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THANKS TO ALL OF YOU.



NOTES
SCIENTIFUR
Vol. 12, No. 4, 1988

Now the 4th very successful International Scientific Congress in Fur Animal Production has passed into history.

This well arranged congress was participated by about 280 persons from 18 various countries, of this 92 from Canada, 47 from Denmark, 40 from USA, 34 from Finland, 21 from Holland, 13 from Norway, 11 from Sweden, 4 from Iceland, 4 from Korea, 3 from each of France, Italy and Japan, 2 from each of German Democratic Republic, England and Spain and one representative from Federal Republic of Germany, Argentina and Poland.

Abstracts of the 75 reports or posters presented (sent to the participants before the congress) appear in this issues of SCIENTIFUR.

These mammoth proceedings of 585 pages were given to the participants at arrival. The proceedings, entitled "Biology, Pathology and Genetics of Fur Bearing Animals" edited by Dr. Bruce D. Murphy and Dr. D. Bruce Hunter, contain 74 entire scientific reports given at the congress.

The proceedings are obtainable, and the way to get them is stated on a page in connection to the section of the abstracts from the congress in this issue of SCIENTIFUR.

Several participants took the opportunity to thank the members of the Organizing Committee for the extreme good organization of the congress. Not least the coordinator, Mr. Gary Hazlewood, and his secretary, Mrs. Karlene Hart, were acknowledged for their contribution before and during the congress. The proceedings from this congress will for many years stand as a glorious monument to the editors and other people involved. To the mentioned comments we also want to add thank you very much to the entire organizing committee for their contribution before and during the congress.

The US-excursion after the congress was a great experience for the participants. We ask our latest marvellous hosts, Mr. Tony Rietveld and Mr. Bruce W. Smith, to receive the flowers for that arrangement and bring some of them to the other members of the committee and not least the people at the places we visited.

In total, a very good congress followed by an inspiring excursion both seasoned by a great kindness and hospitality - THANKS TO ALL OF YOU.

INTERNATIONAL FUR ANIMAL
SCIENTIFIC ASSOCIATION (IFASA)

From the fur animal division, a branch of the Scandinavian Association of Agricultural - Scientists, it was proposed to the congress to found IFASA. The discussion about this question was very limited in the audience, but a great number of the participants from nearly all the participating countries gave their personal and positive opinion of the idea to the undersigned and other colleagues from Scandinavia.

THEREFORE, IFASA has been a fact from now on. See in the next issue of SCIENTIFUR what it does mean for you and us in the future.

VI INTERNATIONAL SCIENTIFIC
CONGRESS IN FUR ANIMAL PRODUCTION
- in OSLO, Norway 1992.

As proposed from Scandinavia by Dr. Einar J. Einarsson and confirmed by the congress the Vth Congress was invited and will be arranged in Oslo in the beautiful Norway in 1992.

From Poland was also given an invitation to the Vth Congress, but based on the arguments from Scandinavia, Professor S. Jarosz from Poland withdraw this invitation and proposed to the congress that Poland will work at arrangement of the VIth congress in 1996.

As you can see many things are going forward. The participants of the congress were told that SCIENTIFUR have serious economical problems both regarding 1989 and in the future

After 12 year in service we must realize that even after raising the subscription price to Dkr. 500.- per volume from January 1989 (Volume 13) the 1989-budget for SCIENTIFUR has a negative balance of Dkr. 100,000.- with the same number of subscribers and advertisers as in 1988.

THEREFORE, WE ASK FOR EXTRA SUPPORT TO SCIENTIFUR IN 1989. We ask organizations and institutions to order more subscriptions. Why not offer a subscription to all directors (managers) and board members as well as to people with whom you have professional contact. We also know that SCIENTIFUR is appreciated of a lot of companies supplying the fur animal production.

WHY NOT - DEAR FRIENDS, IN THE SERIOUS COMPANIES - SUPPORT SCIENTIFUR DURING ADVERTISEMENT. We will send you a letter as soon as possible inviting you to advertize and give the conditions for advertising.

WE NEED ALL THE SUPPORT WE CAN GET. As already mentioned the subscription price will go up from January 1989, from Dkr. 420.- to Dkr. 500.- per year. We hope that you will have understanding for that - and will pay the subscription as soon as possible after receiving the invoice at January 1989.

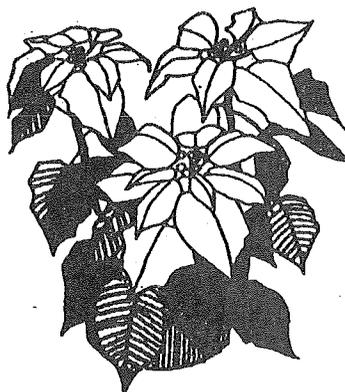
NEW ADDRESS FROM JANUARY 1st 1989.

Because of movement of our Institution to the new Research Center in Jutland the Division of fur Animals under N.J.F. has made an agreement with Danish Fur Breeders Association regarding office and necessary facilities for the secretary, Mrs. Ellen Andersen. Therefore, there are 2 NEW ADDRESSES FROM JANUARY 1st 1989. See special advertisements on the next page.

By this latest issue of SCIENTIFUR, Volume 12, we wish to thank all subscribers, contributors and advertisers for your support in 1988. We wish you a MERRY CHRISTMAS and A HAPPY AND PROSPEROUS NEW YEAR.

Kind regards
your editor


Gunnar Jørgensen





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IMPORTANT



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SCIENTIFUR INFORMATION

1. NEW ADDRESSES. As mentioned under Notes SCIENTIFUR is going to change address from January 1st 1989.

Thanks to Danish Fur Breeders Association it has been possible to move the functions of secretay, administration and production to Copenhagen Fur Center, where Ellen Andersen will still take care of this functions.

From January 1st 1989 all correspondence regarding subscriptions and book orders shall therefore be addressed to:

SCIENTIFUR
60, LANGAGERVEJ, DK 2600
GLOSTRUP, DENMARK

Phone (45-2) 967122,
Telex. 33171 dnfur

Telefax (02)2-452546.

Ellen Andersen will be at the office the weekdays Monday-Tuesday, 8 a.m to 4 p.m..

Editorial correspondence shall be addressed to:

SCIENTIFUR
Foulum
P.O. Box 39, DK 8830 Tjele

Phone (45-6) 652500,
Telefax: ??

2. NEW SUBSCRIPTION RATES:

As advertised under Notes the subscription rate will go up from January 1st 1989, (Volume 13) to NET Dkr. 500.-. Including exchange costs at present equal to US\$ 80.-).

This cost include 4 issues of the journal containing at least 20 original reports and 500 abstracts or titles of scientific reports occurred in 150 international scientific journals.

Invoices for Volume 13 will be send at the beginning of January 1989. We ask you, kindly, to give the invoice your prompt attention.

3. REDUCED PRICE OF ADVERTISEMENTS.

Due to the fact that it is essentially for SCIENTIFUR as well as it is important for SCIENTIFUR's readers in 30 countries to receive information from advertiseres, the price for advertisements in the journal has been reduced by approx. 30 per cent. Our intension is to do advertising more attractive in the only international journal regarding fur animals , which bring you in touch with the entire world of fur animal production.

See price lise and suggestions on next page.



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*Original report***Probiotic - a survey. An alternative to antibiotics in the feed of fur-bearing animals?**

Mogens Jørgensen, D.V.M., Mosbjerg, DK-9870 Sindal, Denmark.

An optimum result of animal production is closely connected with the health condition of the animals. To obtain increased growth rate, increased feed utilisation and prophylaxis against infections, it has for many years been common practice to add antibiotics to the animal feed. The extensive use of antibiotics has several adverse consequences. The most serious one is increased bacterial resistance and, apart from that, antibiotics may exterminate certain parts of the intestinal flora, thereby causing diarrhoea (*Pietrusko*). The feed additives (antibiotics) normally used are effective only on a limited spectrum of Gram-positive bacteria and may therefore disturb the balance of the intestinal flora in favour of Gram-negative bacteria (*E. coli*) (*Gedek*). It is important therefore to find alternatives to antibiotics.

Animals are born with a sterile gastrointestinal tract and immediately after birth they incept micro-organisms from the dam and its environment. After a few weeks a stable gastrointestinal flora has settled in the healthy animal (*Hirch*). The different groups of micro-organisms in the healthy animal adjust to a mutual balance (eubiosis). The composition of the intestinal flora of the very young animal differs from species to species. In newborn piglets *E. coli*, Streptococci and Lactobacillus are dominant (*Ducluzeau*). An examination of mink kit suffering from diarrhoea revealed only Streptococci and Staphylococci in the intestinal tract until the kit were 3-4 weeks old. At this age the kit begin to eat on their own and then *E. coli* is dominant in the intestinal flora (*Jørgensen*). By culturing the visceral contents of healthy kit from birth until eating on their own *Tove Clausen* found cultures of Streptococci and Staphylococci (isolated Staph. aureus) and later a predominans of *E. coli*.

The affects of stress (for example, frequent removals, unaccustomed noise, feed of a bad quality, insanitary surroundings) often disturb the balance among the different groups of micro-organisms in the intestinal flora (dysbiosis) resulting in diarrhoea and possibly other infections, which distinctly influences the animal's health and development.

As early as in 1907 *Metchnikoff* suggested that the intake of acidified milk products would improve health and development. It has been known for years that the composition of the intestinal flora is a condition for optimum development and utilisation of feed. On this basis it is possible to select natural intestinal flora and perhaps increase the ability to prevent the settling of pathogenic microorganisms (*Søgaard*).

These products are called probiotics. The germs that have been used most frequently over the years are species of Lactobacillus and Streptococcus faecium (lactic acid producing) and spores of Bacillus toyi (acetic acid producing).

