.79 ± 0.33	34.2 ± 5.3
	3	9.77 ± 0.28*	12.47 ± 0.25	27.9 ± 2.3
24 h after	1	11.10 ± 0.75*	14.36 ± 0.63*	29.6 ± 3.6
OT injection	2	10.80 ± 0.76*	14.87 ± 0.86*	38.9 ± 5.9
	3	10.00 ± 0.86	13.55 ± 0.51	37.5 ± 8.6

* difference is significant in comparison to data of previous investigation

Table 2. The TK activity and values of ThDP effect index in the mink organs during B_1-deficiency with OT (M ± m)

Organs	Group	TK activity, mkmol/s/l	ThDP effect %
Liver	1	5.5 ± 0.4*	38.7 ± 4.1*
	2	7.4 ± 0.6**	24.5 ± 4.6
	3	5.8 ± 0.3	27.4 ± 4.6***
Kidneys	1	12.6 ± 1.3*	18.3 ± 3.8
	2	34.4 ± 4.7	28.4 ± 4.2
	3	27.9 ± 3.1***	26.1 ± 5.8
Heart	1	9.4 ± 0.7*	23.6 ± 2.5*
	2	14.3 ± 1.3**	10.5 ± 2.0**
	3	10.9 ± 0.9	26.7 ± 5.8
Brain	1	21.9 ± 1.0*	25.3 ± 7.2*
	2	35.9 ± 2.2**	7.7 ± 1.5**
	3	26.7 ± 1.0***	13.7 ± 1.7

* difference is significant between group 1 and 2
** difference is significant between group 2 and 3
*** difference is significant between group 1 and 3

Depending on the vitamin-deficiency level, TK was also inhibited in the tissues of major organs: the liver, kidneys, heart and brain where thiamine plays an important role (Table 2). Similar enzyme inhibition and considerable increase in the ThDP effect could also be observed in polar foxes but at a much higher OT-dose (*Izotova et al, 1994*).

The initial vitamin deficiency in Group 1 was also characterized by a lower total thiamine content and its phosphorylated forms in the blood. Nevertheless, during the first experimental period the tendency of changes in these indices after injecting OT was identical in all groups and, despite the expected lowering, manifested itself in a sharp increase of all thiamine forms under study: total, ThDP and ThTP. This is likely to be connected with a large OT-dose having caused an acute inadequate reaction in the mink and directed on preserving a vitamin B_1, pool in the blood. At the same time, further changes in the groups were different but a lower ThTP (most labile and deposited vitamin form) level in the blood was peculiar for Groups 1 and 2 (fig. 1).

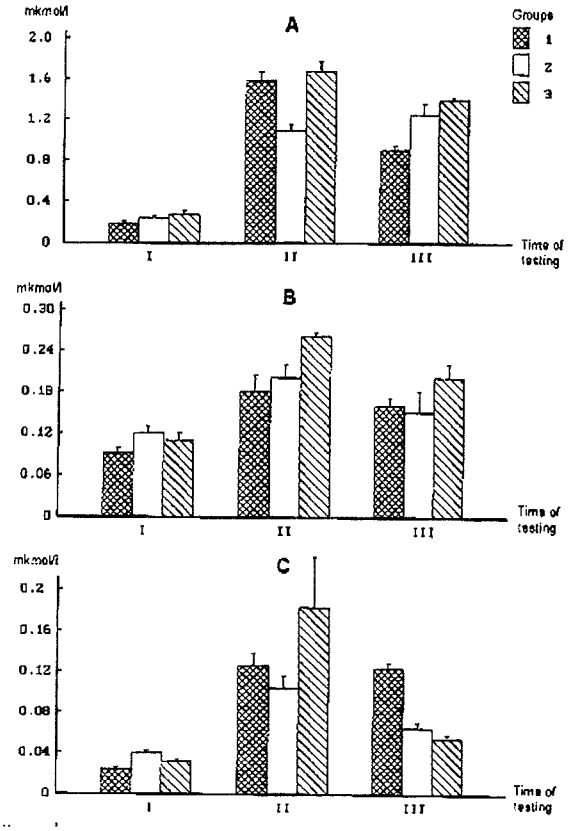

Fig. 1. Dynamics of total thiamine (A) and its ethers (B – ThDP, C – ThTP) content in mink blood under OT vitamin deficiency (I – initial data, II – 7 h after injecting OT, III – 24 h later).

Enzymes of thiamine biotransformation are found to be essential for developing a B_1-pool in the organism. A background activity of the enzyme of synthesis of a coenzymic thiamine form, Th kinase, in the blood was 2.5 times higher in Group 2 supplied with additional benphothiamine as compared with Groups 1 and 3 which shows its better provision with the vitamin. The dynamics of Th kinase changes were as follows: the growth of its activity on a background of vitamin deficiency (Groups 1 and 3), and its slight decrease in Group 2, 7 h after injecting OT, and then its gradual growth in all three groups (Fig. 2 A).

The initial activity of an enzyme of synthesis of a reserve thiamine form, ThDP kinase, in the blood was found to be essentially higher in Group 2, followed by Group 3, and the lowest one was observed in Group 1 on a background of vitamin deficiency. During the first stage of the experiment, enzymatic activity was found to be heavily inhibited 7 h after injecting OT : in Group 1 - twofold, in Groups 2 and 3 - threefold. It is interesting to note that after 24 h, the activity practically remained at the same level in Groups 1 and 3 with initial vitamin B_1, deficiency while in Group 2 it grew 2.5 times, i.e. the tendency of changes differed depending on initial values, especially in Group 2 with a preliminary provision with benphothiamine (Fig. 2 B).

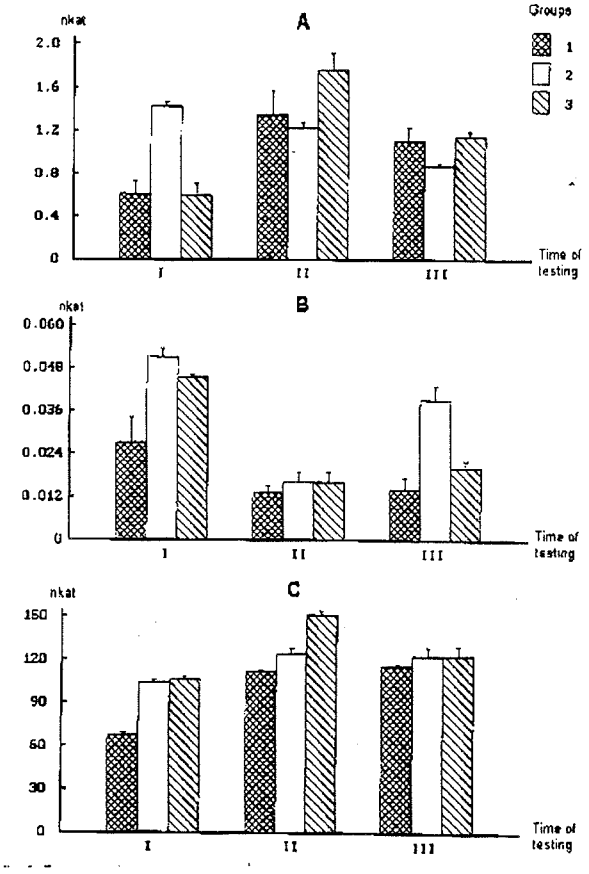

Fig. 2.. Enzymes of synthesis activity dynamics (A – Th kinase, B – ThDP kinase) and thiamine degradation (C – ThDPase) under OT vitamin deficiency (I – initial data, II – y h after injecting OT, III – 24 h later).

The background activity of an enzyme of thiamine hydrolysis, ThDPase, was almost twice as low as in Group 1 with feed hypovitaminosis,

thus showing weaker vitamin hydrolysis, and in Groups 2 and 3 it turned out to be practically identical. In Group 1, 7 h after injecting OT, ThDPase activity grew significantly (almost twice), levelled with the indices in Groups 2 and 3, and remained the same 24 h after. In Group 3 with initial spontaneous deficiency, an increase (50 %) was also found to take place, and then some decrease was observed, while Group 2 (positive control) showed an increase, though less expressed (20 %), 7 h after injecting OT, and 24 h later it remained at the former level.

Thus, enzymes of synthesis responded differently on injecting OT: Th kinase was activated at initial deficiency and was inhibited at initial adequate vitamin provision; ThDP kinase was inhibited in all groups. Simultaneously, a ThDP-degradation enzyme, ThDPase, became more active but to a lesser extent as compared with enzymes of thiamine synthesis.

Special mention should be made about the variability of some indices in the development of thiamine deficiency in mink as compared with that of rats (*Voskoboev & Chernikevich, 1987; Chernikevich et al, 1995*) which can be explained by hypersensitivity of the former to OT due to their being carnivorous. The dose injected to mink appeared to be destructing. It resulted in an acute vitamin deficiency and, most probably, during the first period of the experiment the response was directed at mobilising thiamine from depositing organs and releasing it in the blood for further inclusion into metabolic processes.

Further changes in indices characteristic of thiamine status most likely occured on a background of destructive changes in tissues which were accompanied by typical neurological symptoms of vitamin deficiency: quickened breath, apathy, unsteadiness and, at the end, could result in death due to vitamin deficiency developed all over the organism including the brain, as it is considered that OT cannot penetrate a hemato-encephalic barrier (*Ostrovsky, 1975*).

Thus, oxythiamine, antimetabolite of vitamin B_1 injected intramuscularly to mink at a dose of 1,5 mg/kg causes an acute form of vitamin deficiency accompanied by considerable biochemical changes in specific indices of thiamine metabolism and typical neurological symptoms. In some cases, biochemical reactions in animals preliminary provided with benphothiamine differed from those in the groups with initial vitamin deficiency; but even in this group, the dose injected was destructive and resulted in acute vitamin deficiency already during the first experimental hours which could be explained by biological peculiarities of carnivorous; their high sensitivity to thiamine deficiency due to the fact that thiamine is not synthesized in the digestive tract.

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Original Report

Digestibility of nitrogen and fats from feed rations for mink at various proportions of poultry by-products

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Summary

The digestibility of nitrogen and fats from feed ration for mink was studied at various percentual proportions of poultry by-products (heads). The digestibility of nitrogen and fats from the tested feed was studied as well. The experiment was performed on the Experimental Farm of Fur Animals at the Research Institute of Animal Production in Nitra. Five unrelated males of standard mink at the age of four months were studied in the experiment. They were housed in special balance cages. The animals were fed basic feed ration in the first stage; the content of the tested feed in the feed ration represented 33.0% out of the original matter in the second stage, 43.6% in the third and 55.3% in the fourth stage. The digestibility of nitrogen in the feed rations was approximately on the same level (80.77 - 81.25%) , and decreased significantly to 76.94% with 55.3% of the tested feed. The digestibility of fats in the feed rations rose significantly in dependence on percent poultry heads from 89.88% to 94.22%. The digestibility of nitrogen from decreased significantly with 55.3% poultry heads (81.45 - 73.58%) and digestibility of fats was approximately on the same level (97.73 - 94,15%).

Introduction

Some authors have been engaged in the study of digestibility of feed rations for mink based mainly on fish and fish by-products, and the need of nutrients , mainly nitrogen substances. *Jorgensen and Glem - Hansen* (1973) designed special cages for balance experiments with mink. *Glem - Hansen* (1979) studied the suitability and digestibility of basic and supplementary feed in the rations for mink used in Scandinavia. *Jorgensen and Eggum* (1971), *Jorgensen and Glem - Hansen* (1972), *Skrede* (1978) were engaged in the study of protein needs, their digestibility and biological value in growing mink, and *Glem - Hansen* (1979, 1980) and *Mertin and al.* (1996) in lactating and growing mink.

Material and methods

The experiment was performed on the Experimental Farm of Fur Animals affiliated with the Research Institute of Animal Production in Nitra. The animals were housed in special balance cages. Five unrelated males of standard mink at the age of four months were used in the experiment. The animals were clinically healthy and examined for plasmacystosis.

The experiment was divided into four stages. Digestibility of nitrogen and fats was studied at various proportions of poultry by-products (heads), and digestibility of nitrogen and fats in the poultry by-products was studied as well. The animals were fed basic feed rations during the first stage. The content of the tested feed in the ration was 33.0% of the original substance in the second stage, 43.6% in the third stage, and 55.3% in the fourth stage.

The feed composition is given in table I. The animals were housed in balance cages one month before the beginning of the experiment. Each experimental stage was divided into two periods - the preparation period and the experimental period. The preparation period lasted seven days during which the animals adapted to the new feed, and the experimental period lasted five days. The animals were fed two times daily at 9 o´clock and at 15 o´clock. The nutritional value of the feed corresponded with the standard for the given age category and physiological stage of animals (*Mertin and al.* 1994).

The parameters necessary for the calculation of digestibility coefficients were recorded: feed intake, amount of feed left and amount of excrements. The given parameters were observed and samples were taken two times daily, always one hour before feeding at 8 o´clock and at 14 o´clock.

The direct method was used to calculate the digestibility of fats in the studied feed rations with various proportions of poultry by-products (heads), and the indirect (differential) method was used to calculate the digestibility in the tested feed (*Lichvár et al.* 1969).

The results were processed mathematically and statistically.

Results and discussion

The digestibility coefficient of nitrogen in the basic feed ration was 81.09 ± 0.66%, in the feed ration with 33.0% poultry by-products (heads) it was 80.77% ± 0.73%, in the feed ration with 43.6% of the tested feed it was 81.25 ± 0.63%, and in the feed ration with 55.3% it was 76.94 ± 0.95%. The results show that the digestibility of nitrogen in the basic feed ration and in feed rations with increased proportion of the tested feed up to 43.6% are approximately on the same level, namely from 80.77% to 81.25%, and it is confirmed also by their statistical insignificance. However, with further increase of the tested feed to the level 55.3% out of the original matter there was observed a marked decrease of nitrogen digestibility to the level 76.94%, and the statistical significance of differences on the level of significance $P < 0.01$ was confirmed compared with the above mentioned three feed rations.

Table I. Feed rations for mink (g/ 418 kJ ME)

Feed	basic feed rations	poultry * byprod-ucts 33%	poultry * byprod-ucts 43.6%	poultry * byprod-ucts 55.3%
Poultry byproducts (heads)	12.0	20.0	27.0	35,0
Beef meat	32.0	27.0	25.0	20.0
Fish byproducts (mackerel)	5.0	5.0	1.5	0.8
NOR II.	6.0	6.0	6.0	6.0
Dried milk	1.0	1.0	0.8	0.3
Plastin MD (g / animal / day)	5.0	5.0	5.0	5.0
Roboran H (g / animal / day)	0.2	0.2	0.2	0.2
Vitamin C (mg / animal / day)	40.0	40.0	40.0	40.0
Vitamin B (g / animal / day)	0.3	0.3	0.3	0.3
Total (g / animal / day)	173.0	182.0	186.0	190.0
ME (kJ / animal / day)	1254.0	1254.0	1254.0	1254.0
Dig. nitrogen (g / 418 kJ ME)	8.32	8.35	8.30	8.43
Dig. fats (g / 418 kJ ME)	5.01	5.13	5.23	5.30
Dig. carbohydrate (g / 418 kJ ME)	4.01	4.01	3.95	3.81

- * % proportion of poultry by-products (heads) was calculated in original matter
- NOR II. - coarse meals for carnivorous fur animals
- Roboran H - vitamin and mineral premix
- Plastin MD - mineral premix

The coefficient of fat digestibility was in the basic feed ration 89.88 ± 0.28 %, and in feed rations with increased proportion of the tested feed 92.31 ± 1.19 %, 91.74 ± 0.20 %, and 94.22 ± 0.42 %, respectively. Significant differences of fat digestibility were noticed between the basic feed ration

and the tested feed rations ($P < 0.01$), and between the tested feed rations ($P < 0.01$).

As opposed to the digestibility of nitrogen in the tested feed rations an increase of digestibility of fat was found to be in dependence on the proportion of the tested feed in the rations, namely from 89.88 % to 94.22 %. It is confirmed by the significance of statistical differences between the basic feed ration and the tested feed rations, and between the tested feed rations ($P < 0.01$).

The digestibility of nitrogen in poultry by-products (heads) was as follows: with 33.0 % - 80.14 ± 2.42 %, with 43.6 % - 81.45 ± 1.75 %, and with 55.3 % - 73.58 ± 1.31 %.

The results show that the digestibility of nitrogen in the tested feed by analogy with the digestibility of nitrogen in the tested feed rations with a higher proportion of poultry heads to 43.6 % are on the same level (80.14 - 81.46 %) which is confirmed also by their statistical insignificance. An further increase of the proportion of the tested feed in the rations to 55.3% decreased significantly the digestibility of nitrogen in the tested feed ($P < 0.01$).

The digestibility of fats in poultry by-products (heads) was approximately on the same level 97.24 ± 1.11 % or 94.15 ± 0.80% and 97.73 ± 0.60%.

If poultry by-products are fed to the animals it is necessary to take into account that the coefficient of nitrogen digestibility decreases markedly when included at a rate higher than 55 % in the ration. The high content and high digestibility of fat cause the frequent occurrence of fat degeneration in the liver of fur animals reared in our conditions.

Table II. Basic variance statistical characteristics of digestibility of nutrients in feed rations for mink (%)

Nutrients	x	s_x	v%	x	s_x	v%	x	s_x	v%	x	s_x	v%
	A_1	n =	25	A_2	n =	25	A_3	n =	25	A_4	n =	25
N	81,09	0.66	4.09	80.77	0.73	4.51	81.25	0.63	3.87	76.94	0.95	6.20
Fats	89,88	0.28	1.57	92.31	1.19	1.02	91.74	0.20	1.09	94.22	0.42	2.23

A_1 basic feed rations
A_2 33.0% poultry by-products (heads)
A_3 43,6 % poultry by-products (heads)
A_4 55,3 % poultry by-products (heads)

Tab. III. 2 - way variance analysis with selected comparisons of digestibility of feeds

Nutrients		Groups A	Days/groups P	Animals B	Interaction AB	Error BP:A	Significant comparisons of groups	F (f_1, f_2) $F_{0.05}$ $F_{0.01}$
N	f	19 3	16 80	4	12	64		A 3.239 5.292
	MS	106.0594	10.9836	24.1647	50.3602	7.638		B 2.513 3.622
	F	9.656^{+}		3.1636^{+}	6.5932^{++}		4:(1,2,3)++	
Fats	MS	79.9617	2.3141	6.3700	6.0813	0.9830		AB1.904 2.471
	F	34.555^{++}		6.480^{++}	6.187^{++}		1:(2,3,4)$^{++}$, 4:(2,3)$^{++}$	

Table IV. Digestibility of nitrogen and fats in tested feeds

Nutrients	x	s_x	x	s_x	x	s_x	Significant comparisons of groups
N	33.0%	(A_2)	43.6%	(A_3)	55.3%	(A_4)	
	80.14	2.42	81.45	1.75	73.58	1,31	$2:4^{+}$ $3:4^{++}$
Fats	97.24	1.11	94.15	0.80	97.73	0.60	$2:3^{+}$ $3:4^{++}$

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Dogfish *(Squalus acanthias)* and dogfish silage as feedstuffs in growing-furring diets for mink *(Mustela vison)*

K. 1. Rouvinen, D. M. Anderson, S. R. Alward

A production trial was carried out with 120 mink *(Mustela vison)* of standard genotype to demonstrate the effects of dogfish (DF) and dogfish silage (DFS) on growth and fur development from weaning until pelting. The experimental treatments were 1) Control, 2) DFI 5%, 3) DF30%, 4) DF45%, 5) DFS 1 5%, and 6) DFS30%. The test ingredients were used to replace the haddock-herring (35%:10%) mixture in the Control diet at percentage levels indicated by the diet group designation. The rest of the diet was compounded of 10% beef tripe and lungs, 8% poultry offal, 10% cereal, 5% corn gluten meal, 0-2% vegetable oil, 0.4% vitamin-mineral premix and water. All diets guaranteed the females' normal body weight gain during the trial. The males receiving the dogfish test diets had significantly poorer growth compared with the males in the Control group. Two males of the DF30% group also developed rickets. The incidence of cotton fur syndrome in the experimental groups was: Control, 0/20; DF 15%, 6/20; DF30%, 7/17; DF45%, 0/19; DFS 15%, 2/18; and DFS30%, 3/17 pelts produced. Acid ensiling of dogfish was shown to reduce the incidence of cotton fur in the mink but also produced an increased trend in the occurrence of enteritis in the females. Based on the hematology results and tissue iron store analysis, impaired iron metabolism was demonstrated in the DF15-30% and DFS15-30% groups. It can be concluded that the anti-nutritional factor, trimethylamine oxide (TMAO), present in dogfish reduced iron absorption in most of the experimental groups and resulted in disturbances in the fur development of the mink. The absence of cotton fur in the DF45% group is likely due to greater ammonia formation in the feed thus preventing TMAO degradation by thiamine oxidase. The improved iron store status in the mink fed the DF45% diet compared with the Control and other dogfish test groups may be explained by the chelating effect of polyamines on iron consequently enhancing its absorption.

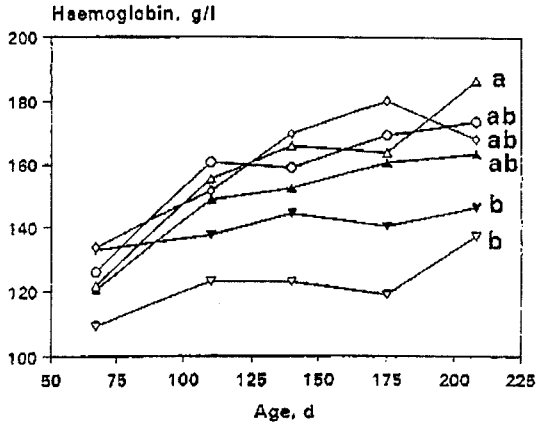

Fig. 1. Haemoglobin values of male mink fed experimental diets from weaning until pelting. Group symbols: –O– Control, –□– Dogfish 15%, –▽– Dogfish 30%, –◇– Dogfish 45%, –▲– Dogfish silage 15%, and –▼– Dogfish silage 30%. *a-b*: significant differences between groups ($P < 0.05$).

Can. J. Anim. Sci. 78, pp. 189-197, 1998. 5 tables, 1 fig., 37 refs. Authors' summary.

Effects of high dietary levels of silver hake and Atlantic herring on growing-furring performance and blood clinical-chemistry of mink *(Mustela vison)*

K. 1. Rouvinen, D. M. Anderson, S. R. Alward

An experiment was conducted with a total of 168 mink *(Mustela vison)* of the standard black genotype to determine the effects of dietary silver hake *(Merluccius bilinearis)*, silver hake silage and herring *(Clupea harengus)* on the growing-furring performance. There were seven dietary groups. The control diet (CONTROL) contained 40% haddock offal, 8% poultry offal, 15% beef tripe and lungs, 5% corn gluten meal, 12% extruded wheat, 0.4% vitamin-mineral premix, and water. Test diets were made by replacing the fish offal with 15 or 30% hake (HAKE 15, HAKE 30), hake silage (SILAGE 15, SILAGE 30) or with 40% herring (HERRING 40). The last dietary group (HERR/CONT) was fed alternatingly with the CONTROL or the HERRING 40 diets. The

animals in the HERRING 40 group developed anorexia after 2 wk on the test diet and were injected with vitamin B complex. The diet was supplemented with thiamine, 25 mg kg^{-1} feed. This restored appetite and supported normal growing-furring performance. Mink fed HAKE 30 diet had a lower weight gain from weaning until pelting (males 814 ± 58.0 g, females 366 ± 53.6 g) than the CONTROL (males 987 ± 61.9 g, females 429 ± 52.1 g)($P < 0.05$). Blood hemoglobin (Hb) values for all groups were on average 178 ± 4.4 g L^{-1} in September and 184 ± 7.0 g L^{-1} in October, i.e. well above the critical level to prevent the development of cotton fur. However, the total amount of iron stored in spleen and liver was lower for the HAKE 30 (562.1 ± 85.1 µg) and SILAGE 30 (435.9 ± 77.7 µg) groups than in the CONTROL (800.7 ± 77.7 µg) ($P < 0.05$) possibly indicating impaired absorption. No signs of poor pigment development were seen in the underfur of the winter pelage. Both silver hake and herring show good potential as alternative feedstuffs in growing-furring diets for mink. At high inclusion levels the effects of thiaminase enzyme in herring and the iron-binding trimethylamine oxide in silver hake should be accounted for.

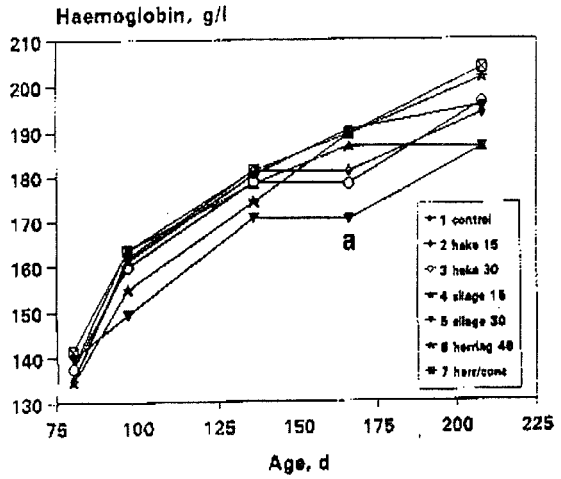

Fig. 3. Blood haemoglobin values of male mink during the growing-furring period. a: SILAGE 30 group differs from the CONTROL group ($P = 0.052$). Total number of observations $N = 42$.

Can. J. Anim. Sci. 77, pp. 509-517, 1997. 5 tables, 3 figs., 27 refs. Authors' summary.

Effects of Dietary Exposure to 2,3,7,8-Tetrachlorodibenzo-p-dioxin in Adult Female Mink *(Mustela vison)*

J. R. Hochstein, S. J. Bursian, R. J. Aulerich

Adult female mink were fed diets supplemented with 0, 0.001, 0.01, 0.1, 1, 10, or 100 ppb 2,3,7,8-tetrachlorodibenzopdioxin (TCDD) for up to 125 days. There was a dose-dependent decrease in feed consumption and body weights indicative of the "wasting syndrome" previously reported for mink and other species exposed to chlorinated hydrocarbon compounds. Mortality reached 12.5, 62.5, and 100% by day 28 in the 1 -, 10-, and 100-ppb groups, respectively, and by day 125, mortality increased to 62.5 and 100% in the I- and 10-ppb groups, respectively. Adrenal gland weights were significantly greater in the three highest dose groups compared to the control group. The percentage of band neutrophils was also significantly greater in the TCDD-treated groups compared to the control. LC_{50} (±SE) values for 28 and 125 days of dietary exposure to TCDD were calculated to be 4.8 ± 4.99 ppb and 0.85 ± 0.64 ppb, respectively. Based on feed consumption of control mink, these LC_{50} concentrations approximate 0.264 and 0.047 µg TCDD/kg body weight/day for the 28- and 125-day exposure periods, respectively. These results confirm the sensitivity of mink to TCDD.

Arch. Environ. Contam. Toxicol. 35, pp. 348-353, 1998. 5 tables, 25 refs. Authors' summary.

Original Review

Selection for increased welfare

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Introduction

Focus on the welfare of domestic animals has increased in recent years, but traits related to welfare can be difficult to record (health and behaviour) and to deal with statistically and have not traditionally been included in breeding programmes. Both of these areas have developed significantly thus making it possible to consider welfare in the selection to a higher degree than before. In this article we will show that selection is of importance to the welfare of the production animals and present results and project plans within the fur area concerning selection and welfare.

Selection and welfare

Selection for specific traits is possible since in most species there is genetic variation influencing different traits, e.g. enzyme activity, size of the animal, colour type etc. Domestic animals are often selected for traits related to production economy, e.g. growth rate in relation to feed intake. A general assumption based on several studies is that animals selected for high performance are more prone to behavioural, physiological and immunological problems (*Rauw, 1997*). This is known from several livestock productions, examples being the leg problems of chickens and pigs as an adverse effect of intense selection for growth rate, meat percentage and feed efficiency (*Jørgensen, 1997*), and problems in dairy cows such as of mastitis, ketosis and diseases correlated with a high milk yield (*Simianer et al., 1991*).

Furthermore, selection for a specific trait may directly or indirectly result in inadvertent changes in other, both physical and behavioural, traits. Regarding fur animals, certain colour types of mink have an increased incidence of different defects, e.g. "screw-neck" in lines of pastel, "bleeder" tendencies and increased susceptibility to bacterial and viral infections, such as plasmacytosis in types with a recessive Aleutian gene, and the white "Hedlund" mink which is deaf as adult and whose ability to care for its kits may be reduced (*Nes et al., 1988*). Further, the big mink kits with a high growth rate have a higher incidence of "welfare disease" (*Brandt et al., 1990*). If animals are selected for traits in one specific production system, a major alteration of the production may make the animals appear less adapted. An example is a change in the nesting behaviour of egg-laying hens selected for the cage system

(Kjær, 1995) where the animals ability to adapt to a new production form with outdoor areas may be reduced when they have to search for nests for laying eggs.

Besides the common production traits, several studies have shown that it is possible to select directly for different types of behaviour. Since the behaviour of an animal involves many aspects, genetic selection can have many directions; e.g. feather pecking where the heritability $(h^2)^a$ to perform this behaviour was up to 0.38 in laying hens which could form the basis for production programmes for selection against this and thus increase the welfare of the animals *(Kjær & Sørensen, 1997)*. Studies of several species have shown that their reaction towards humans is to a certain extent influenced by heriditary factors; a number of results are available for mice and rats, but correlations have also been described for silver foxes *(Belyaev & Trut, 1987)* and mink *(Hansen, 1996)*.

Besides artificial selection through the successive selection of breeding animals, a sort of automatic "natural" selection for adaptability can take place as animals poor adapted to the production system (incl. management) may leave less descendants.

Correlations between genetics and welfare in fur animals

In the fur production, research in the genetic background for behaviours which are thought to be linked to welfare has especially been studied in two areas: 1. Undesirable behaviours and 2. Temperament in a broad sense.

1. Undesirable behaviours

Behaviours which give an impression of reduced welfare (e.g. apathy, hyperactivity, stereotypies) and/or impair the production result (e.g. infanticide, fur chewing) are undesirable in the production.

The frequency of stereotypic behaviour is dependent on the environment while the tendency to perform stereotypic behaviour is assumed to be hereditary in mink *(Jeppesen et al., 1990)* even though one study could not prove clear correlations between the stereotypies of the mother females and those of the kits *(Hansen, 1993)*.

Another type of unwanted behaviour seen in mink is the chewing/sucking of their own or other's fur *(De Jonge, 1988)*. On Test Farm South of the Danish Fur Breeders Research Centre, two lines have been created where the breeding animals were selected for/against neck chewing, and after few generations in the same environment, clear differences between the lines with regard to neck, body and tail chewing were evident *(Nielsen & Therkildsen, 1994; Nielsen, 1996)*. Although the selection was based on neck chewing, the following generations of the fur chewing line showed a clearly increased tendency to body chewing (Figure 1).

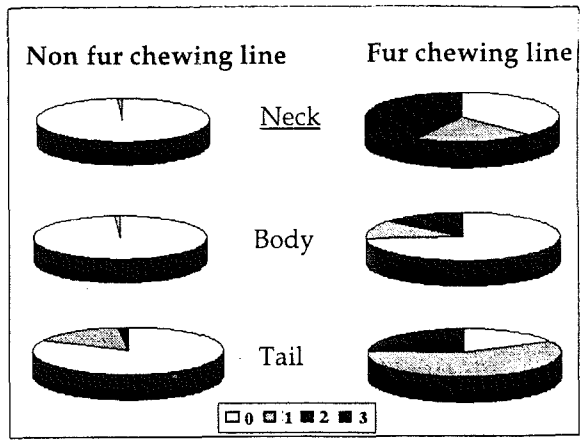

Figure 1. Fur chewing in mink, offspring from breeding lines selected against and for neck chewing on Farm South, scored in November 1995. 194-198 animals per group.
Chewing class 0: nothing, 1-3: increasing degree of fur chewing.

[a] heritability – h^2 indicates the proportion of the total variation that is due to genetic effects.

It has not been possible completely to eradicate this unvanted behaviour, and at the same time several studies have shown that the environment (e.g. age at weaning, housing conditions) plays an important role in the development of fur chewing (*De Jonge, 1988; Mason, 1994; Malmkvist et al., 1996; Hansen et al., 1997*), while allergy to straw in the mink selected for fur chewing is not a releasing factor (*Malmkvist & Hansen, 1997*).

2. Temperament

Research in silver foxes (*Belyaev & Trut, 1987*) and mink (*Trapezov, 1987; Hansen, 1996*) has shown that it is possible to select for hereditary behaviour towards humans. Such studies are carried out at farm level on farm foxes (both blue and silver) in Denmark, Norway and Finland. The reason for selecting fur animals for temperament has been a wish to improve the production and the welfare of the animals. Correlations between temperament and reproduction have been documented in several domestic species, the selection for tameness in silver foxes has led to a number of behavioural, physiological and morphological changes that generally result in a higher fertility (*Nauemenko & Belyaev, 1980; Kolsnikova et al., 1985; Osadchuk, 1992*), and studies of pig herds have shown a negative correlation between sows' level of fear towards humans and their reproduction results (*Hemsworth & Coleman, 1996*). Besides the obvious economic importance, a poor reproduction (mating and birth problems, mortality of young animals etc.) has been used as a general sign of reduced welfare in a given production system. Furthermore, fearful or aggressive animals will typically be more difficult to handle, and the keeping of these can be in conflict with our ethical ideas/concepts, cf. the Law of Prevention of Cruelty to Animals, paragraph 1, stating that "animals should be treated properly and protected in the best possible way against pain, suffering, fear, permanent injury and considerable inconvenience".

At the Danish Institute of Agricultural Sciences, the selection for temperament in mink continues, and there are today two breeding lines of mink showing consistent differences in their fear/confidence towards humans (Figure 2). The selection of breeding animals is based on two tests: 1) the stick test and 2) the Trapezov hand test (described in *Malmkvist, 1996*). Besides the original stick test, the Trapezov hand test was included in 1995 with the purpose of increasing human contact in the test situation thus obtaining a better graduation and basis for the selection of especially the trusting mink.

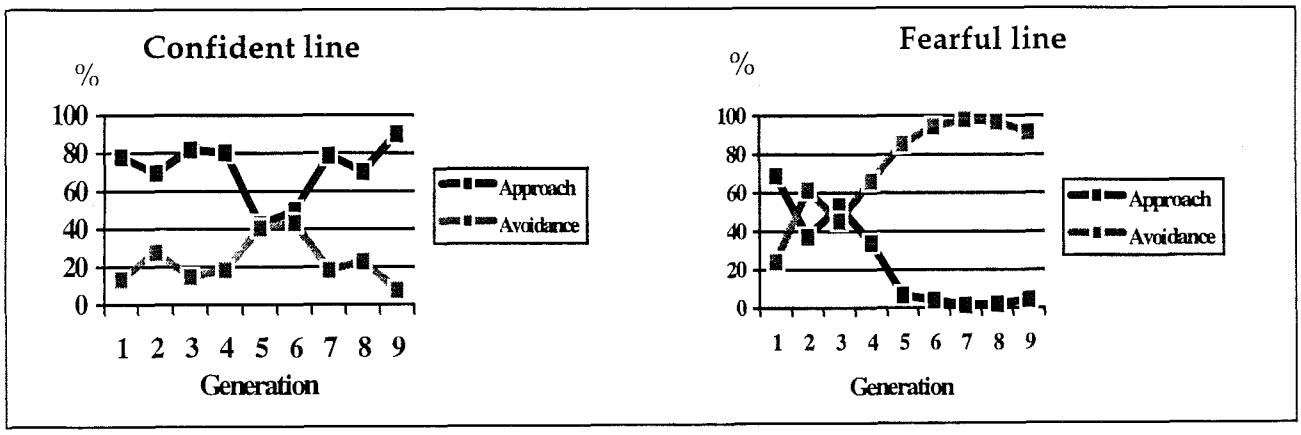

Figure 2. The stick test result (% reacting with approach or avoidance towards humans) in kits from two breeding lines of mink selected for temperament towards humans. Generation 1 = 1988, 9: 1996. Average of 3 tests in September – December.

It is important to understand to what extent the reaction towards humans can be generalised to other situations in order to be able to estimate the effect on the welfare of the mink. Previous studies have shown that not only is the reaction of the mink lines towards humans different, but also their reaction towards a new object and an unknown conspecific (intruder mink) placed in a cage *(Hansen, 1997)*.

Besides behaviour, physiological recordings and collection of reproduction and production data from temperament mink have taken place since 1988. The fearful mink react with a higher cortisol response after handling in connection with blood sampling compared to the confident mink *(Hansen, 1997)*. Furthermore, pulse, temperature, and urine cortisol are measured in animals from the two lines exposed to different types of stress in a current collaborative project between the Institute of Zoology, University of Copenhagen and DIAS. Reproduction (mating time, mating behaviour, kit mortality, kit production, weight of kits and dam) and fur quality have been closely followed in the two lines. In 1996 after 8 years of selection for temperament, the confident mink could be mated earlier, probably because oestrus occurred earlier, while the selection had not yet brought about significant differences in kit production *(Malmkvist et al., 1997)*. New projects have been planned for the coming years with the purpose of gathering further knowledge of fear behaviour and the adaptability of the animals in connection with selection based on temperament. It is for example important to find out whether the animals have actually obtained a better welfare as a result of the temperament selection, or whether they are merely not able to express a given behaviour.

A five-year project on maternal abilities has just been initiated as a collaborative effort between DIAS and the Danish Fur Breeders Research Centre. The background is the continuous selection for bigger litters and faster growing kits involving an increasing strain on the female. This is expected to result in decreased welfare for the female in the form of increased weight loss, negative energy balance and increasing mortality. Selection for litter size and kit growth has been initiated, partly based on the kits' own growth ability, partly on the female's ability to determine the kits' growth. In these selecetion lines, the correlated change in welfare-related traits, such as the female's weight loss and behaviour and mortality among kits and females, will be registered with the perspective to develop viable breeding plans considering both productivity and welfare.

Discussion

If the society/the producers want selection for increased welfare, it would be relevant to discuss how to define breeding goals and how to balance the interaction between environment/management and selection. By way of example, if the traditional cage system for mink should be changed to for instance family cages, it may be necessary to define new breeding goals.

Selection for increased welfare will in practice depend on the species and the production system in question. Breeding goals have typically been based on the most important economic characteristics such as growth, milk yield and size. Several examples show, however, that these breeding goals have resulted in reduced welfare. Consequently, it seems necessary to investigate how productivity and welfare combined can be included in future breeding goals. Animal welfare should be included partly because of the immediate economic importance (costs in connection with disease, and reduced reproductive success), partly to obtain a viable development in productivity, including the consideration of demands from society.