The bioregulatory effect of the lactic acid producing bacteria is due to: Production of lactic acid (lowering of pH) and short-chained fatty acids as well as bacteriocins, which all have a suppressing effect on pathogens (*E. coli*, Salmonella typhi murium, Clostridium sp.) (*Lewenstein et al.*). Colonisation of the entire gut. The formation of a biofilm as a barrier against potential pathogens. Counteracts the adhesion of *E. coli* and certain vira (for example Rotavirus) to the intestinal epithelium by immunostimulation. Stimulates the production of intestinal mucus (protective effect).

The improvement of feed utilisation and growth rate is due to: Increased uptake of fatty acids. The transformation of sparingly soluble compounds into easily soluble compounds. The better aerobic decomposition of the feed, which improves digestion in the small intestine. The prevention of accumulation of indigested feed in the large intestine, whereby less nutrition is left to coliform bacteria (Bioferment Laboratories).

Over the years numerous investigations have been undertaken, using lactic acid producing bacteria for young animals. Certain differences are to be found among bacteria of the types *Streptococcus faecium* and *Lactobacillus*. *Streptococcus faecium* Cernelle 68 (SF 68) used in the LBC form (Lactic acid Bacteria Concentrate) produces more lactic acid than does *Lactobacillus acidophilus* and has shown a greater surviving ability especially in environments with a low pH (*Gyllenberg*). Comparative investigations have shown SF 68 to be the most effective lactic acid producing bacterium and trials on piglets have given identical results, namely less cases of diarrhoea, reduced mortality and better feed utilisation (*Underdahl* 1982, *Underdahl* 1983, *Siwecki*, *Lewenstein* et al.). Only few results are available from trails using probiotics to fur-bearing animals, and in this instance, as is the case with other species, the animals in the period of gestation and sucking are of interest. *Lohi* and *Mäkelä* observed a positive effect on the growth of the kit when adding *Lactobacillus acidophilus* to the feed. *Tauson* undertook trials with different compositions of lactic acid bacteria (LAB) and compared the growth results with those of trial groups that received tylosin. The LAB preparations were combinations of *Lactobacillus* and *Streptococcus* species. In these trials the production of lactic acid in the feed was utilised as a feed preservative. On an average the results were positive: Bigger litters, reduced mortality. One LAB preparation with rapidly growing bacteria caused reduced appetite, undoubtedly owing to a considerable production of lactic acid (reduced palatability). The group receiving tylosin showed the highest growth rate. The litter size of blue foxes was significantly improved by LAB as a feed additive. When mentioning probiotics for fur-bearing animals, there is a thing of special importance and that is the short period of time the food takes to traverse the gastrointestinal tract (4-6 hours) (*Villadsen*).

Thus, for a probiotic to be effective, it must have a short generation time. The *Lactobacillus* species have a generation time of 40-60 minutes (*Lewenstein*). The streptococcus faecium species also have different generation times. Among these SF 68 probably has the shortest one, namely 19 minutes (as has *E. coli*) (*Lewenstein*). In vitro studies with *Bacillus toyi* (*Hattor*) showed that the production of acetic acid and lactic acid increases considerable after 3-4 hours' growth.

Conclusion

Probiotics for the improvement of health and development of furbearing animals have many advantages over antibiotics as feed additives, both for ecological and sanitary reasons. But to be able to utilise the bioregulatory effects of probiotics to the greatest extent, it will be necessary to use germs with the shortest possible generation time on account of the short passage of the visceral contents.

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SPECIFICATIONS:

TYPE	ENGINE	TANK CAP. (litres)	TURNING RAD. mm	HEIGHT mm	WIDTH mm	LENGTH mm	OWN WEIGHT kg
450 STD	10 HP Honda	450	1400	1300	850	1750	350
450 B	12 HP Kohler	450	1400	1350	850	2000	450
450 D	18 HP 2 cyl. Diesel B	450	1400	1350	850	2250	500
600 B	18 HP Kohler	600	1400	1380	850	2100	450
600 D	2 cyl. Diesel	600	1400	1380	850	2250	500
920 D	24 HP 3 cyl. Diesel	920	5000	1500	870	2750	750

Different extra equipment - feed tank stainless steel - acid proof feed hose.

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Original Report

Probioticum (*Streptococcus faecium* Cernelle 68- SF68) for improvement of health and well-being with mink and fox.

Mogens Jørgensen, D.V.M. Mosbjerg, DK-9870 Sindal Denmark.

Summary

Production disorders (mastitis, sticky kits, nursing sickness) in farmed fur animals in Denmark, is problems who had come to stay. For many years, feed additives (antibiotics) has been used in the nursing period, both as a feed preservative and in the hope of preventing infections. The great number of negative effects found by prolonged use of antibiotics, and the lacking of preventing effect on development of production disorders was the reason to test an probiotic: *Streptococcus faecium* Cernelle 68-SF68 on two minkfarms, one silver fox- and one blue fox farm. SF68 was mixed in the feed after mating (20/3) and until weaning (20/6). All the farms got the feed from the same feed supplier, and there was no antibiotics in the feed. The breeding females on each farm was divided in two identic batches: trial batch and control batch. SF68 was given as a concentrate 1g/20 kg feed (35×10^9 bacteria).

Mink trial batch: The females were in labour on the average of 24 hours earlier, tendency to larger number of kits (especially young females), a larger number of kits survives from delivery until weaning and they weigh more. The females yields milk longer and are in better condition. Observations in the period shows that the trial batches thrives much better than the control batches, with constant feed consumption and constant apperance of the faeces.

Fox trial batch: Silver and blue foxes deliver more kits and here again it is the young females who deliver a larger number of kits. As for the blue foxes, a larger number of kits die from delivery until weaning.

The generally positive results obtained from giving SF68 especially to mink as well as the clinical observations indicate that the bacterium colonizes in the intestinal tract in all probability with effects such as larger feed utilization and stability in the intestinal flora. This demonstrated by better growth and health in the females and kits. It can be concluded that SF68 will be a very suitable substitution to the feed additives (antibiotics) in mink feed during the periods of gestation and nursing.

As to silver- and blue foxes the breeding females deliver a larger number of kits. The greater number of kits at the silver foxes until weaning while more blue fox kits die in the trial batch.

Introduction

A steady well working intestinal flora is the first condition to be fulfilled for the optimum well-being of an animal, and especially in the period of gestation and nursing this is important. For some years it has been very common among fur farmers to mix small quantities of antibiotics into the feed in the period mentioned, both as a feed preservative and in the hope of preventing infections. The great number of negative effects found by prolonged use of antibiotics has made it of current interest to find alternative preparations. Besides, the present feed additives have not prevented the development of production disorders such as mastitis, sticky kits and nursing sickness. Here it is natural to think of biological feed supplements (probiotics) with many-sided effects in the intestinal

tract. Owing to the short time of passage through the intestinal tract in fur animals it is important to have a probioticum with a short generational interval, and this is the reason for mentioning the SF68 (Jørgensen, M., *Scientifur*, vol. 12, no. 4, 1988). In order to test the SF68 a trial in fur animals was carried out in the reproduction period in 1988.

Material and methods

Two mink farms, A and B, participated each with approx. 600 mink females of the types scanblack and wild. Both farms are cleared of the disorder of plasmacytosis, and over the years they have had a high state of health.

On each of the farms the females have been divided into two batches, a control batch and a trial batch. The batches are identical as to types, the age of the females and the dates of their matings. From each batch 100 females have been chosen, once again identically compounded as to types, the ages of the females and the dates of their matings. The females were weighed around the 20th March and again at the weaning of the kits. The kits were weighed at the ages of 14, 28 and 42 days. For all females date of birth, number of liveborn kits and number of kits were registered at the weaning. The trial started at the end of March after finished matings and putting out the females into the batches.

Farm B also included 100 silver foxes in the trial. They were divided into two identical batches as to the ages of the females and the dates of their matings. The number of liveborn kits and the number of kits at the weaning were registered. The trial started and ended simultaneously with that of the minks.

Farm C participated with approx. 150 blue fox females. They were divided into two identical batches as to the ages of the females and the dates of their matings. The number of liveborn kits and the number of kits at the weaning were registered. Moreover it was registered whether the females got endometritis after the birth, since this for several years has been a great problem on the farm.

SF68 was given as a concentrate, 1 gramme (35×10^9 bacteria) per 20 kilogrammes feed each day in the period of 23/3-

20/6. However, as to the blue foxes it was given until the last born kits were five weeks old. SF68 was dissolved in water and mixed into the feed through a water dosing device on the feeding machine. The water was sucked out through a connecting piece debouching near to the pump of the feeding machine, while the pump was working. All farms get their feed from the same feed supplier, and during the research period antibiotics have not been used in the feed.

Results

For the mink farms A and B it appeared that the first 66% of the females in the trial batches were in labour on the average of 24 hours earlier than the comparable females in the control batches (table 1).

Table 1. Average day of birth for the first 66% of the females, ± 3 days.

Farm A	Scanblack	wild
Control	03.05. 1988	02.05. 1988
Treated	02.05. 1988	01.05. 1988
Farm B	Scanblack	wild
Control	02.05. 1988	01.05. 1988
Treated	01.05. 1988	30.04. 1988

Result for kits

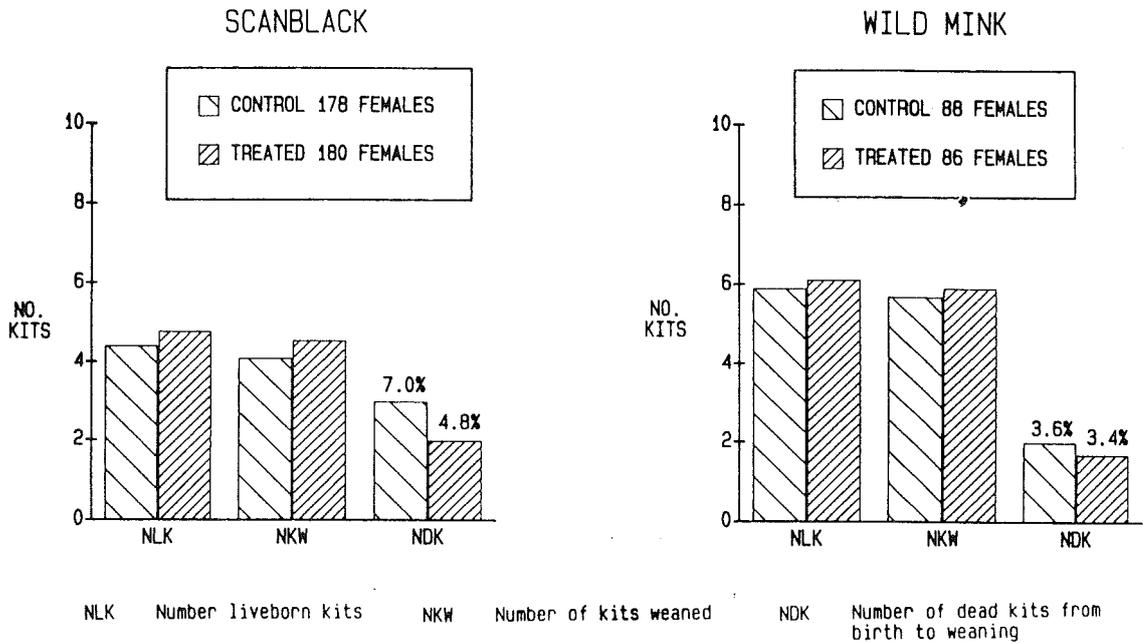
Farm A (fig. 1): In the scanblack group the experimental females gave birth to 0.37 liveborn kits more than the controls, and at the weaning the differences was 0.45 kit.

The likeness of the two types of mink in both of the farms is that the better result of kits in the trial batches is due to the fact that it is the young females which gave birth to more kits. (For farm A it was a fact that young scanblack females in the trial batch gave birth to 0.75 kits more than the young females in the control batch, and the figure for wild mink is 0.48 kit).

The older females in both batches gave birth to almost the same number of kits. In the control batch 7% of the kits are lost from parturition to weaning, in the trial batch 4.8% of the kits are lost.

FIG. 1

KITS RESULT - FARM A



In the wild mink group the experimental females, gave birth to 0.22 liveborn kits more than the controls, and at the weaning the difference is also 0.22 kit. In the control batch 3.6% of the kits are lost, in the trial

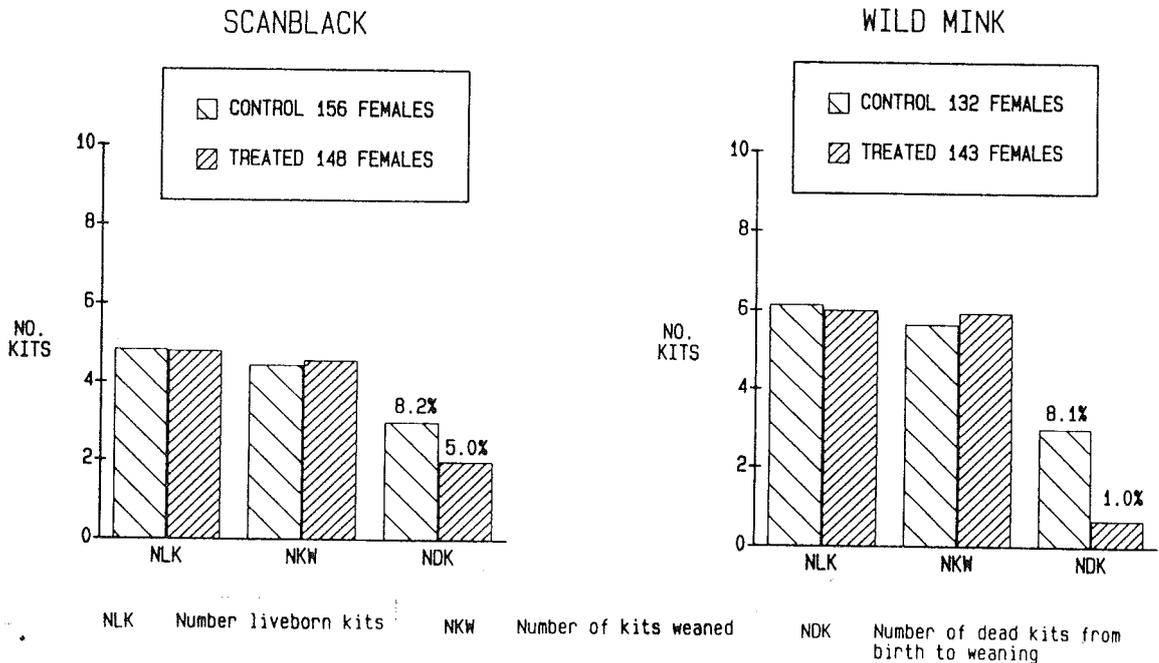
batch 3.4% of the kits are lost before the weaning.

Farm B. (fig 2)

In the scanblack group the experimental

FIG. 2

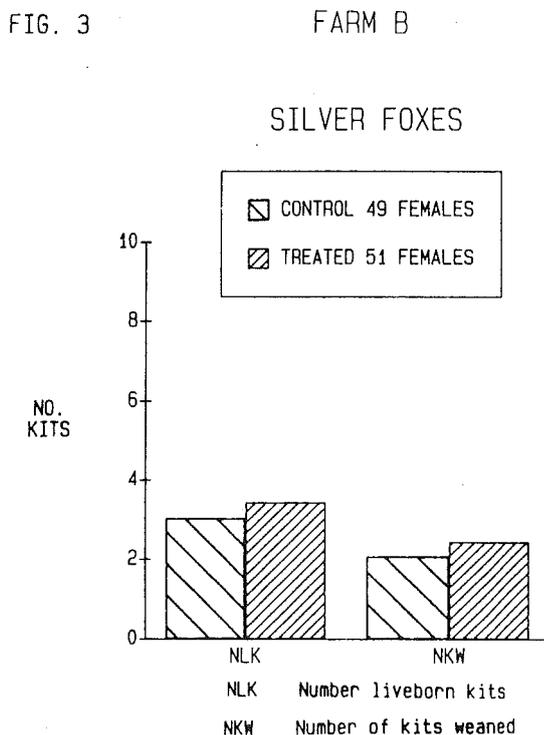
KITS RESULT - FARM B



females gave birth to 0.03 liveborn kits less than the controls. At weaning 0.13 more kits are alive with the experimental females. The percentages of loss until weaning are for the control batch 8.2% and for the trial batch 5.0% of the kits. In the wild mink group the trial females gave birth to 0.14 liveborn kits less than the controls. At weaning there is 0.3 more kits with the experimental females than with the controls. The percentages of loss until the weaning are for the control batch 8.1% for the trial batch 1.0% of the kits.

Farm B. silver foxes (fig. 3)

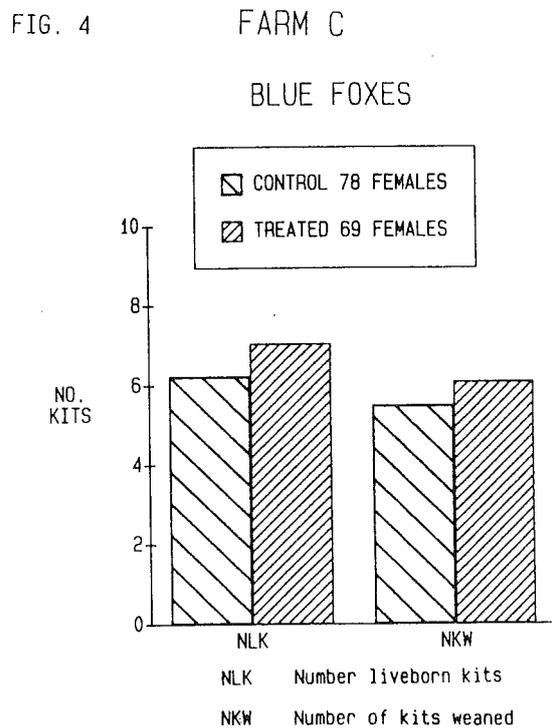
The experimental females gave birth to 0.4 kits more than the controls, and this difference is almost the same until weaning, when the control females have lost 31.6% and the experimental females 29% of their kits. The higher number of kits is due to the fact that the young females in the trial batch gave birth to 0.6 more kits than the females of the control batch. The percentage of sterility is the same for the two batches.



Farm C. blue foxes (fig. 4)

The experimental females gave birth to 1 kit more than the controls, but at weaning the difference was reduced to 0.5 kit. The death-rate of the kits is 14.7% in the trial batch and 9.5% in the control batch in the period from parturition to weaning. Once again it is the young females in the trial batch which give birth to more kits than the young females in the control batch, viz. 1.9 kit. The percentages of sterility do not vary much, the trial batch: 22%, the control batch: 27%.

SF68 does not influence endometritis, as 57% of the females in both batches about to give birth got endometritis.



Development of the kits. (table 2)

As to both of the farms all the experimental kits are weighing more than the control kits at the first weighing. At the second weighing less than those in the control batch, whereas all wild mink kits in the trial batch are weighing more than the kits in the control batch. At the last weighing there is a significant difference in weight between the

Table 2A. Weight of kits at different age, grammes

	Scanblack*				Wild**			
	Females		Males		Females		Males	
	Control	Treated	Control	Treated	Control	Treated	Control	Treated
	Day 14	63.47	65.16	70.42	72.57	59.82	63.96	65.69
Day 28	150.46	150.19	166.72	168.98	144.09	153.04	161.28	170.74
Day 42	293.88	297.58	331.17	338.45	283.02	303.30	326.85	396.77

* 44 untreated litters
54 treated litters

** 31 untreated litters
26 treated litters

Table 2B. Weight of kits at different age, grammes.