In general, welfare can be influenced by selection or by changes in the environment (management, feeding, housing). Often both strategies are used, in other cases one strategy is to be preferred to the other. It will be possible to eradicate/control diseases either by an eradication programme (e.g. plasmacytosis), vacci-

nation or by selection. These strategies deviate both in their effectiveness, time lag and costs depending on the disease in question. Immediate changes in behaviour can be obtained by changing housing or management (e.g. handling). Selection will only slowly, but permanently, influence the behaviour of a population. It should be considered how far one is willing to go to change the animals to fit the production system compared to changing the production system to fit the animals.

Wiepkema (1994) recommends that behaviour is included as a selection criterion when considering the welfare of the mink. Such initiatives are currently being carried out on an experimental basis with regard to temperament in mink, silver and blue foxes and maternal abilities in mink. However, the resulting behaviour will also depend on the environment, therefore the selection for better adapted animals cannot stand alone but has to be combined with an appropriate production environment. It is furthermore important through research to extend the knowledge of the correlation between behaviour (e.g. fear), adaptability and welfare in order to determine to which extent we actually select for increased welfare.

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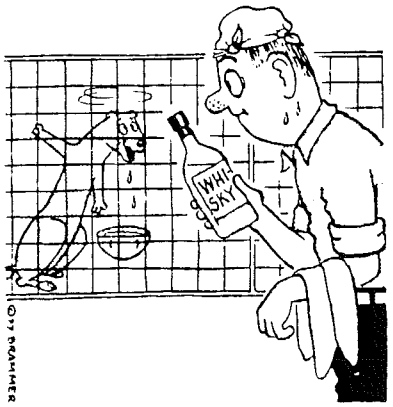

Mink 5S rRNA genes map to 2q in three loci suggesting conservation of synteny with human lq

K. Christensen, B. Lomholt, C. Hallenberg, K. V. Nielsen

By in situ hybridization we show that the 5S rRNA genes in the mink map to chromosome 2q in three loci. The 2q1.1 locus containing 34% of the 5S rDNA maps close to the centromere, and the remaining two loci of the 5S rDNA map to 2ql.3 (52%) and to 2q2.3. (14%). These data were obtained with a tritiated transcript of the 5S rRNA gene containing 121 bp. In a comparative FISH study performed with a biotinylated transcript of the 5S rRNA gene the procedure failed to detect the 2q2.3 site. A closely corresponding difference between the two procedures experienced previously in man and in the crab-eating macaque is discussed. The present results suggest a homology between 2q in the mink and part of Iq in man harbouring the 5S rRNA genes in 1q42.13 and 1q31, respectively.

Hereditas 128, pp. 17-20, 1998. 2 figs., 15 refs. Authors' summary.

Zoo-FISH analysis: the American mink *(Mustela vison)* **closely resembles the cat karyotype**

H. Hameister, Ch. Kiett, J. Bruch, Ch. Dixkens, W. Vogel, K. Christensen

The 24 human chromosome-specific DNA probes were used to visualize segments of conserved synteny on metaphase chromosomes of the American mink *(Mustela vison).* A comparison with the hitherto known gene mapping data shows a high degree of correspondence.

The human chromosomes were found conserved in only 34 segments of common synteny. The mink arrangement proved to be very similar to the arrangement found in the cat, thus corroborating the well-known high karyotype conservation described for Feloidea.

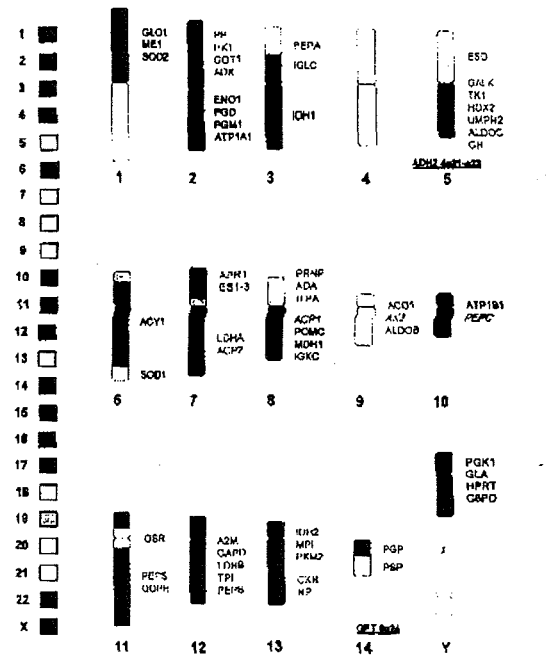

Fig. 3. Summary of the Zoo-FISH analysis with all 22 human autosomal and the X chromosomal DNA library on the mink karyotype. The human Y chromosomal DNA library gave no signal and, hence, no signal was observed on the mink Y chromosome. Mapping data for genes where the human homologue has been mapped are given to the right of each chromosome. For reference of the chromosomal localization, see Serov & Pack (1993) for mink and the last GDB version for human. Two mink localizations, ADH2 and GPT, do not fit the painting results. The human localizations for both genes are added in black.

Chromosome Research 5, pp 5-11, 1997. 2 tables, 3 figs., 19 refs. Authors' abstract.

Molecular cloning of the bile salt-dependent lipase of ferret lactating mammary gland: an overview of functional residues

Véronique Sbarra, Nadine Bruneau, Eric Mas, Margit Hamosh, Dominique Lombardo, Paul Hamosh

Ferret lactating mammary gland bile salt-dependent lipase (BSDL, E 3.1.1.-) has been cloned by RT-PCR. The open reading frame consists of 1869 nucleotides which encode 623 amino acids of the functional enzyme. When compared to other species, the greatest homology is observed between residues 1 and 484, with little or no homology at the C-terminal end where seven repeated segments of similar sequence are located. Ferret mammary gland BSDL retains residues involved in the active site and the tentative heparin binding site at similar positions in comparison to other milk or pancreatic BSDL. Other important items, such as binding peptide to chaperone molecular, phosphorylation site(s) or bile salt binding sites, were also tentatively located in well conserved regions of seven available BSDL sequences.

Biochimica et Biophysica Acta 1393, pp. 80-89, 1998. 2 tables, 3 figs., 45 refs. Authors' abstract.

Original Report

Concentration of hormones and related substances in blood plasma of domestic nutria: the effect of blood sampling

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Summary

The aim of this study was to determine the presence and level of endogenous substances (steroid and thyroid hormones, growth factors, growth factor binding protein and cyclic nucleotide) in blood circulation of domestic nutria, and to understand whether these levels are affected by repeated blood collection.

Blood plasma of sexually mature female domestic nutria was collected daily for 7 days. Concentration of insulin-like growth factor I (IGF-I), insulin-like growth factor binding protein 3 (IGFBP-3), triiodothyronine (T3), thyroxine (T4), progesterone (P), estradiol (E), and cyclic nucleotides (cAMP, cGMP) in collected plasma was measured using RIA/IRMA. Substantial amounts of these substances in nutria blood plasma were detected. The level of IGF-I varied in range of 180-250 ng/ml plasma, IGFBP-3 - 24-29 ng/ml, T3 - 3-8 ng/ml, T4 - 50-80 ng/ml, P - 8-18 ng/ml, E - 700 -1700 pg/ml, cGMP varied from 0.2 to 8.5 pM, whilst cAMP was near marginal to detectable level. Multiple blood sampling produced a significant increase in P, E, decrease in IGFBP-3, T3, T4 and cGMP, but did not influence IGF-I and cAMP plasma level. These observations suggest the presence of growth factor, growth factor binding protein, thyroid and steroid hormones and cyclic nucleotides in the general circulation of nutria. Numerous blood samplings can significantly influence plasma levels of most of the substances studied in this species. This fact should be taken into account in further endocrine studies on this species.

Introduction

Nutria (coypus, Myocastor coypus Mol.) is a semiaquatic rodent originating from the wetland of South America. Domestic nutria is a well known and widely used species of fur animal, which is kept and bred in farm conditions. The fertility rate of this animal in farm

Results and Discussion

It was observed that plasma of domestic nutria females contains significant amounts of IGF-I, IGFBP-3, T3, T4, P, E, and cGMP. The presence of low amounts of cAMP was also demonstrated. The level of IGF-I varied in the range of 180-250 ng/ml plasma, IGFBP-3 - 24-29 ng/ml, T3 - 3-8 ng/ml, T4 - 50-80 ng/ml, P - 8-18 ng/ml, E - 700-1700 ng/ml, cGMP varied from 0.2 to 8.5 pM (Fig. 1a-g), whilst cAMP content was near the detectable limit of the assay (0.3-0.8 nM, data not shown). This is the first report on production of growth factors, growth factor binding protein, thyroid hormones, estrogen and cyclic nucleotide in this species. The presence and concentration of substances detected in nutria plasma are comparable to those reported previously in rats and mice. Therefore, these hormones and growth factors in nutria may play a similar role in the control of metabolism and reproduction, as in other rodents studied previously (*Hillier, 1991, Giudice, 1992, Leung and Steele, 1992, Erickson and Danforth, 1995*).

It was shown that multiple blood sampling produced changes in the content of most of these substances in blood plasma. Most of the blood samples collected at the 2nd-7th day of the experiment contained significantly lower IGFBP-3, T3,T4 and cGMP levels (Figs. 1b, 1c, 1d, 1g) than the samples from the first collection. On the other hand, multiple blood sampling produced a significant increase in P and E concentration (Figs. 1c, 1f, 1g). No substantial changes in plasma IGF-I (Fig. 1a) and cAMP (data not shown) levels during the experiment were observed. For most of the substances the 3rd sampling (IGF-I, T3) or the 4th sampling (E, IGFBP-3) were crucial, when the level was minimal, but during the following collections these contents returned to the starting level, suggesting a switching on of an adaptive mechanism in response to blood sampling. These data suggest that the chronic sample collection and/or related procedures accompanying it can influence the plasma concentration of most of the hormones and other substances analyzed. Changes in levels of different hormonal substances indicate interrelationships between them and suggest the existence of a general mechanism of mediating and integrating such changes.

It is possible, that the animals respond to stress due to numerous immobilizations, anesthesy and bleeding. This hypothesis would be verified in future by measurement of adrenal corticosteroid, which is the generally accepted index of stress (*Munk and Naray-Fejes-Toth, 1995*). If stress in these animals will be confirmed, our data could suggest the involvement of P,E, T3,T4, EGF, IGFBP-3 and cGMP in stress response. Moreover, it was observed that numerous blood samplings produced a sharp decrease in the concentration of cGMP – one of the mediators of steroid action (*Sirotkin & Nitray, 1993*) and peptide hormones and gonadotropins (*Hillier, 1991; Leung & Steele, 1992*). These observations may suggest a stress-induced inhibition of cyclic nucleotide production and/or activation of the phosphodiesterase system and reflect the reduction in response of the organism to hormonal signals. Thus, nutria can be a suitable model for study of stress and its mechanisms.

Steroid and thyroid hormones, growth factors, their binding proteins and cyclic nucleotides are known regulators of growth and reproduction (*Hillier, 1992, Guidice, 1992, Leung and Steele, 1992, Erickson and Danforth, 1995*). Therefore the influence of chronic blood collection on these processes might be suggested. Interrelationships between analyzed substances, stress and other physiological processes in domestic nutria remain to be investigated. In any case, the changes in the concentration of these substances should be taken into account in case of repeated blood collection and during further endocrine studies on this species.

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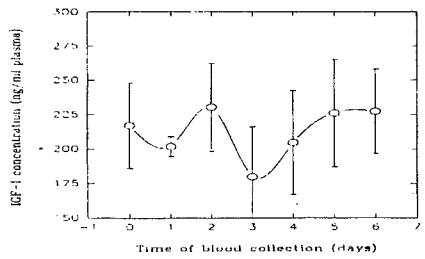
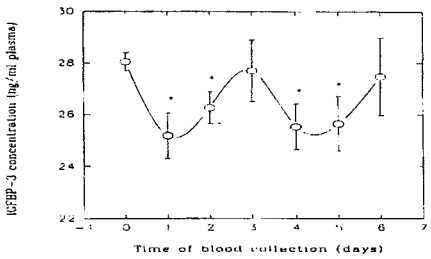
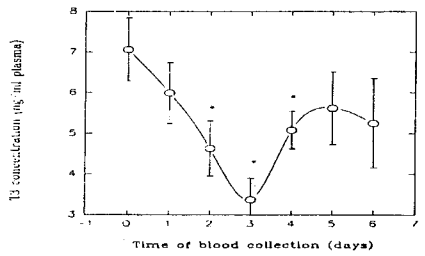
A. Effect of blood collection on plasma IGF-I level in nutria



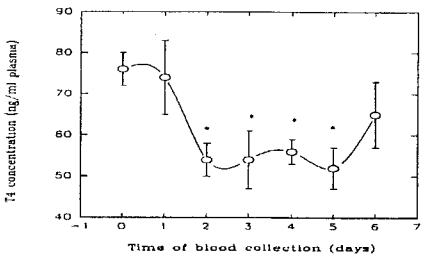
B. Effect of blood collection on plasma IGFBP-3 level in nutria



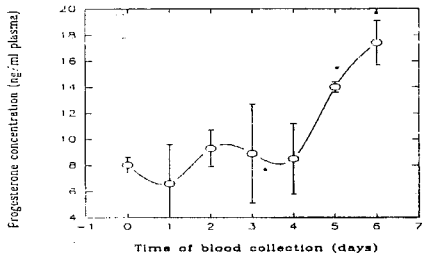
C. Effect of blood collection on T3 level in nutria blood plasma



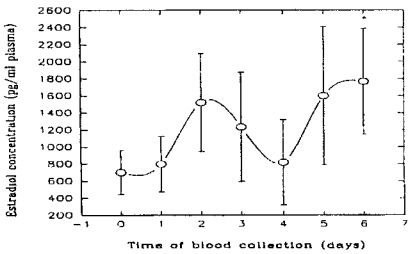
D. Effect of blood collection on plasma T4 level in domestic nutria



E. Effect of blood collection on plasma progesterone level in domestic nutria



F. Effect of blood collection on plasma estradiol level in domestic nutria



G. Effect of blood collection on plasma cGMP level in domestic nutria

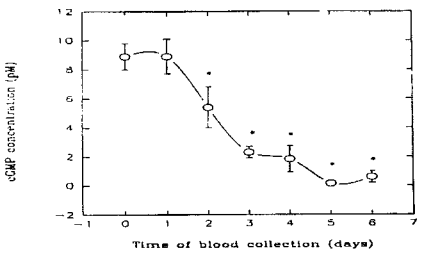


Fig. 1. Concentration of IGF-I (a), IGFBP-3 (b), T3(c), T4(d), P(e), E(f) and cGMP (g) in plasma of female domestic nutria during chronic blood collection. Values are means+-S.E.M.,
* - significant ($p<0.05$) differences with control (first blood collection)

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Original Report

Analysis of the causes of mortality in newborn farmed foxes with emphasis on the influence of infectious agents

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Summary

Studies were carried out on farms of breeding foxes in Poland in which extremely high neonate mortality was observed. Microbiological examinations showed the influence of infections with different bacteria, such as *Escherichia coli, Staphylococcus aureus, Streptococcus sp.* on newborn fox survival rates. No viral infections including canine parvoviruses and parvoviruses were found. *Toxocara canis* larvae were not detected. Mycoplasmas isolated from lungs should be taken into consideration as potential causative agents of interstitial pneumonia, which was found in all of examined cubs. Besides infectious agents feeding errors of pregnant vixens were noted in most of the farms which resulted in poor reproductive results.

Introduction

The mortality of newborn farmed foxes in recent years became a big problem in Polish fox farms, significantly decreasing the reproduction rates. Because of this there was a need for a wide study of this problem. Losses of the young foxes between birth and weaning are relatively high, on average about 25%, of which 50% happens in the first week of life (5). In spite of the role of feeding of pregnant vixens and other farm causes, genetic causes and cannibalism, which all have a great impact on survival rate, one can not avoid the influence of infectious agents. It is supposed that about 25 - 30% of the failures connected with sterility of females, abortions, stillbirth and neonate mortality is caused by bacterial agents. It is reported that the most common microorganisms are *Corynebacterium sp., Escherichia coli, Streptococcus sp.* (13, 14). Potentially dangerous for the newborn can be infection with *Brucella abortus, Leptospira interrogans* and *Listeria monocytogenes* (8, 20). The influence of viral infections on the newborn fox mortality is not exactly explained. But among parasitic infections a great role is played by intrauterine infection with *Toxoplasma gondii* (11).

The aim of the study was to estimate the range of the bacterial infections and chosen viral and parasitic agents in the losses of suckling foxes in the first days after birth as well as a wide analysis for the reasons of these losses.

Material and methods

Preliminary studies were done on 20 farms including 15 polar fox herds and 5 silver fox herds. Feeding and hygiene conditions were analysed as well as the health state of the herds

in the last two seasons. The newborn and the vixens were clinically examined. 275 necropsies of dead newborn were done (at least 10 from the farm). 140 dead newborns (2 - 9 litters from the farm) were bacteriologically examined. Liver, spleen, kidney and lungs were obtained for the bacteriological examinations. Material was inoculated into the following media: agar medium, blood agar, Mc Conkey and Sabourand medium and medium for salmonella isolation. Enterobacteriaceae were identified using biochemical series. Streptotest and Staphytest (LACHEMA) were used to identify isolated micrococci. Antibiotic susceptibility of the pathogens was made using Müller-Hinton medium.

Detail investigations were carried out on 25 newborn foxes which died in the first four days of life, derived from 3 polar fox farms and 2 silver fox farms. Results of the basic bacteriological examinations of these newborn were negative. The study was done to detect the following infectious agents: canine herpes virus (CHV), blue fox parvovirus (BFPV), Mycoplasma spp., Toxocara canis. Additionally histological examinations of the organs were performed.

In order to detect CHV infection two methods were used: direct immunofluorescence and isolation in the cell culture. IFT was performed on the frozen preparations of liver, kidney, heart and lung, which were dried and fixed in acetone. Slides with conjugate anti-CHV/FITC were incubated in the moist chamber at 37°C for 30 minutes. After washing in PBS buffer the slides were covered in glycerol mounting and looked at under the fluorescent microscope at magnifications 10 x 12.5, 10 x 25 and 10 x 50.

For the virus isolation the following cell lines were used: dog fibroma cells (A-72), dog kidney cells (MDCK), rabbit kidney cells (RK-13) and VERO. A 10% suspension of kidney, lung, and liver made in 0.9% NaCl buffer was filtered and centrifuged and the supernatant was the inoculum for the cell culture. The growth medium was Eagle's minimum essential medium (MEM), supplemented with 10% foetal bovine serum (FBS, Sigma), penicillin and streptomycin. The infected cell monolayers were cultivated in at 37°C. Every day the cultures were observed to detect cytopathogenic effect (CPE). The samples were passed 3 - 8 times.

The lungs of the dead newborn foxes were used to detect mycoplasma. The examination was performed using PPLO media (Difco). No species identification was made.

Presence of Toxocara canis larvae was determined with the use of the method by Baermann. Precisely crumbled organs (liver, lungs) were put into the Baermann apparatus with 0.9% NaCl and left there for 24 hours. Next the fluid was evaluated under the binocular.