	Scanblack*				Wild**			
	Females		Males		Females		Males	
	Control	Treated	Control	Treated	Control	Treated	Control	Treated
	Day 14	69.56	70.96	77.81	78.14	61.71	63.92	69.29
Day 28	165.86	158.52	186.12	183.17	143.37	149.50	167.65	198.28
Day 42	372.07	380.75	444.67	450.93	370.72	370.30	456.68	466.67

* 36 untreated litters
42 treated litters

** 38 untreated litters
41 treated litters

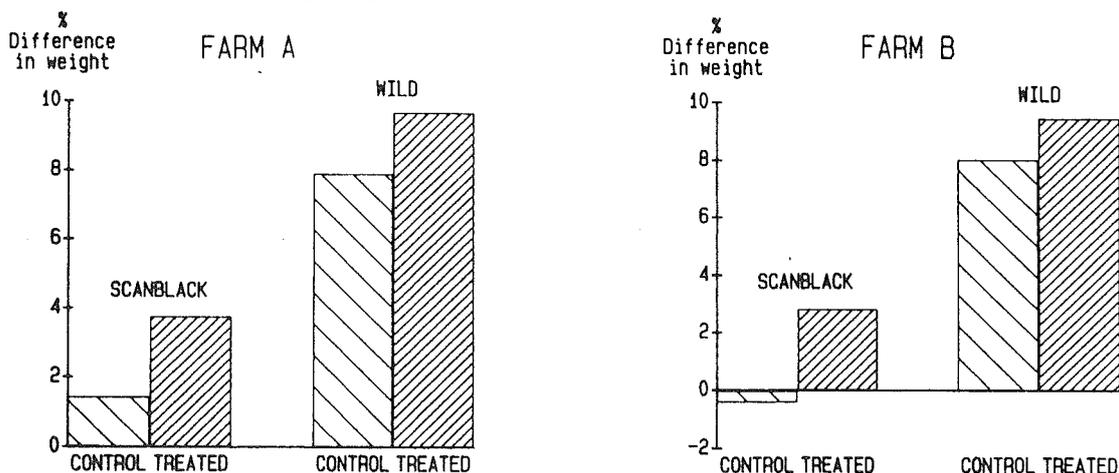
two batches in favour of the trial batch.

The reason for the large difference in weight between the two farms at the last weighing is that for practical reasons farm B did not weigh the kits until they were 47 days old.

The females of mink (fig. 5)

As described the females were weighed after the mating and in connection with the last weighing of the kits. The difference in weight is converted into percentages of the first weighing, and for both types on both farms it

FIG. 5 DIFFERENCE IN WEIGHT OF THE FEMALES IN PERCENT OF WEIGHT AT FIRST WEIGHING

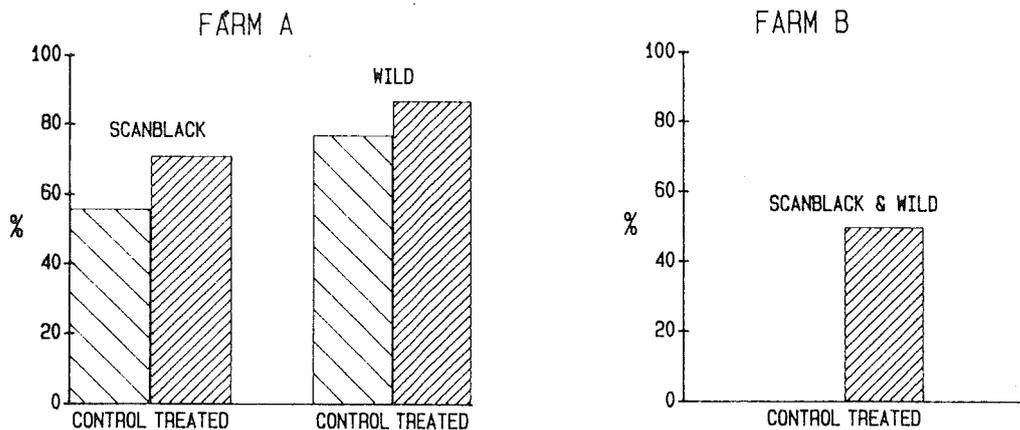


appears that the females in the trial batches have put on more weight in the nursing period than the females in the control batch. Besides, by estimating whether there was milk in the udders it was registered how many females were still yielding milk at weaning.

For farm A it appears from fig. 6 that more experimental females than controls are

yielding milk at weaning. For farm B, where the kits were weaned five days later than those on farm A it has been estimated that none of the females in the control batch were yielding milk, whereas approx. 50% of the females in the trial batch were yielding milk at weaning. The percentages of sterility varied very little between the batches.

FIG. 6 FEMALES WHO MILKS AT WEANING



Clinical observations, mink

Farm A:

When giving birth to kits the females in the trial batch were in better condition than those females in the control batch, although the feed was uniform. This was the reason for a little more difficulties in giving birth to kits owing to fatness.

The appetite and the consumption of feed in the trial batch were more constant in the trial period, and the consumption of feed has been approx. 10% higher than that of the control batch. The appearance of the faeces in the trial batch was constant during the trial period, whereas the faeces in the control batches varied. In the period of 28/5 - 7/6 there were problems with the feed. In the trial batch the females had a greenish, uniform faeces verging on diarrhoea. In the control batch a corresponding tendency was seen, but in this batch 20-30% of the females had diarrhoea. In this period the control batch ate 20-30% less feed than the trial batch. This is also observed from the weight difference between the kits at the last weighing, especially in the wildmink group. No medicine has been used during this period,

but the feed supplier mixed acetic acid into the feed, which gave a disagreeable taste resulting in reduced appetite. In the middle of June there was a slight cannibalism concentrated within the control batch. 14 kits in the control batch and one kit in the trial batch died. No nursing sickness or sticky kits were found in any of the batches.

Farm B:

Also on this farm appetite and feed consumption were constant within the trial batch. Observations corresponding to those for farm A in the period of 28/5 - 7/6 were made.

Discussion, mink

The fact that on an average the experimental females gave birth to kits earlier than the controls is of some importance, as the kits born earlier generally pull through the growth better than the others. Moreover, many farms only breed kits born before May 1st, which gives a larger material for selecting breeding animals. In the efforts to make the females deliver earlier some farms use artificial light towards the end of the period of gestation. This happened on farm B, which explains that

the kits on this farm were born earlier than those on farm A. The earlier deliveries cannot be explained directly, but they may be due to better growth of the females owing to a steady intestinal function. The fact that the females thrive better when adding the SF68 to the feed appears especially on farm A through the larger number of kits delivered, and for both farms through the larger number of kits at weaning, the latter also owing to a lower death-rate from birth to weaning as compared to the control batches. Besides, the females show a better growth until the time of weaning, while at the same time a higher percentage of them are still yielding milk. The latter results in a smaller number of tired out females (early cessation of milk production), so that the problem of kits sucking the mouths of the mothers for liquid is reduced with the result that a considerable stress factor for these females is diminished.

The weighings of the kits show greater kits at the first weighing for both types on both farms for the trial batches. The kits are either born greater or the females have a better yield of milk. The latter may be the most likely reason. At the second weighing the weight of the scanblack kits is almost uniform for the batches on both farms, whereas the wildmink kits in the SF68 batches still weigh more. At this point in time the kits gradually began to eat, while at the same time problems with the feed occurred. As the scanblacks are a little more delicate than the other mink types this may be the explanation of the weighing results. At the last weighing there is again a difference in weight of kits of both types on both farms in favour of the SF68 batches. Observations

of the kits during the testing period showed that the SF68 batches thrived clearly better than the control batches.

Conclusion, mink

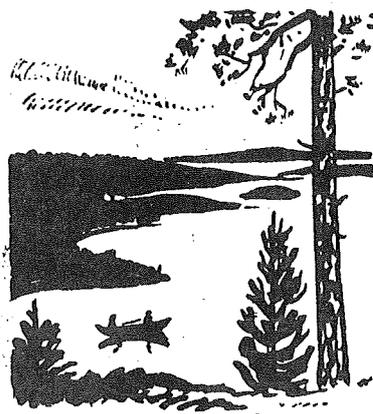
The generally positive results obtained from giving SF68 to mink as well as the clinical observations indicate that the bacterium colonizes in the intestinal tract, in all probability with effects such as larger feed utilization and stability in the intestinal flora. This demonstrated better growth and health in the females and the kits. All in all it can be concluded that SF68 will be a very suitable substitution to the feed additives (antibiotics) in mink feed during the periods of gestation and nursing.

Conclusion, foxes

As to silver foxes and blue foxes the mixing of SF68 into the feed results in a larger number of born kits being able to survive the period from birth to weaning, as with the silver foxes almost the same number of kits in the two batches die during the period, the largest number in the SF68 batch of blue foxes, but the final result is still a larger number of kits in the SF68 batch. In this trial the SF68 had no influence on the number of cases of endometritis in blue foxes.

Acknowledgements

A variance analysis on the results has been worked out by means of the SAS (GLM procedure) by *Asbjørn Brandt*, Veterinary Surgeon, Natl. Institute of Animal Science, Dept. of Fur animals, Hilleroed.



Original report

Effect of visual isolation during pregnancy and lactation on reproductive success in silver fox vixens

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And

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Summary

An experiment with 200 foxes showed that visual isolation during pregnancy and lactation did not affect litter production. Reported experiments with 757 minks showed the same result. Thus, the data presented do not favour the idea that visual isolation in the breeding season will increase well-being of farmed minks and foxes.

Introduction

A newly performed series of experiments (*Hoffmeyer and Møller*, 1986) involving a total of 757 animals showed that there was no significant influence of visual isolation of female ranch mink on number of weaned pups per mated vixen, weight of pups, number of successful matings (copulations), nest building and territorial marking. The visually isolated females delivered smaller litters, and a higher percentage of them delivered no litters at all in one of the experiments. Due to a correspondingly lower loss of pups during lactation there was, as stated above, no difference between the number of pups weaned in the control group and in the group of visually isolated animals. Activity in the cage was reduced (no statistic evaluation of the statement) by the isolation. The visual isolation was attained by placing the females in every second wire-cage leaving an empty cage or a cage filled with straw between them. Table 1 sums up some conditions and results of the experiments.

The experiments are referred to in some details here because the results disagree with earlier and better known Canadian results, which showed that visual isolation before and after breeding increased litter production (*Gilbert and Bailey*, 1967, 1970), presumably due to a decreasing effect of visual isolation on social stress (*Gilbert and Bailey*, 1968). Since decreased stress-susceptibility is a general aspect of domestication (e.g. *Price*, 1985) the most likely reason for the discrepancy between the two experiments is that the domestication has been in progress in the nearly twenty years interval between the two experiments.

Farmed foxes are in many respects more susceptible to environmental strains than minks, and especially the breeding success is supposed to depend heavily on resistance to social stress (e.g. *Bakken*, 1988). It should be relevant therefore to examine the effect of visual isolation on the breeding success in farmed foxes. This is what we intended to do in the present experiment.

Materials and methods

Animals. Two hundred silver fox vixens were randomly assigned to a control group or an experimental group. Animals in the control group were slightly older (2.2 years) than those in the experimental group (1.9 years). Median day of parturition happened to be the same (20th april, 1988) for vixens from both groups.

Table 1. Number of animals, onset and type of isolation, % mated vixens delivering no pups and mean number of born, weaned and lost pups per mated vixen in the control (C) and experimental (E) group of four experiments.

Exp. no. (year)	N		Onset of isolation	Type of isolation	Vixens with no pups (%)		Mean number of pups per mated vixen					
	C	E			C	E	born		weaned		lost	
							C	E	C	E	C	E
I (1985)	65	73	before mating	empty cage	5.7	5.1	5.9	5.4	5.6	5.3	0.3	0.2
II (1985)	77	183	before mating	empty cage	2.5	7.6	6.4	6.2	5.9	5.9	0.5	0.3*
III (1985)	55	43	before delivery	straw cage	6.6	24.1*	6.4	5.7*	5.2	5.2	1.2	0.5**
IV (1986)	131	130	before mating	empty cage	8.4	10.8	6.2	6.2	5.8	5.7	0.4	0.5

* $P < 0.05$ ** $P < 0.01$

Housing. Animals were placed in 4 houses with 4 rows of 25 wirecages measuring 2 x 1 x 1 m. Animals were placed in the outermost rows of each house and separated therefore by two rows of empty cages in the house. Control animals were placed in one of the rows in each house and thus able to see their neighbours. Experimental animals were placed in the other row and visually isolated from each other by cardboard partitions. Partitions were mounted immediately after mating and left in place until weaning. The experiment was performed at Nordjysk Pelsdyrforsøgsfarm, Nr. Rubjerg, DK 9480 Løkken.

Data sampling. Number of pups delivered was recorded daily around the expected time of parturition and regularly throughout the lactation period. Barrenness was assessed by visual inspection before and after the expected date of parturition.

Results and discussion

Table 2 shows the results. Sixteen of the control vixens and 22 of the experimentals were assumed to be barren and 20 controls and 29 experimentals in all did not deliver pups which lived for more than the day of delivery ($p < 0.02$, X^2 -test, two-tailed). This non-significant tendency could be caused by

the difference in age-distribution in the two groups, since the mean age of the non-delivering vixens was lower than the age of all animals (1.60 and 1.58 years respectively in control and experimental vixens). Data corrected for age-differences did not, however, differ much from original data and the P-value of the corrected data remained below 0.2. The result does not support, therefore, the hypothesis of a positive effect of visual isolation on litter production. Data for litter-size and loss of pups during lactation do not differ and, thus, do not support the hypothesis either.

Table 2. Number of vixens mated and giving birth to living pups and mean number of born, weaned and lost pups per delivering vixen in the control and experimental group.

	Control group	Experimental group
Vixens		
mated	100	100
giving birth	80	71
Pups		
born	5.0	4.8
weaned	4.3	4.2
lost	0.6	0.8

It is not possible to prove that under no circumstances will visual isolation have a positive effect on breeding success. The data presented here do suggest, however, that effects, if there are any, are not prominent ones of major importance for the litter production in minks and foxes.

Aspects of the breeding biology may reflect well-being in animals in general (Moberg, 1985), and especially with respect to the silver fox is it tempting to consider reproductive success to be positively correlated with well-being (e.g. data from Bakken, 1988, and Braastad, 1988. Kristensen and Jeppesen, 1988. Kristensen, 1988). Therefore, the data presented here do not favor the idea that visual isolation in the breeding season will increase well-being of farmed minks and foxes.

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Scientifur, Vol. 12, no. 4, 1988.

Stress and genetic variability

P.M. Borodin

It was shown in the studies of *D.K. Belyaev* and his associates that stressful influences lead to a change in the degree of manifestation of genetic variability in model populations with respect to a number of quantitative characteristics, such as fertility indices, growth rate, and endocrine gland function. An influence of stress on the nature of the meiotic process has been established in male mice. Stress leads to an inhibition of replicative and repair synthesis of DNA in the spermatocytes. A consequence of these events is an increase in recombination in the first and second chromosomes and an increase in the frequency of univalents of the sex chromosomes and small autosomes. Thus, stress can lead to a redistribution of the frequencies of recombination events within

the genome and to the appearance of offspring with a changed spectrum of combinative variability. These data confirm *D.K. Belyaev's* hypotheses on the substantial influence of stress on the rate of evolutionary transformations.

Soviet genetics, 1987, 693-699. Translated from Genetika, Vol. 23, No. 6, pp. 1003-1010, June, 1987. (Plenum publishing corporation, 0038-5409/87/2306-0693 US dol. 12.50). In RUSS, ENGL.

1 table, 1 fig., 3 references.

Authors summary.

Neuroendocrine and neurochemical mechanisms of the domestication of animals

E.V. Naumenko; N.K. Popova, and L.N. Ivanova

The survey cites numerous data that have permitted the experimental substantiation and development of *D.K. Belyaev's* hypothesis that the domestication of animals occurs on the basis of hereditary transformation of neuroendocrine mechanisms, controlling the fun-

damental processes of ontogenesis. Information is cited on the hereditary reorganization of the reproductive and endocrine function of the sex glands of silver foxes and Norway rats during their selection with respect to a single characteristic - a decreased defensive reaction towards humans. The results of investigations of the function of the hypothalamo-pituitary-adrenocortical system in these animals and in sheep with various passive-defensive reactions to humans are analyzed. The data obtained permit us to conclude that in the process of domestication, changes in the function of this neuroendocrine system are a universal correlated response. Evidence is cited that selection for a definite type of state of the mediator systems of the brain, participating in the regulation of aggressive behaviour and stressor reactivity of the organism. A special role in this respect is attributed to the serotonergic and noradrenergic systems of the brain.

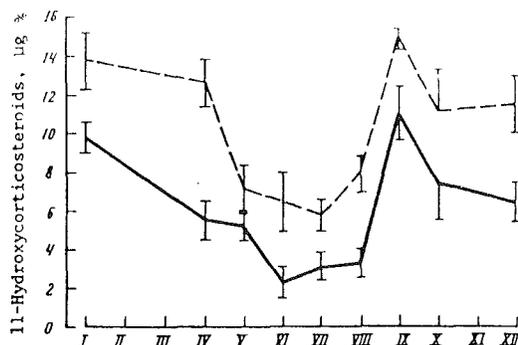


Fig. 1. Corticosteroid level in the blood of domesticated (1) and wild (2) silver foxes over the course of a year.

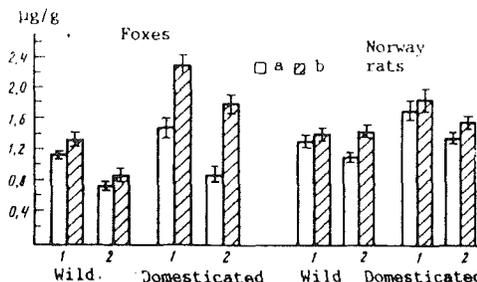


Fig. 2. Change in the level of serotonin and its metabolite in the hypothalamus (1) and in the midbrain (2) of domesticated and aggressive animals. a) Serotonin; b) 5-hydroxyindoleacetic acid.

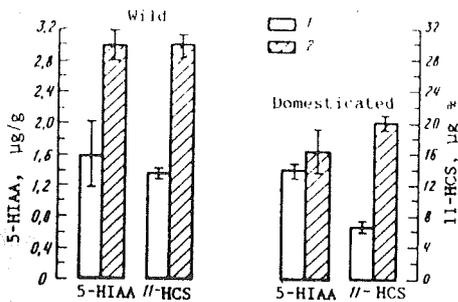


Fig. 3. Influence of emotional stress at the level of 5-hydroxyindoleacetic acid (5-HIAA) in the hypothalamus and the concentration of corticosteroids (11-HCS) in the blood of domesticated silver foxes. 1) Control; 2) stress.

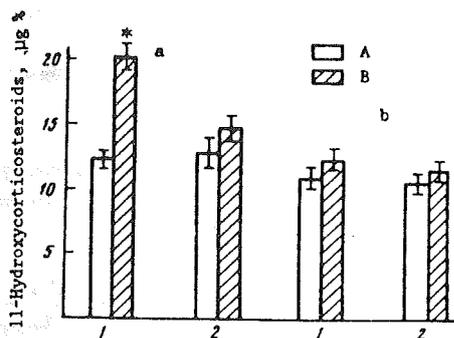


Fig. 4. Influence of the prenatal action of physiological saline solution (1) or hydrocortisone (2) on the corticosteroid level in the blood of adult aggressive (a) and domesticated (b) silver foxes in the initial state (A) and under emotional stress (B) (* $p < 0.001$).