Results and discussion

Both in the polar fox farms and silver fox farms the large number of females losing their litters in the first four days after birth were noted. The percentage of these vixens was 43.03% in polar foxes and 53.44% in silver foxes. The extreme results were in 4 farms: 82.00%, 80.00%, 78.33% and 71.76%. The survival rate described as a relation between the number of weaned cubs and the number born was 31.55% in polar foxes and 40.72% in silver foxes, respectively. Losses in the cubs mainly happened during the first four days after birth. The newborn were weak and not able to suckle.

In the necropsies the most common lesions (61.20% of cubs) noted in every farm was strongly congested lungs. In cubs from 8 farms fur depigmentation was observed and the internal organs were pale. Fluid in the body cavities, bleeding from the legs and haemorrhagic spots in the kidneys were found in a few of the examined infants.

The results of the bacteriological examinations were as below. A large number of *Escherichia coli*, mainly hemolytic strains, were found in the newborn from 5 farms. *Staphylococcus aureus* was noted in 3 farms as well as *Streptococcus pyogenes* and *Streptococcus viridans* in 1

farm, respectively. Large numbers in the pure culture of these bacteria was isolated from liver, spleen, kidney and lungs of all examined newborn from a certain farm. In 4 farms medium or poor isolation of mixed flora was found in some organs from some of the examined cubs. Mixed bacterial flora mainly consisted of: *Streptococcus spp., Staphylococcus spp., Escherichia coli* (non-hemolytic strains) and some *Enterobacter spp., Enterococcus spp.,* and *Klebsiella spp.* None of the bacteria were found in cubs from 6 farms.

Neither agalactia nor symptoms of any diseases were found in vixens from which the neonates were taken for detail examination. Only a single or a few colonies of mixed bacterial flora were isolated from vaginal swabs. The results of serological examinations for brucellosis and leptospirosis were negative. The low titres of antibodies anti-Listeria (1:20 - 1:160) were noted in some of vixens, but no Listeria was isolated from the organs of the newborn. The results of the examinations for parvovirus infection, both in the serological survey of vixens (using hemagglutination inhibition test) and virological examination of vixens and neonates (using ELISA, On-Side Biotech™) were negative. In some of the examined vixens, low antibody titres anti-CHV (1:20 - 1:80), with the use of direct IFT were found. In one farm antibodies anti-Toxoplasma gondii in titres 160 - 640 were detected.

The CHV was not isolated from any neonates. No CPE was observed, infected cell cultures did not morphologically differ from the control cells. No *Toxocara canis* larvae were detected in lungs and liver of newborn foxes. Positive results were obtained in examinations for *Mycoplasma spp.* infection. Mycoplasma were isolated from the lungs of 5 neonates from two farms.

Histopathologically, the most characteristic lesions were observed in the lungs of all the examined neonates. Interstitial pneumonia with focii of atelectasis and alveolar emphysema as well as hyaline degeneration in cases of more intensive lesions was found. The other organs were free from clear changes with the exception of adipose degeneration of the liver and early degenerative changes in kidney observed in a few cubs.

Microbiological examinations showed the big participation of bacterial agents in the mortality of newborn foxes. In 50% of the farms there were infections of neonates with *Escherichia coli, Staphylococcus aureus* or *Streptococcus sp.* Foxes were born weak and were probably infected during intrauterine life from asymptomatic infected mothers. There was possibly also infection in the genital tract during parturition. It was not possible to infect newborn with milk from the females because they did not suckle. The source of infection of the vixens was probably poor sanitary state of the feed. It should be said that on 3 farms there was a successful antibiotic therapy based on results of the bacteriological examinations and antibiograms. Chosen antibiotics, especially amoxicillin, were administered with the feed for at least last five days of pregnancy. Only the treated vixens had healthy litters. The same bacterial agents as isolated in our study were reported as a cause of newborn dog mortality. The author showed that the losses could be limited to less than 10% by improvement of the hygiene in combination with antibiotic therapy (17).

Negative results of vixens and cubs examinations for parvovirus infection confirm that BFPV infection is dangerous only in the first part of pregnancy in polar foxes. The fact was in conflict with Polish breeders. The lack of influence of BFPV on fox neonate mortality was also reported earlier (15, 19).

The character of postnatal fox mortality is reminiscent of the disease of newborn dogs caused by canine herpesvirus (6). Gross pathological and histopathological changes observed in newborn fox were similar to those described in CHV-infected dogs which died in the first hours of life (10). In spite of this resemblance, as well as low antibody titres in vixens, the negative results of the virological

examinations make it impossible to assent the CHV infection as a cause in foxes in the first few days after birth.

The influence of *Toxoplasma gondii* infection on fetus death, stillbirth and early mortality of cubs in foxes (3, 11) was reported. In one of the examined farms antibody titres from 1: 160 to 1:640 were detected with the use of direct IF method. In dogs a titre 1: 64 using CFT is considered to be positive (7). Direct IFT is comparable to other serological methods and is considered as a relatively sensitive test (3). Titres higher than 1:256 are classified as high in this method (1). It can be suspected that there was an influence of *Toxoplasma gondii* infection on the poor reproductive results in the mentioned farm. Toxoplasmosis may be a dangerous problem in Polish fox farms, but there is a lack of knowledge studied on this subject.

Analysing the reproductive losses in fox farms it should be said that some feeding errors were noted on most of the farms. Especially the connection between the lack of iron in the pregnant vixen diet and newborn cub mortality was shown. On 6 farms fur depigmentation was observed and mucosal membranes and visceral organs were pale. These changes were resembling those frequently described in mink and foxes as "cotton fur" disease (18). Iron deficiency was probably one of the main causes of death of cubs in those farms. It was reported that too high fat: carbohydrate ratio in pregnant vixens diet leads to decrease of glucose level in blood plasma. Lack of the main source of energy results in the birth of weak litters (2). Extremely high levels in the diet of pregnant vixens was found on 4 of the examined farms and additionally adipose degeneration of liver in the newborn was observed, which may suggest the influence of excess fat on newborn fox survival.

Histological changes observed in lungs of neonates were similar to those described in human and some animal infants with immaturity of lungs connected with surfactant deficit (12). Feeding during pregnancy can seriously impact on synthesis of surfactant, mainly phospholipids in the fetal lung (9). There are no reports about surfactant in fox infants and in spite of the characteristic lesions in the lungs it is not possible to suggest the influence of feeding errors noted in examined farms on lung immaturity in neonates which resulted in early death. In the lungs of some of the examined neonates mycoplasmas were found. *Mycoplasma pneumoniae*, beside the viruses is one of the main agents of interstitial pneumonia in human (4). Mycoplasmas are rarely considered as the cause of respiratory system diseases in animals. Till now the typical mycoplasma infection has not been described in foxes. Because of the lack of other agents, isolation of mycoplasmas from lungs in our studies suggests that these organisms can cause interstitial pneumonia in polar and silver fox infants.

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The Fourth International Symposium on Canine and Feline Reproduction and The 2nd Congress of the European Veterinary Society for Small Animal Reproduction

Norwegian School of Veterinary Science, Oslo, Norway, June 30th and July 1st 2000

In Stockholm, Sweden, the **14th International Congress on Animal Reproduction** will take place on July 2.-6. 2000. Preceding this congress a satellite symposium on canine, feline, and exotic carnivore reproduction, will be held in Oslo, Norway, on June 30th -July 1st. This **4th International Symposium on Canine and Feline Reproduction** is a sequel to three previous successful symposia in Dublin, Ireland (1988), Liège, Belgium (1992) and Veldhoven, the Netherlands (1996). An increasing number of papers and other scientific contributions have occurred in the field of reproduction in both domestic and wild carnivores, and international collaborations have been developed in this area. Through the three previous supplements published by Journals of Reproduction and Fertility Ltd. the current knowledge and the scientific progress in the area of small animal reproduction have been made available to the scientific community. In Europe, the European Veterinary Society for Small Animal Reproduction held its first congress in Barcelona in 1998. The EVSSAR has decided to arrange the second **EVSSAR Congress** in conjunction with the **ICAR** satellite symposium, the two presenting a joint program to accommodate all scientists as well as veterinary practitioners interested in the field of reproduction in dogs, cats and exotic carnivores. Our aim is to provide another successful meeting for all of you in the city of **Oslo, Norway**, in 2000.

Thus, the International Organising committee (IOC), The European Veterinary Society for Small Animal Reproduction (EVSSAR), The National Centre for Veterinary Contract Research and Commercial Services Ltd. (VESO), and scientists from the Norwegian School of Veterinary Science (NVH) have the pleasure of inviting you to this event.

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Registration will also be possible later in connection with registration for the ICAR 2000.

Original Report

The possibilities of silver fox early pregnancy diagnosis

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Introduction

Silver foxes are monoestrous mammals. In spite of properly preparing them for reproduction and mating, some females are not fertilized. It contributes to losses in reproduction and farm economical effects. The possibility to make an early pregnancy diagnosis reduce losses. Non-pregnant females could be petted within the period of slight decrease of fur value. The breeder could avoid feeding the female all year and not run a risk of the animal's death with a valueless skin during the summer. The above reasons became an inspiration to start research into the possibilities of diagnosing early pregnancy in silver fox females.

Materials and methods

The studies were carried on the farm "Batorówka" located in Central Poland, in the end of March 1998. 8 vixens: 6 silver and 2 whiteneck mutants were examined. The latest mated vixens on the farm were taken for the experiment, as in practice it is observed that this group has a higher percent of infertile females. All vixens were mated once. Four of them were examined 21 days after mating and four - 14 days. Two kind of detectors were used for the pregnancy diagnosis: Danish, applied in sow pregnancy testing (PQM-1/KOMBI) and Polish, manufactured by Draminski, previously used for dog pregnancy testing. Both detectors detect uterine waters through ultrasonic wave reflection. The detector probe was junctioned to the ventral area of the vixen's body. It sends ultrasonic waves which reflect on the uterus filled with water (when the vixen is pregnant) and returns to the probe. Before examining, the skin in the tested area was moisten by 10 ml of soya oil, carefully spread with cotton wool, for better possibility of skin contact. The females were tested by putting the probe at the right and left sides of the abdomen around the knee joint. The first two females were tested standing (photo 1), the following 6 vixens were tested lying on the left side (photo 2). The signals were observed on the screen as sinusoidal curves (in the Danish detector) or as sound and light impulses (in Draminski's detector).

Photo 1. Female tested standing by using Draminski's detector.

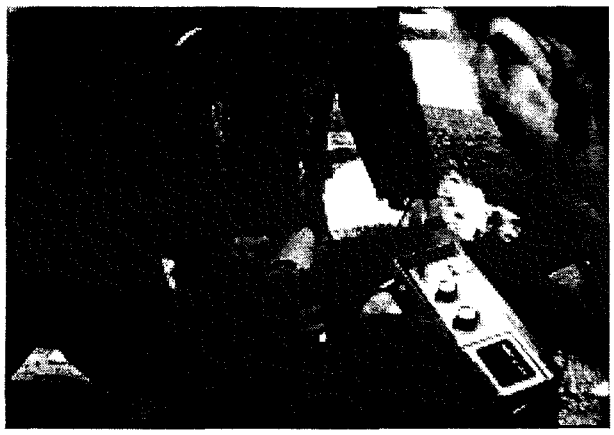


Photo 2. Female tested laying by using Danish detector.

Three types of curves were observed on the screen of the Danish detector:
- a - single, paused, vanishing small pulses (up to 1/4 of the screen),
- b - constant, with a small amplitude (up to 1/2 of the screen),
- c - constant, with a large amplitude (up to 1/1 of the screen).

Two kinds of impulses generated by Draminski's detector were observed:

Light impulses:
- **A** - 2-3 light impulses/sec,
- **B** - more light impulses/sec.

Sound impulses:
- **0** - no sound impulses,
- **s** - weak sound impulses,
- **S** - strong sound impulses.

The Draminski detector has the possibility of adjusting the range of wave infiltration and the signal strength. Five females were examined with infiltration 8 (maximum was 15) and with strength 1,5 (maximum was 5); the last three vixens with infiltration 6 and strength 2.

Results

The changes in impulses generated by the detectors were registered and described. The results are presented in Table 1.

Table 1. The kind of observed signals and the number of kits born

Number of females	Days after mating	Female position during examination[1]	Danish detector signals[2]	Draminski's detector signals (light)[3]	Draminski's detector signals (sound)[4]	No of kits born
782	21	S	c	-	0	8
782b	21	S	b	A	0	4
776b	22	L	a	B	0	6
775	22	L	c	B	s	6
779	15	L	a	A	0	6
798b	15	L	c	B	s	7
783	15	L	a	A	0	6
768	14	L	a	B	S	7

1 - **S** - female was standing
- **L** - female was lying

2 - **a** - weak signals, up to 1/4 the height of the screen,
- **b** - stronger signals, up to 1/2 the height of the screen,
- **c** - strong signals, up to 1/1 the height of the screen

3 - **A** - 2-3 light impulses/sec,
- **B** - more light impulses/sec

4 - **0** - no sound impulses,
- **s** - weak sound impulses,
- **S** - strong sound impulses

The first two females (782, 782b) were examined when standing (photo 1). It was found that such a position is more difficult during testing, the animal is much more nervous, and the diagnosis could be uncertain. The rest of females were tested when lying (photo 2). This position was much more comfortable for the animal, which was easier to examine and the results seemed more certain.

The Danish detector's impulses were observed on the screen as a sinusoidal curve. The curves varied between females, but in all cases pregnancy was assumed.

Draminski's detector generated two kinds of impulses: sound and light signals. In 7 cases pregnancy was assumed by observing both kinds of signals. In female no. 782 pregnancy was not detected, probably because the female was standing; it was the first use of the detector, the method of pregnancy diagnosis hadn't been used before, and the examinator had no experience.

The possibilities of finding a correlation between the number of fetuses and impulse intensity will be the next step in early pregnancy detection.

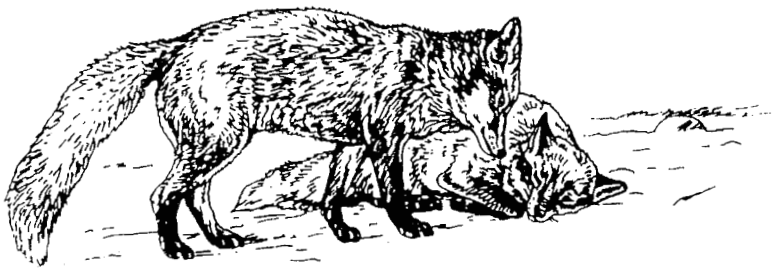
Conclusions

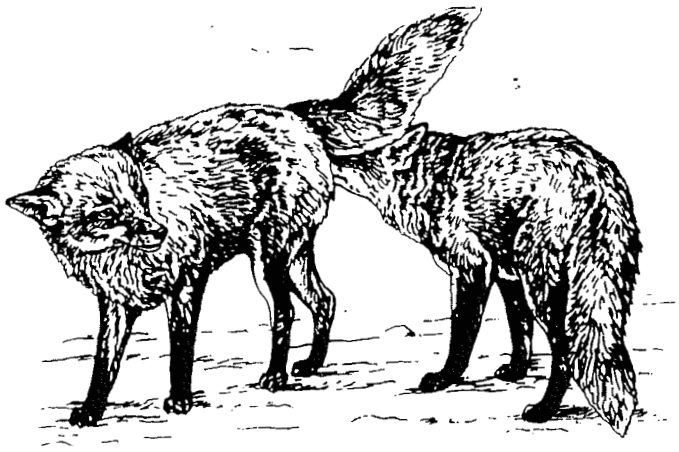
1. It is possible to detect silver fox pregnancy, even 14 days after mating, when fur quality is still pretty high.

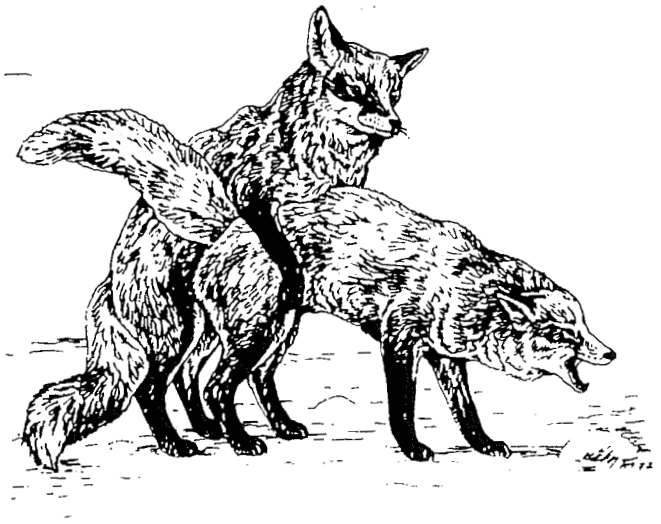
2. It is recommended to keep females lying down during examination.

3. There were no losses in fetuses (abortions) after examination.

4. Draminski's detector, which generated sound and light signals, seems to be more adequate for silver fox pregnancy diagnosis.







Reproductive success of farmed blue foxes

V.A. Ilukha, M. Harri T. Rekilä

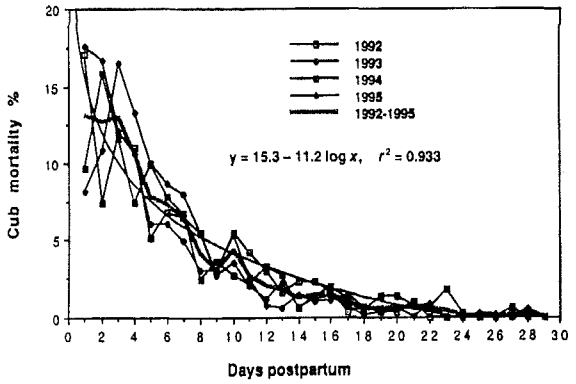


Fig. 4. Postnatal cub mortality by year

The aim of this study was to provide basic data for the different components of reproductive performance of blue foxes under farm conditions. The foxes were mated naturally and the perinatal mortality of cubs was carefully recorded. This data allowed the evaluation of the effect of female age and differences between years, and the maternal and paternal components of reproductive success. Generally the results were similar for all four years of the study. Altogether 2047 females (84.8 % of the total) gave birth to 22 941 cubs, of which 5.9 % were stillborn and 11.4 % died before weaning. Only in a very few cases (1.3 %) was it the whole litter that was lost, and more commonly there were some cub losses in almost one-half of the litters (46.9%). Abnormal birth and abortion of a part of the litter contributed most to reproductive failure of the vixen. Infanticide played a minimal role as a cause of postnatal cub mortality (6.3 %). Death of the vixen was extremely rare. One half of all parturitions were dated between May 14 and May 28 and May 8 and May 20, for primiparous and multiparous vixens, respectively. Thus the parturitions peaked 5 days earlier ($p<0.001$, median test) for multiparous vixens. The litter size was smaller and cub losses were higher for primiparous vixens than for multiparous ones. With a few exceptions, the age of the father or date of birth did not affect litter size or cub mortality. Postnatal cub mortality (γ, %) decreased with age of the cub (x, days) and can be described by a simple equation: $\gamma=15.3 - 11.21\log x$, $r^2=0.933$. Fractional cub mortality increased with increasing litter size. Despite being significant, this increase was modest in extent. Low h^2-values were observed for litter size at birth.