Soviet genetics 1987; Dec. 1987; v. 23(6): p. 699-710. Translated from *Genetika*, Vol. 23, No. 6, 1987 (Plenum Publishing Corporation, 0038-5409/87/2306-0699. US Dol. 12.50). In ENGL, RUSS.
4 fig., 44 references.

Authors summary

Molecular mechanisms of stress-induced hereditary variability

R.I. Salganik

The molecular mechanisms of the generation of bursts of genetic recombination and point mutation under the action of stress factors are discussed. As a result of oxidative, thermal, radiation, and other types of stress, modified bases (hypoxanthine, uracil, photoproducts of pyrimidines, methylated purines) arise with a high frequency in DNA and undergo excision with the formation of single-strand gaps. If the damage affects one strand of

DNA, then a restoration of its primary structure according to the intact complementary strand occurs with greater probability. If the frequency of damages as a result of stress increases, then opposite portions of the two DNA strands, limited to the dimensions of the repair gap, begin to be damaged. It has been shown that such damages lead to bursts of recombination and point mutations. The cause of such bursts may be mispairing in the repair of gaps, induction of the SOS system, and the appearance of recombinogenic double-strand breaks in DNA. If regions of self-complementary sequences are affected with increasing frequency of damages, then in the region of gaps falling in these areas, hairpin-loop structures are formed. It has been shown that the repair of such portions leads to the appearance of deletions, insertions, and clusters of point mutations, predetermined by the primary structure of DNA. Mobile genetic elements are evidently an independent mechanism of stress-induced recombinations. The conditions of stress activate a displacement of transposons, leading to structural mutations. As a result of the stress-induced bursts of recombinations, new variants of genetic programs may arise for the selection of those that provide for adaptations to new extreme conditions.

Soviet genetics, 1987, 728-738.

Translated from *Genetika*, Vol. 23, No. 6, pp. 1050-1063, June, 1987. Original article submitted October 27, 1986. (Plenum Publishing Corporation, 0038-5409/87/2306-0728 US Dol. 12.50).

In RUSS, ENGL.

3 tables, 6 fig., 33 references

Authors summary

Acclimatization of minks of different genotypes in hot climate

V.Z. Gazizov

Duration of acclimatization to hot climate of minks of three colorations: standard, silver blue and palomino, was estimated by biochemical assays. Most significant differences in the biochemical parameters (total protein, 11-oxycorticosteroids, glucose) were displayed by newly introduced and acclimatized (local)

minks in summer in the first year of acclimatization. The latter is shown to be completed by third year of life, proceeding more rapidly in silver blue and palomino, than in a standard genotype.

Sel'skokhozyaistvennaya Biologiya; No. 9; 80-83; 1987.

In RUSS, Su. ENGL.

2 tables, 7 references Authors summary

24th Scientific meeting of the society of Laboratory Animal Science, 6-12 September 1986 in Heidelberg. Abstracts papers.

Topics covered at this meeting included transferability of animal experiments, diseases of laboratory animals, alternatives to animal experiments, housing and behaviour of experimental animals, nutrition and metabolism and experimental surgery and anaesthesiology. 66 abstracts are included, arranged alphabetically by senior author.

Zeitschrift fur Versuchstierkunde; 30; 1/2; 1-36; 1987.

CAB-abstract

Importance of some haematological values in nutria

P. Pop; C. Falca; G. Roth, and I. Chisu

Blood samples were taken from 23 adult female nutria and 33 each of young (8-9 months old) female and male nutria. Haematological values in the three groups were: haemoglobin (g/100 ml) 10.8 (range 10.2-11.5), 10.45 (9-11.36) and 11.07 (9.6-11.9); haematocrit (%) 43 (40-45.5), 41.77 (38.1-49.5) and 43.43 (39.6-50.4); erythrocyte count (million/ml) 3.7 (2.9-4.6), 3.4 (2.7-4.3) and 4.16 (3.6-4.7); leukocyte count (thousand/ml) 7.3 (6.2-10), 5.88 (4.2-8.6) and 9.75 (6-16). Values are compared with those reported in the literature.

Revista de Cresterea Animalelor; 36(6): 32-36, 1986

In ROMN.

3 tables, 15 references. CAB-abstract

Main arteries of aortic arch and a way of their branching in the raccoon

Ryszard Jablonski; Witold Brudnicki, and Cezariusz Wiland

There were examined fifty-nine animals whose arteries had been filled with latex through the left ventricle. It was proved that in the raccoon as in the remaining representatives of carnivores, from the aortic arch the brachiocephalic artery and the left subclavian artery and no variability in their branching was observed. The variability of branching of the brachiocephalic artery included the existence of common carotid arteries in 65,4% of the animals and the occurrence of the right subclavian artery in various places or in 32,2% of the animals the branching was at the same level. One animal (2,4%) had a common trunk for the carotid arteries.

From the subclavian arteries in the raccoon as in other carnivores there branched off four arteries, among which ten variants of branching were noticed. The occurrence of a common trunk for the vertebral artery and costocervical trunk was particularly frequent in case of this species.

Akademia Techniczno-Rolnicza IM. Jana I Jędrzeja Sniadeckich w Bydgoszczy Zeszyty Naukowe Nr 150 - Zootechnika (15) - 1987-27-35.

In POLH, su. ENGL, RUSS.

4 fig., 14 references.

Authors summary

Effect of ultraviolet irradiation on rabbit performance

Stanislaw Niedzwiadek; Jacek Kowalski; Jerzy Fijał, and Adam Pilarczyk

The effects of ultraviolet (UV) irradiation of rabbits on their reproductive and fattening performance and the content of total protein and its fractions in the blood were studied. An experiment was conducted on 500 does used for reproduction and 1000 young rabbits from the birth till 90 days of age. The does

were allotted to 4 groups of 125 each: group I and III irradiated, respectively, 55 and 110 mer/h/m², group II and IV - not irradiated control. Young rabbits were allotted in an analogous way.

UV irradiation of rabbits at the intensity of 55 mer/h/m² had a beneficial effect on does mating efficacy and on reducing mortality rate of both young rabbits by mothers and during fattening. An increase of the content of total protein and albumins in the blood serum was found in young rabbits. With irradiation intensity of 110 mer/h/m² a significant reduction of does mating efficacy and a high increase of young rabbit mortality during fattening were found.

Rocz. Nauk. Zoot. T. 14, z. 1 (1987) 295-304.
In POLH, su. ENGL, RUSS.
3 tables, 14 references.

Authors summary

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

Andrzej Zon; Dorota Kubanek, and Stanislaw Niedzwiadek

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

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

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

of lower value due to losses and higher brittleness of cover hair.

Rocz. Nauk. Zoot. T. 14, z. 1 (1987) 121-130.
In POLH, su. ENGL, GERM, RUSS.
3 tables, 1 fig., 14 references.

Authors summary

Typing of pseudomonas aeruginosa strains isolated from minks and feedstuff

Lisa Hering, and H. Zimmermann

Serotype 0:6 pyocine type III *Pseudomonas aeruginosa* strains were histologically isolated in the course of post-mortem examinations of minks collected in the northern regions of the GDR. The same serotype was recorded from seven in ten typed *Pseudomonas* strains which had been established from poultry waste used in feeding.

Mh.Vet.-Med. 43 (1988): 312-313
In GERM, su. RUSS, ENGL.
7 tables, 27 references.

Authors abstract

Results of Roboran^R (Spofa) and Roboran H^R (Spofa) administration in large-scale breeding of blue foxes

V. Chvalová; P. Hartvich, and J. Rajchard

Administration of vitamin-mineral preparations Roboran^R (Spofa) and Roboran H^R (Spofa) was tested in large herds of blue foxes. Effects of administration of the above preparations on reproductive traits of females of the initial herd were studied in the first part, and namely in groups of 20 animals each, compared to the control of identical size.

Certain effects of the administered preparations on conception rate and litter size were observed especially in the group with Roboran H. As the number of progeny turned equal in all groups in the course of rearing, the administration of Roboran and

Roboran H could not be considered effective (under the described conditions). Further testing on a more numerous set of animals would be needed.

Effects of administration of the preparations on the pelt quality of progeny designed for processing were studied in the second part. Groups of 40 animals each were tested, compared to the control of identical size. The tested drugs were administered in the period of June - November at a dose of 4 - 4 g twice a week per head.

Administering of Roboran and Roboran H showed a positive effect on classification of pelts in quality classes, Roboran H producing better results (82.5% pelts in the top quality class) compared with Roboran (77.5% pelts in the top quality class, the control - only 62.5% pelts in this quality class).

Biologizace a Chemizace Zivocisne Vyroby, Veterinaria: 21(4): 345-351, 1987.
In CHEC su. ENGL, GERM, FREN, SPAN.
6 tables, 6 references.

Authors summary

Validation of a direct radioimmunoassay of melatonin in the blue fox

M. Forsberg, and A. Madej

A direct radioimmunoassay procedure for the determination of melatonin in the blood of blue fox has been validated and applied.

The assay required 50 μ l of sample and standard, 100 μ l of antiserum and 100 μ l of (3 H)melatonin. After overnight incubation at 4°C the antibody bound melatonin was separated from the free hormone with dextran-coated charcoal. Following centrifugation the antibody bound (3 H)melatonin at a final dilution of 1:36000. The non specific binding represented less than 5% of the total radioactivity in all assays. The lowest detectable amount of melatonin was 2.6 fmol/tube, corresponding to 52.5 pmol/l. The inter-assay coefficient of variation at 178 and 510 pmol/l was 15.6 and 8.8%, respectively. The precision profile, calculated from a 10-replicate

standard curve, showed that the coefficient of variation decreased from 43% at 84 pmol/l to 15% at 336 pmol/l, and remained at or below 10% for concentrations exceeding 670 pmol/l.

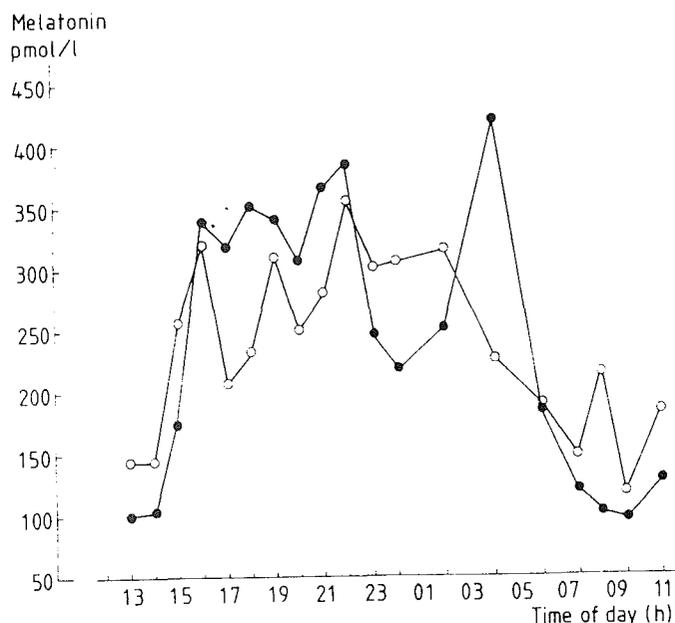


Figure 3. Diurnal variations in plasma concentrations of melatonin in two male blue foxes: fox no. 1 (●-●) and fox no. 2 (○-○).

Acta vet. scand. vol. 28 no.

Plasma was collected from 2 male blue foxes at about hourly intervals during a 24 h period in September and assayed for melatonin. Maximum (421 pmol/l) and minimum (97 pmol/l) concentrations of the hormone were inversely related to light intensity.

Acta vet. scand. 1987, 28, 73-79.
3 fig., 10 references.

Authors summary

Results of a field trial with melatonin

Maija Valtonen

When 47000 mink and 94000 foxes at 490 farms in Finland were treated with an unspecified dose of melatonin in an attempt to accelerate fur maturation, excellent results were obtained for 46% of mink, 34% of blue foxes, 21% of silver foxes and 8% of blue X silver foxes, and satisfactory results were obtained for 51, 55, 58 and 47% resp. of mink, blue foxes, silver foxes and blue X silver foxes.

Finsk Pålstidskrift; 22; 2; 68; 1988.
 In SWED.
 1 table. CAB-abstract

The halothan-nitrous oxid-oxygen anaesthesia in ferrets

W. Küpper, and S. Glockauer

The Halothan-Nitrous Oxide-Oxygen anaesthesia with endotracheal intubation and artificial respiration is a very safe and controllable anaesthesia for ferrets.

Zeitschrift für Versuchstierkunde: 29(5/6): 205-207.
 In GERM su. ENGL.
 5 references. Authors abstract

Chemical sedation of sea otters, *Enhydra lutra*

Brian E. Joseph; Lanny H. Cornell, and Thomas Williams

Preliminary studies on the chemical sedation of sea otters, *Enhydra lutra*, were conducted using 11 sea otters a total of 43 times. Compounds investigated included meperidine hydrochloride, diazepam, nalbuphine hydrochloride, azaperone, fentanyl hydrochloride, ketamine hydrochloride and several combinations of these compounds. Combinations of meperidine hydrochloride at dosages of either 11.0 or 13.2 mg/kg in combination with diazepam at 0.22, 0.33 or 0.55 mg/kg provided the safest, most reliable sedation due to reversibility and lack of residual lethargy.

J. Zoo An. Med. 18: 7-13, 1987.
 2 tables, 8 references.

Authors summary

A guide to the pet ferret

Manon Paradis

The domestic ferret (*Mustela putorius furo*) is

becoming increasingly popular today as a household pet. The following is intended to be a guide on its origine, behaviour, care, diet reproduction and also on prophylactic medicine, and diseases susceptible to affect it.

Med. Vet. Quebec Vol. 17 No 2.
 In FRENH, su. ENGL.
 3 tables, 4 fig., 35 references.

Authors summary

Repeatability of pheromone emissions from individual female ermine moths

Yponomeuta padellus and *Yponomeuta rorellus*

Jia-Wei Du; Christer Löfstedt, and Jan Löqvist

The repeatability of the composition of pheromone emitted by individual female moths (*Yponomeuta*) was determined by gas chromatographic analysis. An improved technique for repeated collections of airborne volatiles from the same moth was developed. The procedure did not harm the females and allowed precise quantification of 0.05 ng of pheromone components in 30-min collections. Individual females of *Y. padellus* (N = 10) and *Y. rorellus* (N = 5) were sampled six and eight days after emergence. *Y. padellus* released, on average, 4.8 ng/30 min of tetradecyl acetate, (E)-11-tetradecenyl

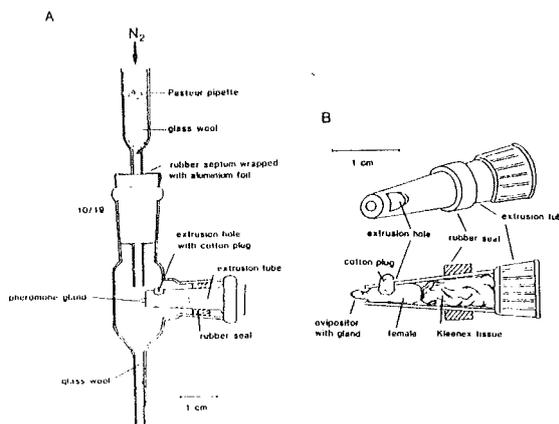


Fig. 1. (A) Device for collection of airborne volatiles from female moths, modified from Baker et al. (1981). A stream of purified nitrogen (ca. 50 ml/min) is directed to the exposed pheromone gland with a Pasteur pipet. The linear velocity at the outlet of the pipet is approximately 0.6 m/sec. (B) Expanded view of the extrusion tube with an inserted female.

acetate, (Z)-11-tetradecenyl acetate, hexadecenyl acetate, (Z)-9-hexadecenyl acetate, and (Z)-11-tetradecenyl acetate in the average ratio 445:38:100:494:35:421. The amount of (E)-11-tetradecenyl acetate relative to (Z)-11-tetradecenyl acetate was less variable [coefficient of variation (CV) = 15%] than the relative amounts of the other components (CV = 46-61%). The repeatability of the relative amounts of compounds released by individual females was high for all components ($r = 0.82-0.90$). The average emission of tetradecyl acetate, tetradecanol, hexadecyl acetate, and hexadecanol by *Y. rorellus* was 8.3 ng/30 min (ratio 100:8:10:2). The repeatability was low for tetradecanol ($r = 0.51$) but higher for hexadecyl acetate ($r = 0.87$) and hexadecanol ($r = 0.89$). The low interindividual variance for the (E)-11-(Z)-11-tetradecenyl acetate ratio in *Y. padellus* might be due to its importance for reproductive isolation, i.e., it is under strong selection pressure.

Journal of Chemical Ecology, Vol. 13, No. 6, 1987.

2 tables, 3 fig., 13 references.

Authors summary

A trial of some interferon inducers in animals (rabbits, mice, piglets and arctic foxes)

A.V. Selivanov

The preparation dsRNA, injected i/m at 0.5-3.0 mg/kg increased the interferon activity of peripheral blood, provided protection against Aujeszky virus injected into rabbits, mice, piglets and arctic foxes 4 hours before infection, and enhanced the immune response to Aujeszky's disease vaccine. Polyguacil and oral levamisole were also effective in these respects, while Tyloron was rather less effective.

Veterinariya, Moscow, USST; No. 10; 29-31; 1987.

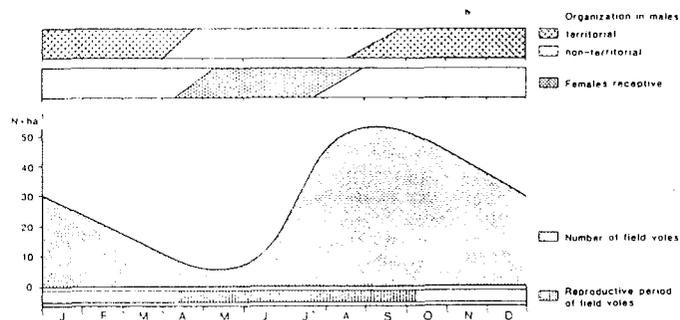
In RUSS.

CAB-abstract

Seasonal changes in the social organization of male stoats, *Mustela erminea*: an effect of shifts between two decisive resources

Sam Erlinge, and Mikael Sandell

A change in male organization is expected when the most important resource during the breeding season (receptive females) has different dispersion and predictability characteristics as compared with the most important resource during the non-breeding season (usually food). Male stoats showed a marked seasonal shift in their social organization from a pattern of intrasexual territories during their non-breeding season (autumn and winter) to a non-territorial pattern with extensive and overlapping ranges during the mating season (spring and summer). This shift could not be explained by changes in food availability or distribution, but was correlated instead with the onset of breeding. The proposed hypothesis, that a change in social structure is caused by a shift of decisive resources, will explain seasonal shifts in the social organization of several other mammalian species.



OIKOS 47:1 (1986)

Fig. 2. Seasonal changes in male social organization as related to the period in which females are receptive. The annual fluctuation in the field vole population in the study area is also shown. The vole data are from L. Hansson (see Erlinge et al. 1983, 1984).

Oikos 47: 57-62. Copenhagen 1986.

In ENGL su. ENGL, RUSS.

1 table, 2 fig., 33 references.