J. Anim. Breed. Genet. 1114, pp. 465-474, 1997. 5 tables, 4 figs., 24 refs. Authors' summary.

Brief report

Epizootic catarrhal gastroenteritis in mink

A preliminary histologic study of the intestine

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Epizootic catarrhal gastroenteritis (ECG) is a transient kind of diarrhea in mink which has been known since around 1970 in USA (*Larsen & Gorham 1975*) and since 1977 in Sweden (*Mejerland 1977*). It is characterized by inappetence and diarrhea of a mucoid nature. Young mink at the age of 5-7 months are mostly affected during the molting period up to the time of pelting in the fall (*Larsen & Gorham 1975, Mejerland 1977*). Older mink are also affected, mostly during periods with some kind of stress *e.g.* mating and weaning (*Larsen & Gorham 1975, Mejerland 1977, Shen et al 1984, Hunter & Lemieux 1996*). Even if the rate of morbidity of the disease is high the rate of mortality is low. Thus, the animals usually recover after 3-4 days with symptoms, and the disease has therefore also been called "3-days disease" (*Hansen 1986*). Fatilities may, however, occur if the mink are concurrently affected with *e.g.* plasmacytosis or nursing sickness (*Shen et al 1984*).

The etiology of the disease is unknown even if its appearance seems to be infectious (*Larsen & Gorham 1975, Mejerland 1977, Hansen 1986*). Infectious agents like coli bacteria, rotavirus and coronavirus have also been found in fecal samples from naturrally occuring cases (*Larsen & Gorham 1975, Hansen 1986, Gorham et al 1990, Jörgensen et al 1996*). The clinical symptoms are similar to, but less severe than those in the well known mink viral enteritis (MVE) caused by parvovirus 2 (*Larsen & Gorham 1974, Mejerland 1977*). As vaccination against MVE, however, does not give any protection against ECG (*Larsen & Gorham 1975, Mejerland 1977, Shen et al 1984*), the diseases seems to have quite different etiologies.

According to the literature, few studies have been devoted to the pathology of ECG. Thus, *Larsen & Gorham* (1975) found the intestinal lesions of affected animals to be nonspecific and not of that character typical for MVE. *Shen et al* (1984) saw an excessive amount of thick, clear-to-white mucous in the stomach and intestine of affected animals and a catarrhal gastroenteritis with a mild to severe mucoid degeneration of the intestinal mucosa.

In this report animals from a farm with serious outbrakes of ECG in the fall were studied. Seven 5-7 months old minks with inappetence and a mucoid diarrhea were selected and sacrified. After opening of the peritoneal cavity 1-2 cm long cross-cut samples of the intestine were taken from 5-6 different parts of the intestine and fixed in 10 % formalin. From these samples 10-16 sections were cut, processed according to conventional histological technique, stained with

hematoxylin and eosin (H&E) and examined microscopically.

The histological appearance of the mucosa of the small intestine varied between different animals as well as sometimes also between different sections of the intestine of the same animal. In all the animals, however, varying degrees of lateral fusion of the intestinal villi were seen (Figs 1, 7). The mucosal crypts were often dilated and filled with mucous (Fig. 8) and were often mucous free in the intestinal lumen (Figs 1, 2). The epithelial cells of the laterally fused villi were sometimes hyperplastic, sometimes atrophic (Fig. 8). In two of the animals the mucous in the dilated crypts was mixed with degenerated and desquamated epithelial cells (Fig. 8). In another animal areas were found where the epithelium was hyperplastic and the tips of the partially fused villi were very irregular in shape (Figs 1, 2). Some of the apical cells of these villi were degenerated, and apparently desquamated, epithelial cells was seen in threads of mucous outside and around the villous tips (Figs 2, 4). Degeneration of the epithelium in the bottom of the crypts, like in MVE, was not seen. In the propria of the villi all the animals had an increased number of inflammatory cells, predominantly of mononuclear character (Figs 2, 8). In one animal single subepithelial microabscesses were seen in the villous tips of the ileum.

Sections from the colon was analyzed in 5 of the 7 animals. The crypts of the colon were usually dilated and filled with mucous and in many cases mucous appeared also in the intestinal lumen. In two of the animals cell detritus was found in the mucous of the crypts.

Some of the lesions found in this study are in agreement with those described in young, 1-5 week old, mink kits with diarrhea, so called "sticky kits" (*Järplid & Mejerland 1998*). In those young kits, degeneration of villous apical cells, appearance of degenerated epithelial cells in the intestinal lumen and irregularity of villous tips were seen (Figs 3, 5, 6). This sequense of lesions was judged as a result of degeneration and desquamation of epithelial cells from the tips of the villi. It seems reasonable that similar lesions in the young adult mink with ECG in this study (Figs 2, 4) could have the same explanation.

The severe villous atrophy described in young diarrhetic kits (*Järplid & Mejerland 1998*) was not seen in this study. Instead, the lateral villous fusion and the inflammatory reaction in the villi were more extensive in these adult mink with ECG than in the kits. These differences may reflect a more chronic condition in the adults.

The etiology of the diarrhetic conditions in the "sticky" kits as well as in the older animals with ECG are unknown. In the kits the appearance of the lesions suggested a viral etiology, possibly a rotavirus (*Järplid & Mejerland 1998*). In this study the lesions of degeneration and desquamation of villous epithelial cells are similar to those in the kits and may thus also indicate a possible viral etiology. This was also suggested by *Shen et al* after successful transmission of ECG via filtered organ suspension already in 1984. Later studies of fecal samples from naturally occuring cases of ECG have also revealed findings indicating the presence of coronavirus as well as rotavirus (*Gorham et al 1990, Jörgensen et al 1996*).

That ECG does not affect mink younger than 4 months of age (*Shen et al 1984*) may indicate some kind of temporary immunity which the animals have acquired as kits.

Even if this study is preliminary and the material is limited, the similarity of the intestinal lesions between "sticky" kits with diarrhea (*Järplid & Mejerland 1998*) and older mink with ECG in this study may indicate connections between these two diseases. In order to be able to elucidate these questions, however, more extensive studies of the histopathology of ECG are needed.

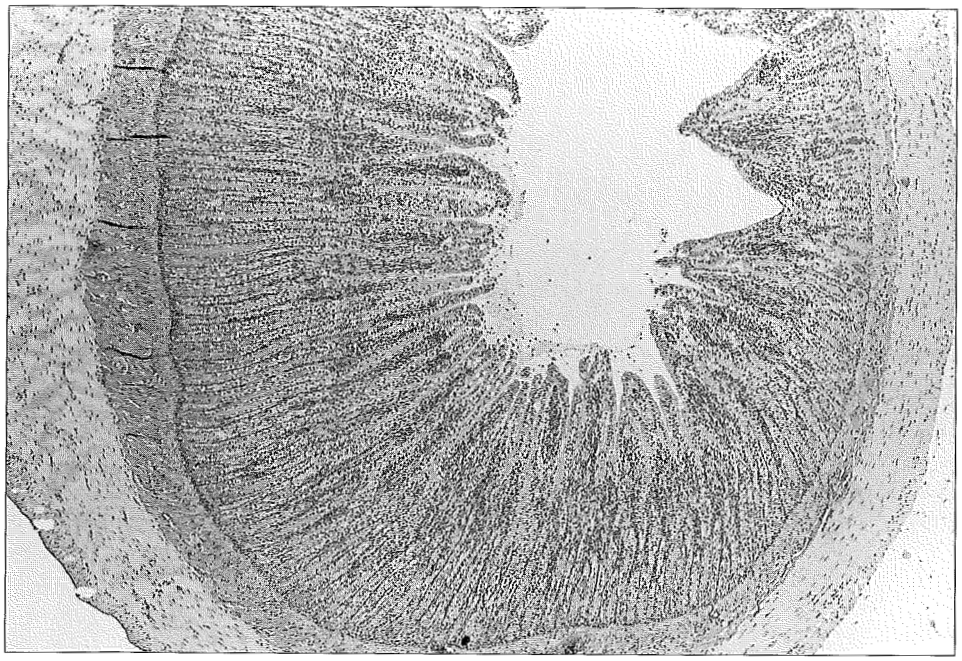

Fig. 1. Small intestine from a 5-7 months old mink with epizootic catarrhal gastroenteritis (ECG). Extensive lateral fusion of irregularly shaped villi. H&E x 35.

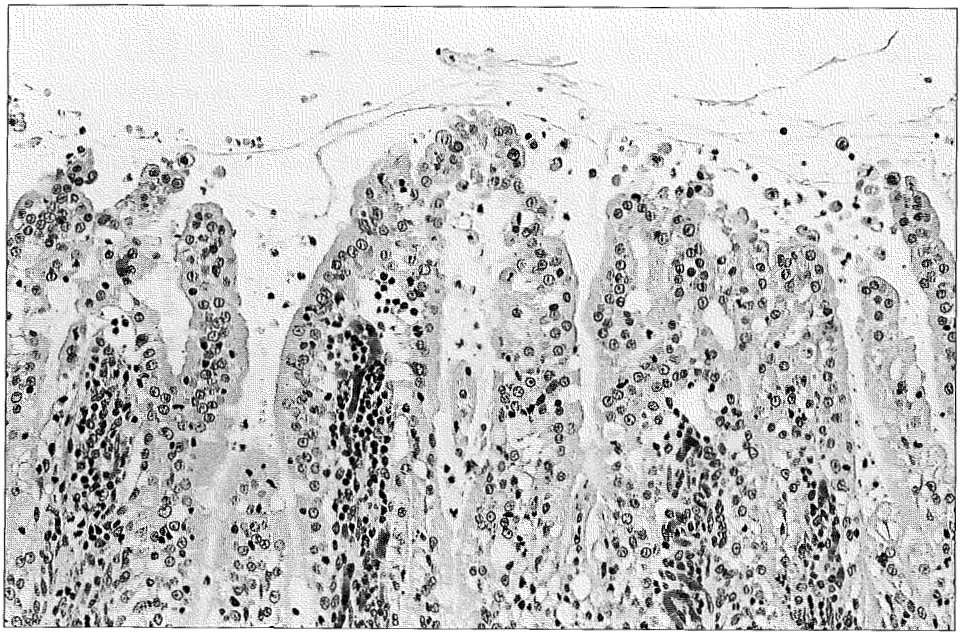

Fig. 2. Detail of Fig. 1. The tips of the villi are irregular in shape as a result of desquamation of degenerated epithelial cells, which appear free or caught in mucous around the villous tips. Mononuclear cells appear in the villous propria. H&E x 175.

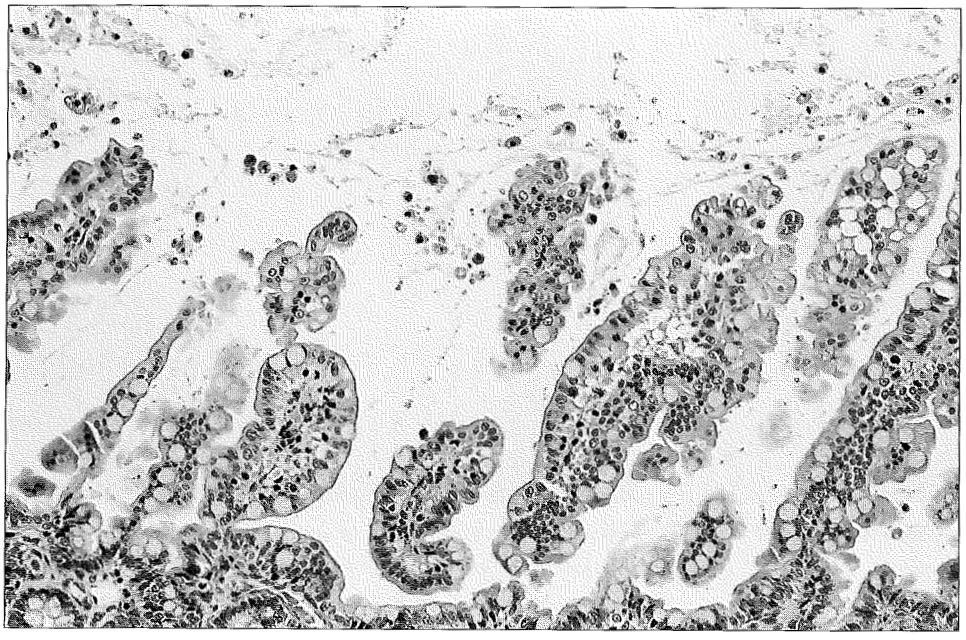

Fig. 3. Small intestine from a 27 days old "sticky" mink kit with diarrhea. The villi are thin and irregularly shaped. Like in ECG in Fig. 2 above the irregularity in shape of the tips of the villi is a result of degeneration and desquamation of epithelial cells which are seen in the mucous around the villous tips. H&E x 175.

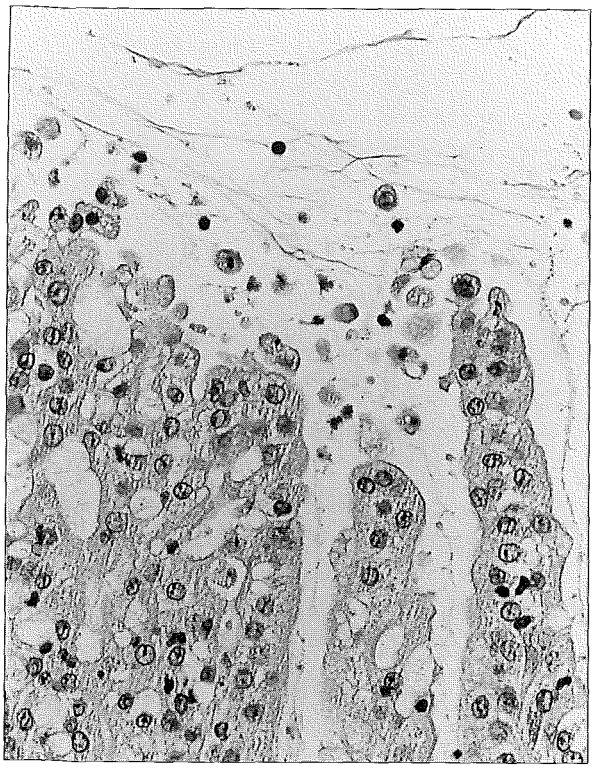

Fig. 4. Detail of Figs 1 and 2. The epithelium is hyperplastic. Some epithelial cells are degenerated and desquamated and appear free or caught in threads of mucous around the villous tips. These lesions are similar to those in "sticky" mink kits with diarrhea in Figs 5 and 6. H&E x 350.

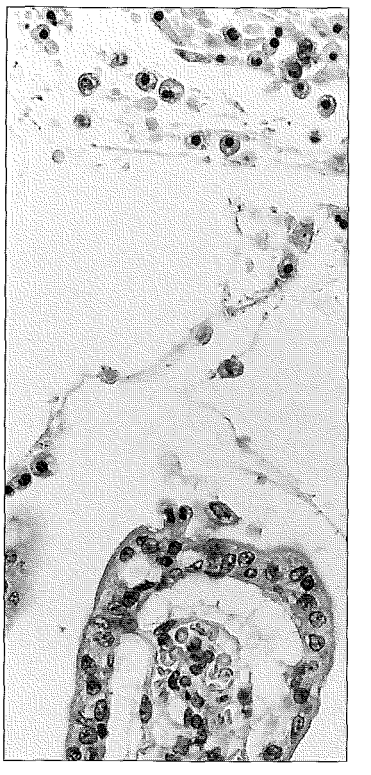

Fig. 5. Small intestine from a 32 days old "sticky" mink kit with diarrhea. Degeneration and desquamation of epithelial cells at the tip of a villus. Desquamated epithelial cells are caught in mucous (top). H&E x 350.

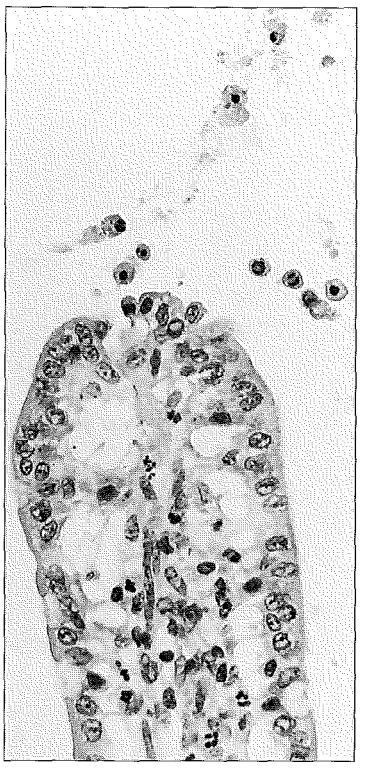

Fig 6. Small intestine from a 32 days old "sticky" mink kit with diarrhea. Degeneration and desquamation of epithelial cells at the tip of a villus. H&E x 350.

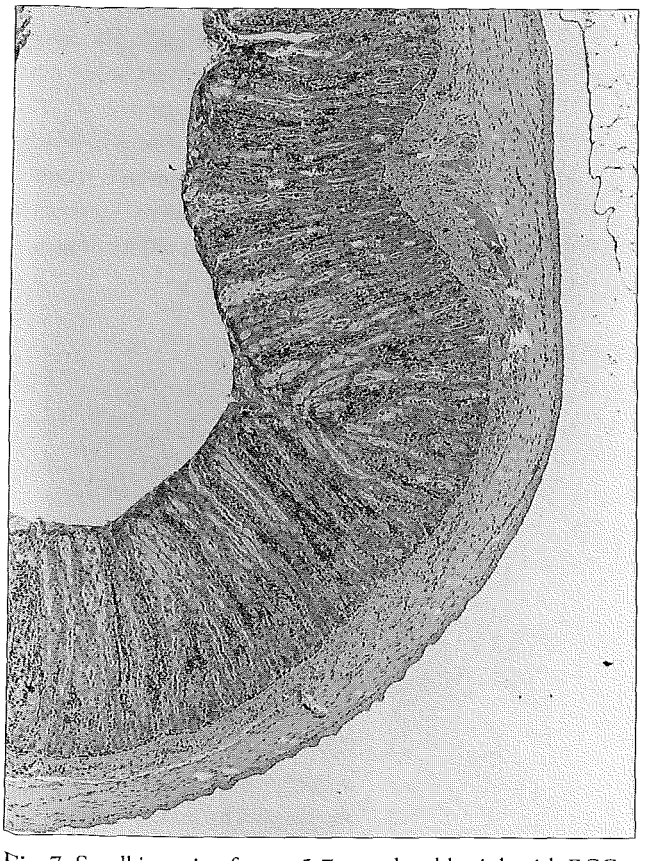

Fig. 7. Small intestine from a 5-7 months old mink with ECG. Extensive lateral fusion of the villi. H&E x 35.

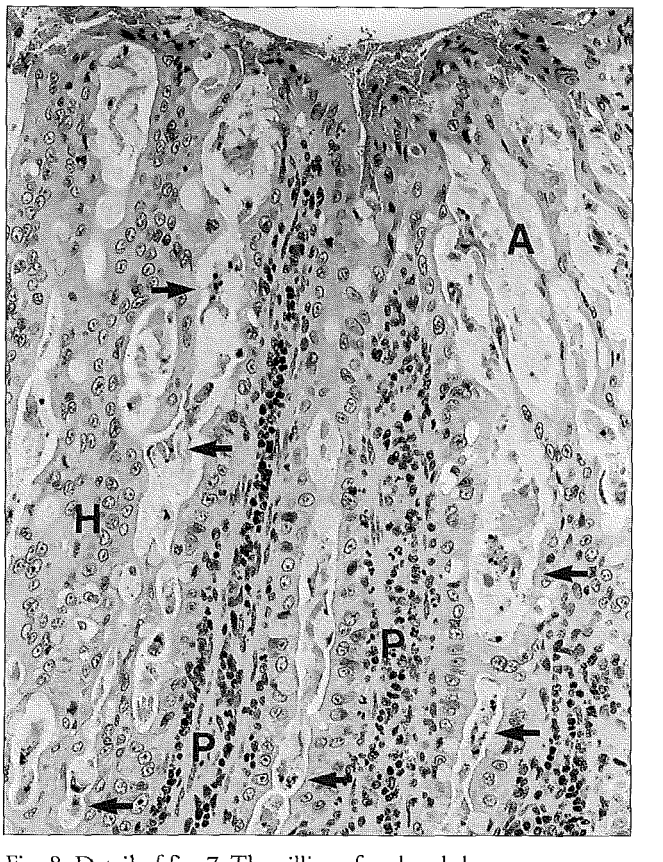

Fig. 8. Detail of fig. 7. The villi are fused and the crypts are dilated and filled with mucous and desquamated epithelial cells (arrows). The crypt epithelium is partly atrophic (A), partly hyperplastic (H). Mononuclear cells appear in the villous propria (P). H&E x 175.

Acknowledgements

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7th Symposium.
Vitamins and Additives in the Nutrition of Man and Animal

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Conference fee amounts to 100,- DM (unemployers, pensioners: 50,- DM, students: 10,- DM) and includes symposium participation, abstracts to the begin of the meeting, proceedings of the meeting (December 1999), coffee breaks and the symposium dinner.

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For the organizers

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Prof. Dr. R. Bitsch
Dept. Human Nutrition
of the University Jena

Prof. Dr. G. Flachowsky
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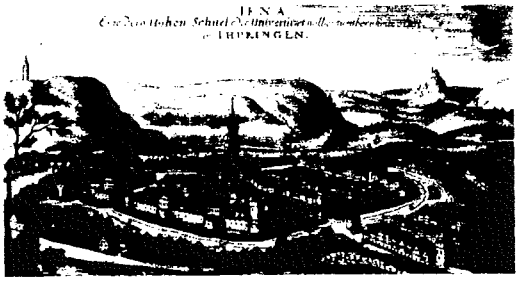
7th Symposium

Vitamins and Additives
in the Nutrition of Man and Animal

September, 22 and 23, 1999
Jena/Thuringia



Announcement
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7th Symposium

„Vitamins and Additives in the Nutrition of Man and Animal"
Jena, Sept. 22 and 23, 1999

I want to take part in the meeting and I am interested in further information:

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Please send back till March 15, 1999
1) please cross

Original Report

Efficacy of a combined inactivated vaccine for control of trichophytosis in rearing foxes

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Dept. of Vet. Microbiology, University of Agriculture, Lublin, Poland

Abstract

Studies were carried out on rearing foxes housed on a farm. The animals, both healthy and suffering from trichophytosis, were vaccinated with a new combined vaccine developed by the authors and transferred to Biowet-Pulawy which has begun to produce it on a large scale. The vaccine called „Alopevac" contained the inactivated strains of Trichophyton mentagrophytes var. granulosum and Trichophyton verrucosum.

The animals were vaccinated twice intramuscularly at intervals of 10-14 days using each time from 1.0 to 2.5 ml of the preparation according to the age of the animals. It was found that the combined inactivated vaccine elicited a high degree of protection in foxes against a virulent field strain of T. mentagrophytes. When the vaccine was applied in foxes with clinical lesions of mycosis quicker recovery from the disease was observed. However, no noticeable improvement was found when the lesions occurred on digital pulps and paws.

Introduction

Most cases of dermatomycosis in foxes on breeding farms are caused by Trichophyton mentagrophytes (8,16,23), though sometimes Trichophyton verrucosum or Microsporum canis may also bring about ringworm in this species of animals (2,8,22). Trichophytosis in foxes can appear in two types, i.e. as a superficial or a deep one (3,8). The first form is characterized mainly by loss of hair or its fracturing in pieces resulting in the occurrence of spherical foci with short, sparse hair or baldness and intense desquamination of the epidermis. In deep dermatophytosis vesicles occur which later convert into firmly fixed crusts. In such conditions the skin of the animals is of less value or even disqualified. The first clinical changes usually occur on the skin of the head, nose, ears and neck. Sometimes grey spots on the finger tips or fragile claws are the first signs of the disease. In case of lesions on the paws the germ can be alive for a long time and therefore there are considerable difficulties in eliminating the source of infection in diseased animals and their surroundings. The greatest expansion of ringworm, sometimes in the form of enzooty, is observed in young foxes aged 6-8 weeks (8,23). Females, after recovery from the disease, are often asymptomatic carriers of the fungus, becoming the source of infection for young pups. Therefore, clinical changes of trichophytosis can be found already in 3-4 week old foxes (8,16,23).

The control of ringworm only by means of disinfectants is often long-lasting and of little effect while the application of specific immunoprophylaxis is worth emphasizing. The most popular vaccine known as Mentovac TM-135 was used on a large scale in foxes and ferrets in the former Soviet Union (11,16). However, the vaccine containing a live strain of T. mentagrophytes is not entirely safe as it may revert to pathogenicity and be infectious chiefly for immunocompromised humans or animals. The authors have developed an inactivated combined vaccine which has been recently produced on a large scale by Biowet-Pulawy (Poland) under the name Alopevac. The purpose of the work was to present the results of prophylactic and therapeutic administration of the vaccine on a farm where trychophytosis occurred in the enzootic form.

Material and methods

Animals. Studies were performed on two groups of foxes housed on a farm localized not far from Lublin. Its sanitary and zootechnological conditions raised no objections. The first group comprised 284 foxes, i.e. 74 Vulpes vulpes and 210 Alopex lagopus, aged from 10 weeks to over 18 months. The animals under study did not show any signs of mycosis. For prophylactic purposes 194 foxes were given an inactivated vaccine Alopevac twice at intervals of 14 days. Ninety unvaccinated foxes served as a control. The second group containing 82 foxes of both species, aged from 10 weeks to over 18 months, displayed clinical signs of mycosis confirmed by mycological examinations (*Trichophyton mentagrophytes*). The lesions were situated on different parts of the body and in some older animals the changes were noticeable on digital pulps and paws. The disease broke out after some time since purchasing a new group of vixens. The disease spread and its course, especially in pups, was serious. In 46 diseased foxes the vaccine was administered for therapeutic purpose also twice at intervals of 14 days. Thirty-six other non-vaccinated foxes served as a control.

All the foxes were observed for 6 months. From some animals with clinical lesions the samples of hair, skin or paws were collected for mycological examinations.

Vaccine. Suspensions of Trichophyton mentagrophytes No 58 and Trichophyton verrucosum No 43, selected on the basis of their immunogenic properties, were used to prepare the vaccine according to our own method (20). Briefly, the strains producing spores abundantly were grown in Sabouraud's liquid media and their culture suspensions were mixed up and inactivated with formalin (0.3%). The final product contained approximately 25 per cent of the sediment after 48 hours storage at 4°C. After checking its sterility and harmlessness on mice and guinea pigs the vaccine was given twice, at intervals of 14 days at a dose from 1.0 to 2.5 ml, depending on the animals' age.

Morbidity rate and severity index (M-S index). The M-S index was calculated by multiplication of the percentage of infected animals by severity of lesions expressed by the number of crosses (+ = 1; ++ = 2; +++ = 3).

Results and discussion

For many years specific vaccinations have played an essential role in the control of ringworm. Live and recently inactivated vaccines have been used both for prophylactic and therapeutic purposes in various species of animals (1, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24). Live vaccines contain as a rule attenuated strains which inder favourable conditions may, however, revert to virulent forms. Our earlier studies have shown that an inactivated vaccine - Bovitrichovac II - containing the Trichophyton verrucosum strain, elicited a good immune response in cattle, chiefly of cellular type (21). Promising findings were also obtained by Hussin and Smith (7) in guinea pigs immunized with a vaccine made of Trichophyton mentagrophytes var. erinacei inactivated with formalin. Much the same findings were noted by Pier et al. (13)

with killed dermatophyte vaccines administered in domestic animals. The preliminary results performed by us under laboratory conditions on foxes using monovalent and bivalent inactivated vaccines (20) were successful as well. Therefore, we have developed on a larger scale a combined inactivated vaccine against ringworm in foxes consisting of two immunogenic strains classified as T. mentagrophytes var. granulosum and T. verrucosum.

The protective and therapeutic value of the combined vaccine was assessed on a typical small farm, where a relatively high per cent of foxes suffered from trichophytosis. It was found that the vaccine administered for prophylactic purposes both in young and older foxes (table 1) was beneficial. The animals (Alopex lagopus) aged from 3 to 5 months did not display any signs of the disease throughout the time of observation (table 1), though they were housed on the same farm as the diseased foxes and were attended by the same personnel. Only a low percentage (2.5 - 15%) of older foxes (over 18 months) had slight lesions which, however, disappeared quickly within approximately 6 weeks. A little worse findings were noted in Vulpes vulpes, although compared with the control group, the beneficial effect of immunization was also evident. The profitable outcome of vaccination was in particular noticeable when M-S indices were compared after 3-4 months after immunization of young individuals aged approximately 12 weeks. In vaccinated animals the M-S indices were from 30.0 to 0.0 and in controls 66.6 to 22.2, respectively. The worse results of immunization in this group of foxes (Vulpes vulpes) could be caused by its higher sensitivity to trichophytosis or its more frequent contact with the virulent fungus. A therapeutic use of the vaccine also brought about positive effects chiefly in young foxes (phot.1-3). The values of the indices in the group of immunized animals were 3 times lower and the mycotic changes remission was approximately 4 weeks shorter than in the controls.

Table 1. Effect of prophylactic vaccination against trichophytosis in foxes

Breed	Age of animals	Clinical status before vaccination	Clinical status after vaccination (months) 1	2	3	4	6	Localization of lesions	Result of mycological examination
Alopex lagopus	3 months	0/60** 0 [b]	0/60 0	0/60 0	0/60 0	0/60 0	0/60 0	-	
	5 months	0/20 0	0/20 0	0/20 0	0/20 0	0/20 0	0/20 0	-	Trichophyton mentagrophytes
	>18 months	0/40 0	0/40 0	1(+)/40 2.5	6+/40 15	0/40 0	0/40 0	digital pulps, ears	
Vulpes vulpes	3 months	0/10 0	0/10 0	2(+)/10 20	3(+)/10 30	0/10 0	0/10 0	legs	T. mentagophytes
	5 months	0/64 0	0/64 0	10(+)/64 15.6	40(+)/64 62.5	4(+)/64 6.25	0/64 0	legs	T. mentagophytes
Unvaccinated animals (control)									
Alopex lagopus	< 3 months	0/90 0	30(+++) ***/90 99.9	30(+++)/90 99.9	30(++)/90 66.6	20(+)/90 22.2	0/90 0	trunk, ears, legs	T. mentagophytes

* - number of diseased animals; ** - number of animals under study; *** - intensity of lesions
b - M-S index (per cent of diseased animals x degree of lesion intensity determined by the number of crosses)

The worst results in respect to the remission of mycotic lesions were observed in vaccinated animals aged 18 months with lesions localized on the digital pulps and paws (photo 4). The changes regressed slowly and were still noticed in some foxes after 6 months after the first dose of the vaccine administration. Nevertheless, M-S indices in vaccinated group of animals were lower than those in controls (table 2). Immunized animals had better appetite and weight gain compared to the control. No side effects were noticed apart from a rare appearence of lesions in the form of small foci on the body which, however, regressed quickly without any treatment. To sum up one can say that the inactivated vaccine proved to be safe and effective. It can be administered to pups and older foxes both for prophylactic and therapeutic purposes. However, with mycotic lesions situated on digital pulps and paws an increased immunity is not effective enough to bring about a rapid recovery. Under such circumstances not only vaccination ought to be taken into account as a mode of treatment but an additional local administration of modern, synthetic drugs may be advisable.

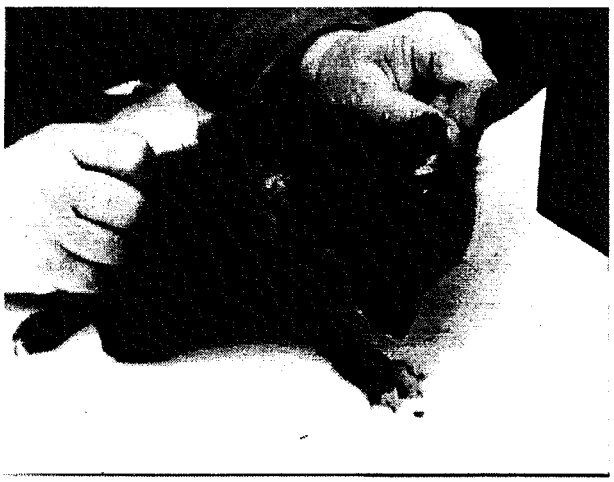

Photo 1. Three months old fox before vaccination: mycotic lesions on the neck and shoulder.

Photo 2. Three months old fox before vaccination: mycotic lesions on the back.

Photo 3. Remission of mycotic lesions after 3 months since vaccination.

Photo 4. Maintenance of mycotic lesions on the digital pulps and paws in a fox after 6 months since vaccination.

Table 2. Effect of therapeutic vaccination of foxes with clinical lesions of trichophytosis

Breed	Age of animals	Clinical status before vaccination	Clinical status after vaccination months 1	2	3	4	6	Localization of lesions	Result of mycological examination
Alopex lagopus	3 months	14(+++)/14 *300*	14(++)/14 *200*	14(+)/14 *100*	10(+)/14 *71.4*	0/14 *0*	0/14 *0*	trunk, ears, legs	Trichophyton mentagrophytes
Vulpes vulpes	5 months	6(+++)/6 *300*	6(++)/6 *200*	6(+)/6 *100*	4(+)/6 *66.7*	3(+)/6 *50*	0/6 *0*	trunk, ears, legs	T. mentagrophytes
Vulpes vulpes	18 months	26(++)/26 *200*	26(++)/26 *200*	26(+)/26 *100*	10(+)/26 *38.5*	2(+)/26 *7.7*	2(+)/26 *7.7*	digital pulps, paws	T. mentagrophytes
Unvaccinated foxes (control)									
Alopex lagopus	< 3 months	30(+++)/30 *300*	30(+++)/30 *300*	30(+++)/30 *300*	30(++)/30 *200*	20(+)/30 *66.7*	0/30 *0*	trunk, ears	Trichophyton mentagrophytes
Vulpes vulpes	>18 months	6(++)/6 *200*	6(++)/6 *200*	6(++)/6 *200*	6(++)/6 *200*	4(++)/6 *133.3*	4(+)/6 *66.7*	digital pulps, paws	T. mentagrophytes

Legend : see table 1

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Anesthetic effects of Telazol® and combinations of ketamine-xylazine and Telazole®-ketamine-xylazine in ferrets

Jeff C. H. Ko, Luisito S. Pablo, James E. Bailey, Terrell G. Heaton-Jones

Ten, 10-month-old, sexually intact male ferrets were used in a crossover study to evaluate the anesthetic effects of Telazol® (TEL, 22 mg/kg of body weight, IM), ketamine-xylazine combination (KX: K, 25 mg/kg and X, 2 mg/kg IM), and Telazol®-ketamine-xylazine combination (TKX: TEL, 3 mg/kg; K, 2.4 mg/kg; and X, 0.6 mg/kg IM). Each ferret received each anesthetic combination in a randomized order, with 4 to 7 days between treatments. Glycopyrolate (0.01 mg/kg IM) was administered with each anesthetic combination to decrease salivation and respiratory tract secretions. Statistical significance was set at $P<0.05$. All three combinations induced recumbency within 2 minutes after injection. Duration of toe pinch, tail pinch, and skin pinch analgesia induced by KX (37.2 ± 14.2, 38.9 ± 10.0, and 36.7 ± 9.4 minutes, respectively) and TKX (33.0 ± 11.4, 34.0 ± 12.0, and 30.0 ± 10.0 minutes, respectively) were significantly longer than analgesia induced by TEL alone (17.5 ±14.6,16.5 ±13.0, and 17.5 ± 11.8 minutes). Duration of endotracheal intubation was significantly shorter by use of TEL (15.7 ± 15.5 minutes), compared with KX (40.7 ± 17.5 minutes) and TKX (43.2 ± 6.7 minutes). Throughout the study, the ferrets breathed room air. Heart rate and systolic blood pressure were significantly higher in response to TEL than to KX and TKX. There was no difference between the three groups for time of injection to time of attempting to rise; however, time from injection to time for complete mobility was significantly shorter in response to TKX (101.6 ±10.2 minutes), compared with KX (139.4 ± 28.5 minutes) and TEL (188.0 ±42.8 minutes). Pulse oximetry performed on the tail indicated that all three combinations induced lowering of oxyhemoglobin saturation. In a separate study, 4 ferrets were re-anesthetized with TKX and supplemented with 100% oxygen after drug administration. In these ferrets, there was a trend of higher oxyhemoglobin saturation, compared with the values obtained when these 4 ferrets breathed room air. Ventricular bigeminy was observed in one ferret treated with TEL. Only sinus arrhythmia was observed in KX- and TKX-treated ferrets. Quality of recovery was considered smooth in KX- and TKX-treated ferrets, and was rough and frequently associated with opisthotonos, excess paddling, and swimming motions in response to TEL. We concluded that KX and TKX were effective injectable anesthetic combinations in ferrets. The authors also recommend oxygen insufflation during anesthesia to prevent lowering of oxygen saturation of hemoglobin. Due to the short duration of analgesia and rough recovery TEL alone at the dosage tested was not recommended for use in ferrets.

Contem-top-lab-anim-sci. Cordova, TN: The Association, Vol 35 (2), pp. 47-52, 1992. 3 tables, 3 figs., 20 refs. Authors' summary.

Evaluation of the sedative and cardiorespiratory effects of medetomidine, medetomidine-butorphanol, medetomidine ketamine, and medetomidine-butorphanol-ketamine in ferrets

Jeff C.H. Ko, Terrell G. Heaton-Jones, Constance F. Nicklin

Ten ferrets were used in a crossover study to determine the anesthetic effects of intramuscular (IM) medetomidine (80 µg/kg body weight), medetomidine (80 µg/kg body weight)-butorphanol (0.1 mg/kg body weight), medetomidine (80 µg/kg body weight)-ketamine (5 mg/kg body weight), and medetomidine (80 µg/kg body weight)-butorphanol (0.1 mg/kg body weight)-ketamine (5 mg/kg body weight). All ferrets assumed lateral recumbency within four minutes and remained dorsally recumbent for 100 minutes, until atipamezole (400 µg/kg body weight, IM) administration. All four anesthetic combinations were effective for chemical restraint, with the most respiratory depression occurring in the medetomidine-butorphanol-ketamine group. The addition of butorphanol or ketamine to

medetomidine significantly increased the duration of analgesia. The addition of ketamine to medetomidine-butorphanol expedited endotracheal intubation.

J Am Anim Hosp Assoc., 33, pp. 438-48, 1997. 4 tables, 17 refs. Authors' summary.

Preliminary studies on intestinal parasites in chinchillas

Olga Szeleszczuk, Jaroslaw Poltorak, Urszula Poltorak, Piotr Niedbala

The study was aimed at investigating endoparasites occurring in the alimentary tract in chinchillas, and at comparing the intensity of infestation in six selected farms in southern Poland. Three types of intestinal parasites were found: *Eimeria, Trichuris* and *Trichostrongylus* sp. The study 1 (spring) on farm A showed that 20% of research animals were not infested, compared to 25% on farm B, 11.1% on farm C, 30% on farm D, 20% on farm E and 40% on farm F. The study II (conducted in autumn) showed that 35% of animals on farm A were not infested. The relevant figures were 33.3% on farm B, 33.3% on farm C, 40% on farm D, 30% on E, and on farm F as many as 80% of animals were not infested. The highest infestation rate (expressed in the number of oocysts in 1 g of feces sample) was found on farm C (920 on average), and the lowest on farm F, averaging 275.

Zeszyty Naukowe Akademii Rolniczej im, H. Kollataja w Krakowie nr. 323, pp. 101-108, 1997. In POLH, Su. ENGL. 3 tables, 1 fig., 10 refs. Authors' summary.

Health state of chinchillas bred on selected farms in southern Poland

Olga Szeleszczuk, Dorota Olesinska

The study aimed at evaluating the health state of' chinchillas bred on selected Polish farms. The health state was evaluated on the basis of documentation and oral information. The acquired information concerned the changes in the number of bred animals, mortality rate, disease incidence and treatment applied in 1992-1994. The pregnancy rate, reproductive potential and feeding conditions of the animals was also assessed. The study included anatomopathological examination of' dead or culled animals. Fecal samples were taken for parasitic examinations.

The most frequent death causes in the bred animals included eversion of the anus, breaking a tooth or delivery-related complications. Bacteriological examinations and autopsy revealed salmonellosis and pasteurellosis on two farms. Parasitic examinations of fecal samples showed the presence of three intestinal parasites.: *Eimeria. Trichuri* and *Trichostrongylus* sp.

Zeszyty Naukowe Akademii Rolniczej im. H Kallataja w Krakowie nr. 323, pp. 109-119, 1997. In POLH, Su. ENGL. 9 tables, 10 refs. Authors' summary.

S-Phase-Dependent Cell Cycle Disturbances Caused by Aleutian Mink Disease Parvovirus

Martin B. Oleksiewicz, Søren Alexandersen

We examined replication of the autonomous parvovirus Aleutian mink disease parvovirus (ADV) in relation to cell cycle progression of permissive Crandell feline kidney (CRFK) cells.

Flow cytometric analysis showed that ADV caused a composite, binary pattern of cell cycle arrest. ADV-induced cell cycle arrest occurred exclusively in cells containing de novo-synthesized viral nonstructural (NS) proteins. Production of ADV NS proteins, indicative of ADV replication, was triggered during S-phase traverse. The NS^+ cells that were generated during later parts of S phase did not undergo cytokinesis and formed a distinct population, termed population A. Formation of population A was not prevented by VM-26, indicating that these cells were arrested in late S or G, phase. Cells in population A continued to support high-level

ADV DNA replication and production of infectious virus after the normal S phase had ceased. A second, postmitotic, NS^+ population (termed population B) arose in G_0/G_1, downstream of population A.

Population B cells were unable to traverse S phase but did exhibit low-level DNA synthesis. Since the nature of this DNA synthesis was not examined, we cannot at present differentiate between G_1, and early S arrest in population B. Cells that became NS^+ during S phase entered population A, whereas population B cells apparently remained NS^- during S phase and expressed high NS levels postmitosis in G_0/G_1.

This suggested that population B resulted from leakage of cells with subthreshold levels of ADV products through the late S/G_2 block and, consequently, that the binary pattern of ADV-induced cell cycle arrest may be governed merely by viral replication levels within a single S phase. Flow cytometric analysis of propidium iodide fluorescence and bromodeoxyuridine uptake showed that population A cells sustained significantly higher levels of DNA replication than population B cells during the ADV-induced cell cycle arrest. Therefore, the type of ADV-induced cell cycle arrest was not trivial and could have implications for subsequent viral replication in the target cell.

Journal of Virology, pp. 1386-1396, 1997. 8 figs., 55 refs. Authors' summary.

Two parvoviruses that cause different diseases in mink have different transcription patterns: Transcription analysis of mink enteritis virus and Aleutian mink disease parvovirus in the same cell line

Torben Storgaard, Martin Oleksiewicz, Marshall E. Bloom, Brian Ching, Søren Alexandersen

The two parvoviruses of mink cause very different diseases. Mink enteritis virus (MEV) is associated with rapid, high-level viral replication and acute disease. In contrast, infection with Aleutian mink disease parvovirus (ADV) is associated with persistent, low-level viral replication and chronic severe immune dysregulation. In the present report, we have compared viral transcription in synchronized CRFK cells infected with either MEV or ADV using a nonradioactive RNase protection assay. The overall level of viral transcription was 20-fold higher in MEV- than in ADV-infected cells. Furthermore, MEV MRNA encoding structural proteins (MEV MRNA R3) was dominant throughout the infectious cycle, comprising approximately 80% of the total viral transcription products. In marked contrast, in ADV-infected cells, transcripts encoding nonstructural proteins (ADV MRNA RI and R2) comprised more than 84% of the total transcripts at all times after infection, whereas ADV MRNA R3 comprised less than 16%. Thus, the ADV MRNA coding for structural proteins (ADV MRNA R3) was present at a level at least 100-fold lower than the corresponding MEV MRNA R3. These findings paralleled previous biochemical studies analysing in vitro activities of the ADV and MEV promoters (J. Christensen, T. Storgaard, B. Vium, B. Aasted, and S. Alexandersen, J. Virol. 67:1877-1886, 1993). The overall low levels of ADV MRNA and the paucity of the MRNA coding for ADV structural proteins may reflect an adaptation of the virus for low-level restricted infection.

Journal of Virology, pp. 4990-4996, 1997. 4 figs., 56 refs. Authors' summary.

Rabies in farm mink

H. Zimmermann

If rabies exists in non-domestic animals in the surroundings of mink farms, an infection hazard for humans may result by biting wounds of mink, that have temporally escaped from the farm area and have been recaptured later. Mink, which are in cages in fence-controlled farms are in this respect scarcely dangerous for humans.

De Pelsdierenhouder 48 (1), pp. 239, 1998. In DUTCH. Author's summary.

Improvement of a polymerase chain reaction assay for the detection of *Echinococcus multilocularis* DNA in fecal samples of foxes

Ph. Monnier, F. Cliquet, M. Aubert, S. Bretagne

A polymerase chain reaction (PCR) method was developed in order to permit a sensitive and specific identification of *Echinococcus multilocularis* DNA from fox fecal specimens. In an attempt to overcome problems related to the presence of endogenous PCR inhibitors in fecal extracts, we investigated a DNA extraction technique using an anion binding resin (Gene-Fizz). This simple and rapid procedure was applied to 61 faecal samples. Compared with the traditional microscopic examination, the sensitivity of PCR using Gene-Fizz was 82.3% and the specificity was 95.5%. No PCR signal was obtained for 20 *Echinococcus granulosus* isolates, showing that this method allowed discrimination between *E. multilocularis and E. granulosus*. Large-scale epidemiological surveys of fox excrements may be possible by using Gene-Fizz treatment prior to PCR amplification reactions.

Veterinary Parasitology 67, pp. 185-193,1 996. 1 table, 5 figs., 25 refs. Authors' abstract.

Serous biliary cystadenoma in ferrets (*Mustela putorius furo*)

James G. Fox, Xiantang Li, James C. Murphy

Serous biliary cystadenomas were observed in two male ferrets (*Mustela putorius furo*). Grossly, the neoplasms, one 8 x 7 x 7 cm and the other 8 x 5 x 4 cm, consisted of interconnecting spherical or oval cysts defined by irregular fibrous capsules, with effacement of the hepatic parenchyma. Most cysts contained thin, clear or straw-coloured fluid, and some had opalescent thick contents in both ferrets. Histologically, the cysts were lined by a single row of cuboidal to columnar epithelial cells and contained clear to eosinophilic secretion, with thin fibrous stroma. In one ferret, small papillary growth and intraluminal infoldings of the epithelium were observed in a few cysts.

Fig. 1. The liver from ferret 1. An 8 x7 x 7 cm, fluid-filled, multiloculated cystic mass (C) occupies and effaces the entire right liver lobe. The spherical or oval cysts of 1 mm to 4 cm in diameter contain thin, straw-colour to opalescent fluid. Bar= 1.1 cm.

Contem-top-lab-anim-sci. Cordova, TN: The Association, Vol. 35 (6), pp. 78-79, 1996. 3 figs., 9 refs. Authors' abstract.

AKADEMIA ROLNICZA W LUBLINIE
WYDZIAŁ ZOOTECHNICZNY

Proceedings

AKTUALNE BADANIA
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Genetic and environmental background of body conformation and coat traits in Arctic foxes

M. Zatori, A. Filistowicz, P. Przysiecki, H. Wierzbicki, I. Zwolinska-Bartczak

The paper aims at heritability coefficients of fur coat traits estimation as well as phenotypic, genetic and environmental correlations between features evaluated during licence appraisal in Arctic fox population. The data taken for this study consisted of 3.000 animals whose parents were of well-known genealogy and coat colour. Genetic parameters were estimated using restricted maximum likelihood (REML) method. Statistical analysis and calculations were made with the use of SAS package. The heritability coefficients estimated for the coat traits ranged from 0.20 for skin length to 0.76 for hair length. The highest phenotypic, genetic and environmental correlations were estimated between coat traits and total score (from 0.12 to 0.75). Moreover, significant influence of sires, dams and year on fur coat traits was stated.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 14-15, 1998. In POLH, Su. ENGL. 2 refs. Authors' summary.

Genetic background of skin size and quality in arctic fox

H. Wierzbicki, A. Filistowicz, P. Przysiecki, B. Zuk

Genetic and phenotypic correlations and coefficients of heritability for the skin size and quality were calculated. Estimation was made with the use of restricted maximum likelihood (REML) and regression methods. Skin size coefficients of heritability estimated using REML and regression methods were 0.464 (SE – 0.152) and 0.582 (SE – 0.082), respectively. Coefficients of heritability for the skin quality estimated with the use of methods mentioned above were 0.424 (SE – 0.148) and 0.646 (SE – 0.122), respectively. Phenotypic and genetic correlations between skin size and skin quality, skin size and skin shade, as well as skin size and skin shade were 0.436, - 0.184, - 0.372 and 0.411, 0.052, 0.128, respectively.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 16-17, 1998. In POLH, Su. ENGL. 2 refs. Authors' summary.

Genetic background of coat colour shades in theblue type of Arctic fox

H. Wierzbicki

In the population of blue Arctic fox a great variation of colour can be seen. This variation is due to both guard hairs and underfur. The wool colour can vary from bluish grey to almost white and the coloured tips of guard hairs may be weakly or strongly pigmented. The dark or pale shades are due to polygenes and modifying genes. Therefore, the shade of the colour can be changed by selection. The purpose of the present study was to estimate colour shade heritability using restricted maximum likelihood (REML) and regression methods. Moreover, the frequencies of different colour shades among the pups were calculated for each type of mating. The data were analysed statistically using SAS System. The coefficients of heritability estimated with the use of REML and regression methods were 0.603 (SE – 0.162) and 0.770 (SE – 0.114), respectively. The colour shades seem to be inherited like a quantitative trait, because intensity of colouring among the offspring was similar or intermediate in comparison to the colour shades of their parents.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 18-20, 1998. In POLH, Su. ENGL. 1 table, 3 refs. Author's summary.

Characteristic of certain utility features of mink varieties: Polish standard, Danish standard and their crosses

H. Bernacka, I. Skuczynska, P. Kubacki

The research concerning certain utility features of mink, both female and male mink of Polish

standard, Danish standard and their crosses (Polish standard x Danish standard) were carried out in 1997 on the farm of fur animals Fox – Nor in Kraczki.

The comparison of female Polish standard mink and crosses considering certain features e.g. the length of pregnancy, number of cubs born in a litter and grading showed no statistically significant difference. Similarly Polish standard variety males didn't differ from Polish standard males in relation to the analysed traits. Polish standard offspring had slightly higher body mass, which was controlled during the grading, higher mass than the Danish standard and the crosses' offspring. The grading was very similar in each case.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 21-26, 1998. In POLH, Su. ENGL. 2 tables, 9 refs. Authors' summary.

Effect of adding vegetable fats on performance indices in mink

Pawel Bielanski, Jan Zajac, Dorota Kowalska

The objective of the studies was to determine the suitability of marrow oil cake and rape seed oil in mink feeding. Studies were carried out on 120 mink, in two stages. The first stage consisted of determining the effect of these two feeds on body weight gain and pelt quality. In the second stage reproduction was examined in the animals fed diets containing marrow oil cake and rape seed oil. The results of the studies revealed a beneficial effect of rape seed oil on animal growth, pelt size and quality. The two tested feeds did not affect reproductive performance.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 40-49, 1998. In POLH, Su. ENGL. 5 tables, 15 refs. Authors' summary

The level of thyroid hormones and B_{12}-vitamin in Polar foxes fed a dry diet during winter furring season.

Romuald Rajs,Beata Glowinska, Roman Szymeczko

The level of thyroid hormones, triiodothyronine, thyroxine as well as B_{12} vitamin was examined in polar foxes during the furring season. The animals were fed a dry diet with different levels of metabolic energy from fat and carbohydrates. No significant differences in the level of thyroid hormones and B_{12} vitamin were found in the blood of the experimental animals. Concentration of B_{12} vitamin was lower than in foxes fed the conventional diet.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 50-53, 1998. In POLH, Su. ENGL. 2 tables, 14 refs. Authors' summary

Hematological and production indices in polar foxes fed dry pelleted feed

Roman Szymeczko,, Beata Glowinska, Romuald Rajs

The study was carried out on 42 growing polar foxes divided into two groups: control and experimental. Control foxes were fed standard wet diet and experimental animals were kept on the dry pelleted feed. There were no significant differences between control and experimental animals in the level of hematological indices in the blood. Foxes fed during the whole experimental period with dry pelleted feed had better fur quality and longer raw skins.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 54-57, 1998. In POLH, Su. ENGL. 3 tables, 10 refs. Authors' summary.

The effect of slowly-releasing melatonin implant and reducing daylength on growth and priming of winter fur coat in blue foxes

Olga Szeleszczuk, Stanislaw Jarosz

The experiment was conducted on a total of 120 young blue foxes assigned to 4 genetically similar groups. To the foxes of Groups I and II, 12 mg of slowly-releasing melatonin implants were given subcutaneously (Wildlife Pharmaceutical, USA) at two fixed dates: Group I – on 13 July at 8-9 weeks of age, Group II – on 27 July at 10-11 weeks of age. Group III were kept in pavilions with a reduced daylength according to the following time and light regimes (in terms of luminous intensity coefficients in Lx): from 2-5 August – 35.71% Lx, from 5-11 August – 18.25% Lx and from 11 August to 1 November – 2.14% Lx, Group IV without melatonin, kept in a traditional pavilion was the control.

Subcutaneous administration of melatonin implants and reduced daylength regime both resulted in acceleration of winter fur coat priming by about 3-5 weeks.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 58-67, 1998. In POLH, Su. ENGL. 6 tables, 17 refs. Authors' summary.

Analysis variability of body size traits and fur quality on chinchilla population (*Chinchilla veligera*)

Stanislaw Socha, Anna Antolik

The work aimed at an evaluation of the variability of body size traits and fur traits and to influence on this variability. Moreover, genetic parameters of fur traits were evaluated.

A significant influence of sex was found on body size, fur's paunch part and total value of scores. Year of birth influenced colour clarity, colour type and total value of scores. Heritability coefficients were differentiated (from 0.126 to 0.913). The lowest heritability coefficients were found for fur's paunch part (0.126) while the highest for fur structure (0.913).

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 68-73, 1998. In POLH, Su. ENGL. 2 tables, 7 refs. Authors' summary.

An attempt to improve the quality of the chinchilla coat through implementation of a new standard for body conformation evaluation as a selection criterion within herd

Malgorzata Sulik

Selection of chinchillas according to the obligatory standard is very difficult to realise in farms with animals of good quality. This is a result of the great improvement of the size of chinchillas and the quality of their coat which has been achieved since the actual body conformation evaluation standard has been elaborated. This forces us to work out a new standard that will be used by breeders to continue improving the existing population of chinchillas.

The study included 31 standard variety chinchillas that had their exterior evaluated according to the obligatory standard and the new one actually worked out. In both cases the evaluation referred to the same traits, but the latter included in more detail the quality of particular coat parameters. As a result of the performed evaluation of body conformation, greater differences in point score were obtained. The greatest differences were observed when the clarity of the coat colour and the coat structure were evaluated. Animals constituting a group that were evaluated at 29 points according to the obligatory body conformation evaluation standard showed great differences.

Based on the performed analysis of body conformation evaluation according to both stan-

dards it can be stated that the use of a new evaluation standard as a selection criterion within the herd will allow us to go on improving the chinchilla population to a greater extent.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 74-79, 1998. In POLH, Su. ENGL. 2 tables, 7 refs. Authors' summary.

Estimation of factors determining skin auction price

Boleslaw Zuk, Andrzej Filistowicz

The skin auction price is determined by its size (84.8 – 86.9%) and its quality (11.3 – 11.5%). The skin shade practically does not influence skin price. There are no linear relations between the skin parameters and the skin price because of the clear interactions which occur between skin size and skin quality.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 80-85, 1998. In POLH, Su. ENGL. 1 table, 6 figs., 4 refs. Authors' summary.

Frequency of some conformation defects in fur animals from the canidae family

Andrzej Jakubczak, Grazyna Jezewska, Stanislaw Socha

Frequency of conformation defects was studied in silver and polar foxes as well as in raccoon dogs. The following defects were considered: twisted tail, lack of a tail, divided hair cover (parting), whirls, unshaped hair cover. Examinations of a basic herd and progeny were carried out after their full hair maturity. It was found that twisted tail occurred only in common and polar foxes. This defect was not found in raccoon dogs. Its frequency for common fox from the basic herd amounted to 2.69%, for youth – 3.87%; as well as 0.65% for polar foxes and 6.95% for youth. Whirls and unshaped hair cover were observed only in 8 common foxes. Divided hair cover was not found in polar foxes and raccoon dogs. This defect frequency was 2.27% for common foxes from the basic herd and 3.98% for the progeny.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 99-102, 1998. In POLH, Su. ENGL. 1 table, 4 refs. Authors' summary

Some features of raw coypus skins and the relation between them

Ryszard Cholewa, Michal Gedymin, Artur Lazar

Measurements were carried out on raw and dried skins from farms in the western districts. 650 skins were used: 250 standard type, 50 sable type and 350 Greenland type of coypu. Each skin was graded by a qualified person and given matching quality and length points.

The measurements done on the skins concerned skin length, thickness, height of coat and SGM measurements. Evaluation of hair cover was carried out in 12 places along the animals' middle and side parts; taking the whole of the animal into account. It has been proved that the standard coypu skins were longer and had longer hairs than the other ones. Crucial statistic relations between skin features had to do with height of hair cover and SGM measurements. They also dealt with skin length and the thickness of the back.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 103-107, 1998. In POLH, Su. ENGL. 1 table, 7 refs. Authors' summary

Measurements of some features of coats compared with the results of visual grading of one-year-old Polar female foxes

Ryszard Cholewa, Michal Gedymin, Danuta Kedziora

The research was carried out on the coats of 79 female polar foxes. The hair samples were taken from the middle side of their top body (10 cm behind the scapulas), at fur priming.

The values of the measured features (height and length of hairs, breadth of colour range) were compared with the results of visual grading done in November the same year on the same animals. Points on the scale of 0 to 6 were taken into account, as far as the length of hairs and the colour of coat are concerned. The average values determining the quality of the coat were smaller than the ones quoted in the available literature on the subject. No dependence of visual grading on the majority of the polar fox coat features measured in the laboratory was found. However, the length of awned – down hairs and the height and length of the guard hairs had a small impact on the quality of the exterior.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 108-113, 1998. In POLH, Su. ENGL. 1 table, 5 refs. Authors' summary.

The estimation of electrical current levels measured on blue fox vixen teats in different breeding periods

Marian Brzozowski, Dariusz Lamparski, Andrzej Frindt, Robert Glogowski, Danuta Dzierzanowska-Goryn

The aim of this study was to describe the differences in electrical currency level, measured on polar fox female nipples in December and in the beginning of the lactation period. In addition, the correlation between electrical currency level and mammary gland activity was estimated. The experiment was done on one-year old vixens, which had good reproduction results last season. 4 groups of vixens were observed with reproduction results being noted: very good mothers (over 6 pups reared), good mothers (up to 6 pups reared), vixens which does not have pups and vixens which destroyed their litters.

The result of the experiment was that electrical currency level is much higher during lactation than in December (*anestrus* phase). Such a tendency was observed even in groups of vixens which did not produce the milk. To estimate the correlation between electrical currency level during *anestrus* and mammary gland activity, other experiments ought to be done, when more vixens with reproduction problems could be used.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 114-118, 1998. In POLH, Su. ENGL. 3 tables, 9 refs. Authors' summary.

Comparison of two ohmmeter types in optimal mating time detecting in Polar foxes

Andrzej Frindt, Maja Kaminska, Marian Brzozowski, Danuta Dzierzanowska-Goryn, Robert Glogowski, Wieslaw Gajzler

The optimal mating time was detected using vaginal mucus impedance measuring method. Two measuring devices were compared. Norwegian SJ-LI3D and a Polish product manufactured by Draminski. The values obtained by Draminski's device were lower that from the Norwegian device. The dominant type of impedance curve had rapidly increasing and decreasing impedance values. Considering the lower impedance values measured with the Polish device, ranchers who use this device should try mating females at 400-500 units (ohms), because delay can increase the number of infertile females.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 119-124, 1998. In POLH, Su. ENGL. 1 table, 1 fig., 5 refs. Authors' summary.

Variability of heritability coefficients of body size and fur quality in polar white and shadow fox

Stanislaw Socha

The level of genetic parameters as well as heritability coefficients characterise a population at a fixed period of time. Changes in the parameters happen faster in selected populations or in populations under other genetic pressure to modify the genetic structure of the population.

A few authors have adjusted heritability coefficients in the fox population (*Filistowicz i Zuk, 1995; Socha, 1995, 1996*). No papers were found concerning long term changes of heritability of the traits in the same populations of white and shadow foxes. The aim of the present work was to evaluate heritability coefficients for body size and fur quality traits in polar white and shadow foxes in consecutive years of breeding.

The studies were performed on a reproductive farm of polar blue foxes during a period of 7 years. Animals were evaluated according to Polish standard (*Wzorzec, 1984*). The heritability coefficients were estimated on the progeny of parents of known origination, from at least three litters if they numbered minimum 5 animals. Totally about 1200 animals were investigated. The parameters were evaluated using the sire and mother components of variability with mixed model (*Zuk, 1989*). Coefficients were calculated for each year separately.

Heritability coefficients varied for body size from 0.158 to 0.673, colour purity from 0.263 to 0.661, fur density from 0.04 to 0.513, hair length 0.04 to 0.754, total number of scores 0.296 to 0.719 and fur structure from 0.136 to 0.498. Trait structure comes from summarisation of the score points for hair density and length.

On the basis of the results it can be clearly seen that they were different in particular years. The results also indicate dynamic changes in the population.

In general, values are at similar level to those from different species and different papers. However the fluctuation of particular coefficients was very high. High alteration can be observed. The hesitancy can rise on the genetic variability background. It can be suggested that biased judgement of fur evaluation can influence the pelage estimation (*Maciejowski and Slawon, 1974*).

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 125-126, 1998. In POLH, Su. ENGL. Only summary. Authors' summary.

Initial studies upon the growth and development of raccoon dogs

G. Jezewska, A.G. Niezgoda, A. Jakubczak, J. Tarkowski, B. Slaska

The purpose of the studies was to estimate the growth and development of young raccoon dogs from weaning to full hair maturity.

Material was collected form a fur animal farm in Jeziory Wielkie. 448 raccoon dogs, including 219 males and 229 females were studied. Young raccoon dogs were weighed three times: at 105th, 137th and 170th day of life. They were graded according to the obligatory standard after attainment of full hair maturity.

Estimating the growth results, it can be seen that mean body weight of males exceeded that of females in all measurements. Comparing mean body weight (in autumn) to other author's results, it can be stated that the size of the animals was not different from the mean for the country. It was also proved that litter size did not affect the final body weight of the kittens. Raccoon dogs from small and numerous litters obtained similar body weights. The grading showed that they could be classified as very good animals as regards body size and hair quality. Autumn body weight of raccoon dogs was significantly positively correlated with the grading.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 127-128, 1998. In POLH, Su. ENGL. 1 table. Only summary. Authors' summary

Reproduction results of common fox females performed in 1990-1997

G. Jezewska, A. Jakubczak, B. Slaska, S. Socha

The aim of the study was to estimate the fertility and prolificacy of common foxes in 1990-1997. Material was taken from the fur animal farm in Jeziory Wielkie near Poznan from 3680 females of the following colour varieties: silver, gold, platinum, pastel, platinum-pastel and

semi-pastel (silver with pastel gene). Data on female performance were collected from breeding documentation. Female reproduction and rearing results were recorded for all varieties.

It was found that the percentage of parturient females, those wasting their litters, as well as sterile ones amounted to: 63.8%, 28.6%, 7.6%, respectively. Significantly better results as regards these factors were obtained for two-year and older females (71.9%, 22.2%, 5.9%) than for one-year olds (48.6%, 40.6%, 10.8%). Variance analysis also showed statistically significant differences between the mean number of born and reared young in litters from one-year females, compared to older ones.

Analysis of the results – taking into account the colour variety – showed that silver fox females with pastel gene were the best.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 129-130, 1998. In POLH, Su. ENGL. 1 table. Only summary. Authors' summary.

Effect of adding feed concentrate R-075 grower to rations for Polar foxes on body weight gain, pelt quality and results of appearance evaluation

Manfred O. Lorek, Andrzej Gugolek

The experiment was performed on 72 young polar foxes, in the period from weaning to pelting. The foxes, selected at random, were divided into three groups. Each group included 24 animals, 12 males and 12 females, coming from different litters and born at a similar time. They were put into typical cages for fox breeding, 4 animals of the same sex in each. The experimental factor was concentrate Grower, added to the feed for the animals of group II in the amount of 10% and to that for those of group III in the amount of 20%. The animals of group I (control) received a standard ration with no additions. Concentrate Grower is produced in Holland and used for carnivorous fur-bearing animals. Its chemical composition is as follows (%): dry matter – 89.16; crude protein – 21.28; crude fat – 3.03; carbohydrates – 57.23. The energy value of 1 kg of the concentrate amounts to 15.820 MJ. The experiment was divided into two periods, during which the nutritive value of rations was adjusted to the needs of the growing animals. The animals were fed and watered ad libitum. An analysis of their body weight gains was made, as well as an evaluation of appearance and pelt quality. The body weight was determined by weighing individual animals (exact to 0.1 kg) every 14 days, at the same time, before feeding. When the animals' winter fur covers were fully developed, their appearance was evaluated applying the standard for polar fox appearance evaluation. The data concerning body weight gains and appearance evaluation were subjected to a statistical analysis of variance for one-factor orthogonal designs. The pelts were evaluated and classified according to the requirements of the Polish standard (1984). The results obtained were compared in the form of mean values.

It was found, on the basis of weighing results, that the mean body weights of the foxes were similar and did not show any statistical differences between the groups. Their initial body weights differed insignificantly only, which indicates proper selection of animals for the experiment. The final body weights turned out to be similar as well.

An analysis of the appearance evaluation results did not show any statistical differences for the traits studied. However, certain differences, although insignificant, were observed between the groups. They could be connected with the application of the concentrate examined. The animals' size was at a similar level (in both points and centimetres) in all the groups, just like their body weights. The type and, to a slighter degree, brightness of colour are genetically determined; that is probably why they did not show inter-group differences which could be caused by the feed examined. The fur cover quality in the foxes of group I (control) and in

those of groups II and III (experimental) was also characterised by similar parameters.

The animals' pelts were evaluated and classified according to the size and category of fur cover. The pelt size was similar in both the control group and experimental ones (it confirms the results achieved in the course of the animals' appearance evaluation and final weighing). The fur cover category was the best in the group of animals receiving a 10% addition of concentrate Grower (group II), and the worst in that receiving a 20% addition of this concentrate (group III).

Conclusion

The research results enable us to conclude that adding Dutch feed concentrate R-075 Grower to rations for polar foxes did not have a significant effect on the performance indices analysed. Better fur cover quality found in the animals of group II might be accidental.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 131-134, 1998. In POLH, Su. ENGL. Only summary. Authors' summary.

Relationship between body weight of raccoon dogs and the physical parameters of their pelts

Malgorzata Piorkowska

Production of top quality pelts is one of the main goals of fur farming. Production of pelts is the final result of farming and its volume is strongly affected by the size of animals.

The aim of this work was to determine the relationship between body dimensions, and dimensions and physical parameters of the pelt.

The following traits were measured on 24 raccoon dog pelts: weight (g), length (cm) and area (dm^2). Correlation coefficients were calculated for them.

Traits	2	3	4	5	6	7	8
1-body weight	,3085	,1606	,1563	,2272	,2202	,1068	,2645
2-body length		-,1288	-,2698	,4490*	,3790	,3157	,1661
3-weight of untreated pelt			,9193**	,4461*	,4785*	,3285	,5495**
4-weight of treated pelt				,3655	,2963	,2138	,4439
5-lenght of untreated pelt					,8132**	,6841**	,5552**
6-length of treated pelt						,6166**	,6319**
7-area of untreated pelt							,6407**
8-area of treated pelt							

* - difference statistically singnificant at P - ≤ 0,05

** - difference statisically singnificant at P ≤ 0,01

In the population of raccoon dogs under study, the body weight was found to be most highly correlated with its length. The weight of the untreated pelt was highly significantly correlated with the weight and area of the treated pelt and significantly correlated with the length of the treated pelt. Positive correlations were also found between the length of the untreated pelt and length and area of the treated pelt. There was a negative correlation between body length and the weights of the untreated and treated pelts.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 135-136, 1998. In POLH, Su. ENGL. Only summary. Author's summary.

Physical measurements of pelts in the raccoon dog

Malgorzata Piorkowska

Fur animals are farmed mainly for pelts. The structure of fur is determined by its base (skin) and coat.

The aim of the present study was to determine the value of untreated and treated pelts in the raccoon dog.

24 raccoon dogs from the Chorzelow farm and their pelts were studied. Pre-slaughter body weights of raccoon dogs and pelt measurements are shown in Table 1 (g).

Sex	Body weight of animal	Weight of stripped pelt	Weight of fleshed pelt	Weight of dried pelt	Weight of treated pelt
Males	9042	2233	874	528	471
Females	9150	2142	847	515	460

The body weight of raccoon dogs exceeded 9.0 kg, the females being 108 g higher. After slaughter, the weight of pelts taken from male animals was 91 g higher. This tendency was observed until the completion of pelt treatment. Differences in the weight of pelts after fleshing, drying and treatment were 27, 13 and 11 g, respectively. After treatment the weight of pelts decreased by 10.7%. The body length of raccoon dogs before slaughter amounted to 98.3 cm in males and 100.3 cm in females. The physical parameters of untreated and treated pelts are shown in Table 2.

Sex	Length of untreated pelt (cm)	Lenght of treated pelt (cm)	Area of untreated pelt (dm^2)	Area of treated pelt (dm^2)	Weight of dm^2 nreated pelt (g)	Weight of dm^2 treated pelt (g)
Males	97,9	90,5	46,7	41,6	11,3	11,4
Females	98,1	89,7	44,9	41,7	11,5	11,1

Untreated pelts were marginally longer. After treatment, the length of pelts from males and females decreased by 7.6 and 8.6 %, respectively. The male racoon dogs had a 1.8 dm^2 larger area of untreated pelt. After treatment, the pelt area became equal in both sexes. The weights of 1 dm^2 untreated and treated pelt were similar, ranging from 11.1 to 11.5 g.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 137-138, 1998. In POLH, Su. ENGL. 2 tables. Author's summary.

Characteristics of physical parameters of untreated and treated pelts

Malgorzata Piorkowska

Experience and in-depth knowledge of fur pelts are essential to their production, processing and export. It is necessary to find out about their structure, interactions, advantages and disadvantages to be able to evaluate them.

The aim of the present study was to evaluate the physical parameters of untreated and treated pelts. Blue fox pelts were taken from the animals pelted at the Chorzelow farm. The pelts were pre-treated, weighed and dried on the farm. Body and pelt measurements are shown in Table 1 (g).

Sex	Body weight of animal	Weight of stripped pelt	Weight of fleshed pelt	Weight of dried pelt	Weihht of treated pelt
Males	7028	2024	717**	438**	389**
Females	6398	1845	630**	386**	343**

** - difference statistically singnificant at P - ≤ 0,01

The body weight of male and female foxes amounted to about 7 and 6.4 kg, respectively. Measurements of analysed pelts showed that pelts taken from male foxes were about 9.7% heavier than pelts taken from females. This difference amounted to 87 g after fleshing and to 52 g after drying. After treatment the weight of the pelts decreased by about 11%. Statistically significant differences for the weight of pelts between the sexes were found in the case of pelt weight after fleshing, drying and treatment. Body length and physical parameters of pelts are shown in Table 2.

Sex	Body length	Length of untreated pelt	Length of treated pelt	Area of untreated pelt	Area of treated pelt	Weight of dm^2 untreated pelt	Weight of dm^2 treated pelt
Males	61,5*	99,2	95,3*	42,0	36,9*	10,4**	10,5**
Females	59,9*	95,5	91,5*	39,9	34,8*	9,7**	9,8**

* - difference statistically singnificant at P - ≤ 0,05
** - difference statistically singnificant at P - ≤ 0,01

In relation to male foxes, the body length, length of untreated pelts and length of treated pelts of females were 2.6, 3.7 and 4.0% smaller, respectively. The difference between body length and length of the treated pelt was statistically significant. The pelts of female foxes were 2 dm^2 smaller, while the weight of 1 dm^2 of their pelt was 0.7 g (6.7%) smaller. Differences in the weight of 1 dm^2 untreated and treated pelt were highly significant.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 139-140, 1998. In POLH, Su. ENGL. 2 tables. Author's summary.

Dependence of growth rate and number of weaned fitch on litter size at birth

Olga Szeleszczuk, Stanislaw Jarosz

A characteristic feature of breeding fitches is their high fertility and fecundity. Numerous litters amounting to 10-12 young are observed frequently in breeding practice. The most critical period in fitch breeding falls on the first few weeks of kit life because the female's milk is their only feed in the first three weeks after birth while milk production decreases from the 3rd week of lactation.

The aim of the present study was to evaluate litter size at weaning and increase in body weight in breeding fitches in relation to litter size at birth.

The study comprised 482 polecats from 80 litters. The observation period lasted from birth to weaning. First control of litter size and body weight was performed on the 2nd day after birth, next examinations took place on 21st and 42nd day, the latter being a period of weaning, and on 180th day of life, at the onset of somatic maturity.

The results indicated that mortality rate in the period between birth and weaning increased with litter size. Mortality rates in the period from birth to 21 days for litter size 2-4, 5-8, 9-12, and 13 and more kits were estimated at 3.2%, 6.0%, 8.7% and 11%, respectively. The lowest mortality at weaning, i.e. on 42nd day of life (7.2% and 7.5%), was found when litter size ranged from 2-4 and 5-6 kits, respectively. If litter size exceeded 12, mortality rate at weaning increased to 20.7%.

Differences in body weight could be noted already at birth and they persisted until weaning, when sex dimorphism developed. However, kits from larger litters gained weight faster after weaning and, at the onset of somatic maturity, their body weight approximated those of kits from smaller litters. Nevertheless, body weight of young from litters larger than 13 kits remained lower also after the onset of somatic maturity.

Proceedings from Recent Studies in Fur Animal Breeding in Poland, pp. 141-142, 1998. In POLH, Su. ENGL. Only summary. Author's summary.

Influence of a number of active mammary glands in female fitches on growth rate of their kits and litter size at weaning

Olga Szeleszczuk, Piotr Niedbala, Andrzej Zon

Female fitches produce large litters, and they can feed them if provided by a sufficient number of active mammary glands. Females of this species have 4-6 pairs of mammary glands, and the number of active mammary glands during lactation averages 6-8. In breeding fitches, lactation lasts 6-8 weeks. The week after birth is the most critical time in fitch breeding since, in this period, milk production in females decreases while, simultaneously, demands of kits for nutrients increases and additional feeding of the young is recommended.

The aim of the present study was to establish the influence of the number of active mammary glands on litter size at weaning and growth rate of kits in the postnatal period in breeding fitches.

The study was conducted on 80 females, 2 or more years of age, in the period between May and December. The females gave birth to 482 kits. The first control of litter size and number of active mammary glands was carried out on the 2nd day after parturition. Kit mortality was determined on the 21st and 42nd day after birth. Growth rate was estimated by weight of kits on days 21, 42 and 180.

The studies showed that the litter size at weaning depended on the number of active mammary glands in the female. If 4 mammary glands were active, mortality at weaning amounted to 34%, while in females with 8-10 active mammary glands, mortality was much lower, i.e. 13.5%.

Body weight of kits at 21 days of age, i.e. after the period when they fed only on the female's milk, differed statistically significantly depending on the number of active mammary glands. However, the number of active mammary glands had no influence on body weight gain from weaning to the onset of somatic maturity. On the 42nd day of life, body weight of females and females ranged from 250 g to 259 g and from 230 g to 239 g, respectively. On day 180 after birth, body weight in males and females varied from 1793 g to 1813 g and from 1080 g to 1097 g, respectively.

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Effect of castration of male blue foxes on body weight gain and coat quality

Olga Szeleszczuk, Jadwiga Kubicka-Kus

Unique characteristics of castrates have been used for ages. Castration of male farm animals improves or changes the taste of their food products, making them highly valued and demanded on markets of many countries. However, data on the effect of castration on pelt quality in fur bearers are missing.

According to the studies conducted by Dube et al. (1971) on mink, there is a direct relationship between day duration and light-induced changes in the secretion of endocrine glands, and coat growth and maturation. Therefore, a question arises if castration of male blue foxes, and thus induced changes in hormone secretion, can influence, and to what extent, their body weight and coat quality.

The studies were conducted on 48 male blue foxes in the period from July to November. The animals were divided into two genetically homogenous groups: the control and experimental. In the experimental group, males were subjected to unilateral castration on 22nd July, 22nd August or 10th September. Body weight was controlled over the whole observation period, and pelt quality was scored in November. After pelting, 8 pelts of foxes from the experimental group and control group were subjected to qualitative and quantitative laboratory examination.

On the day of castration, males were 93 days old and weighed 4155 g on average. Measurements of body weight revealed big individual differences, especially in the experimental group. Before pelting in November, the average body weight of animals in the control group (7063 g) was higher than in the experimental group (6750 g). On the other hand, maximal body weight in the experimental group was higher while minimal body weight was lower than in the control group.

Laboratory tests and pelt quality scoring showed that castration of 3-month-old foxes insignificantly decreased pelt quality.

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