Authors summary

Movement patterns of male stoats *Mustela erminea* during the mating season: differences in relation to social status

Mikael Sandell

Male stoats were tracked during the mating season using radio-telemetry. Three different movement patterns were apparent during spring. Old males (≥ 2 yr), roamed over extensive areas and stayed a few days in each place. Yearlings were either stationary, i.e. present in the same area for the entire spring and with a home range of about 2 km² or they were transients and moved constantly over large areas. The movements of roamers and stationary males were more strongly influenced by the distribution of females than were the transients' movements. Movement activity showed two peaks during spring, one during late April - early May, and then again during early June. Males appeared to avoid confrontations, and a meeting between two individuals was observed on only one occasion. The results of this study suggest that mate-searching behaviour is determined by social status, and that the reproductive success of a male depends on his behaviour and on the spatial and temporal distribution of receptive females.

Oikos 47: 63-70. Copenhagen 1986.
3 tables, 5 fig., 39 references.

Authors summary

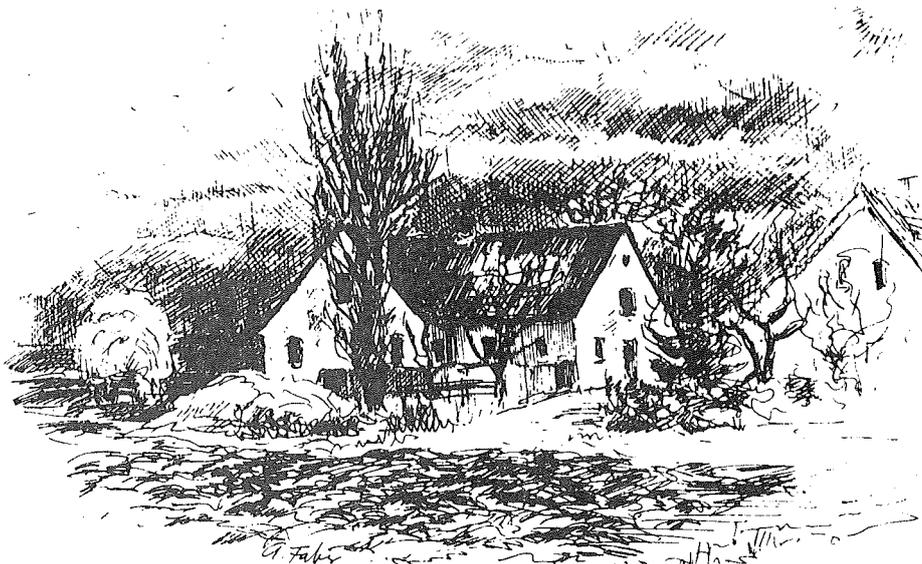
Pelt production in local breeding associations in 1986-87.

Markku Lähteenmaki

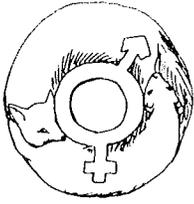
In 1986-87, the production of mink pelts in Finland totalled 3.477.574 vs. 4.273.453 in 1985-86. Of the pelts produced, 44.7% were Scan Black, 9.2% were Scan Brown, 21.1% were Scan Brown wild and 7.5% were Pastel. The production of fox pelts totalled 3.060.637 vs. 2.830.919 in 1985-86, that of polecat pelts was 188.577 and that of raccoon dog pelts was 74.865. Data are tabulated by district and size of farm, and economic aspects are considered.

Finsk Pälstidskrift; 21; 12; 648-653; 1987.
In SWED.
23 tables.

CAB-abstract



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GENETICS

Problems and prospects of animal genetics and breeding studies*D.K. Belyaev*

This article represents the text of the paper prepared by *D.K. Belyaev* for the Eleventh Workshop on Animal Genetics and Breeding (Novosibirsk, September 1985). Unsolved fundamental problems of the genetics and breeding of farm animals and ways to solve them are discussed in it. Hybridization of individual animal breeds, particularly native ones, is regarded as an effective method of creating new breeds combining high productivity with resistance to infections and unfavorable environmental conditions. The need to take into account genetically determined characteristics of the behaviour of animals and their stress resistance when planning the breeding process is shown. The use of photoperiodic methods of regulating physiological functions can play an important role in increasing animal productivity.

Certain complex problems of the theory of evolution are analyzed: the causes of homologous variability and mechanisms of acceleration of evolutionary transformations upon a pronounced change in environmental conditions. The prospects of using the concept of the destabilizing function of selection when studying these problems is pointed out. Data are given showing that marked changes in the neuroendocrine status of animals can lead to inheritable activation and inactivation of genes and to a change in the frequency of recombination events. Anti-Darwin concepts of evolution are critically analyzed. The most important prospects of the development of animal genetics and breeding studies and their role in the development of evolutionary theory are outlined.

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In ENGL, RUSS.

31 references

Authors summary

Constructive contribution of D.K. Belyaev to the idea of the functional organization of chromosomes*I.I. Kiknadze*

The major trends in studies of the functional organization of Chironomidae polytene chromosomes conducted at the Institute of Cytology and Genetics are reviewed. The results obtained from analysis of the pattern of activation and inactivation of puffs and nucleoli during ontogenesis and evolution in several species of the genus *Chironomus* are summarized. The contribution of Academician *D.K. Belyaev* to the developments in this area of research is emphasized.

Translated from Genetika, Vol. 23, No. 6, pp. 956-961, June, 1987. Plenum Publishing Corporation, 0038-5409/87/2306-0654, US Dol. 12.50.

In ENGL, RUSS.

60 references.

Authors summary

Advanced approaches to the synthesis and reconstruction of genetic material

L.S. Sandakhchiev; V.A. Petrenko; V.V. Samukov; A.N. Sinyakov, and V.P. Kumarev

Advanced approaches to the synthesis and reconstruction of genetic material developed in the institutes of Molecular Biology and Genetics during the past years are summarized. The evolution of methods for oligonucleotide synthesis and scopes for their use in gene production are discussed. The principles of localized mutagenesis methods developed in the Institute are described, such as: a) mutagenesis directed to the regulatory gene regions; b) segment-localized mutagenesis; c) mutagenesis directed by phosphotriester analogues of oligonucleotides. Examples of

employing these methods for induction of regulatory mutants of phage lambda, production of fused genes, mutant interferon genes, construction of new DNA vectors, construction of hybrid H1-h3 subtype haemagglutinine gene of influenza virus etc. are presented. The approach to in vivo site-directed mutagenesis is experimentally substantiated.

Translated from Genetika, Vol. 23, No. 6, pp. 962-973, June, 1987. Plenum Publishing Corporation, 0038-5409/87/2306-0660, US Dol. 12.50.

In RUSS, ENGL.

6 fig., 43 references.

Authors summary

Problems associated with the arisal of new forms and the integrity of the organism in the context of destabilizing selection

L.N. Trut

D.K. Belyaev's concept destabilizing selection regards evolution as a series of changes in the regulatory system for development. In the light of *Belyaev's* views on evolution features of the evolutionary process such as unequal rate and the paralle nature of transformations are discussed. It is proposed that the genetic variation in the integrated properties of behaviour and physiology, which are closely correlated with the system for regulating ontogenesis, in certain situations provides material for rapid and profound evolutionary reorganizations. Genetic elements controlling the functional state of the neurohormonal regulatory system in an organism occupy a high profile in the neurohormonal regulatory system in an organism occupy a high profile in the hierachical organization of the genome, since hormones and possibly mediators participate in the regulation of genetic processes. The parallel nature of complex evolutionary transformations is regarded as a consequence of similar changes in the regulatory elements associated with development which arise in the same selection vector. In a discussion of the features found in the course of evolutionary processes the main aspects of the concept of destabilizing selection are formulated.

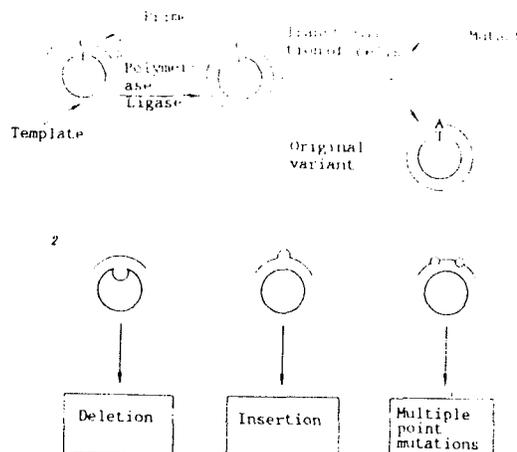


Fig. 3. Oligonucleotide-directed mutagenesis. 1) Schematic for conducting the mutagenesis process; 2) types of mutations introduced.

Translated from Genetika, Vol. 23, No. 6, pp. 974-987, June, 1987. Plenum Publishing Corporation, 0038-5409/87/2306-0671, US Dol. 12.50.

In RUSS, ENGL.

4 fig., 75 references.

Authors summary

Immunogenetic systems of the mink: problems of evolution

O.K. Baranov

Basic features are described for the organization of genetic systems of serum allotypes in the mink: Ld system of low-density lipoprotein, multigenic Lpm families, gamma-heavy and light immunoglobulin chains. Species-specific genes were identified for these systems, according to which mink differ for other representatives of the question of episodic transformations of the Lpm and gammaC families of genes during phylogenesis of the mink. Hypotheses are briefly examined which explain manifestation of nine new Lpm genes in mink, which make a basic contribution to the allotypical polymorphism of the Lpm systems. Possible reasons are discussed for the unusual prevalence in mature mink of instability of quantitative phenotypical expression of C-gamma genes and evolutionary-genetic mechanisms of episodic evolution of this multigenic family. Rapid appearance of broad genetic variability and instability during phylogenesis of the domesticated mink, similar

to mutations of homeotic genes or transpositional bursts, may be caused to a substantial degree by activation of silent genes, and destabilizing selection according to D.K. Belyaev is induced. The aggregate of results completely satisfy the concept of punctualism, which gives the decisive role in species formation to macromutations which cause saltatory transformations of multigenic families.

Soviet genetics 1987; Dec 1987; v. 23 (6): p. 710-719. Plenum Publishing Corporation, 0038-5409/87(2306-0710, US dol. 12.50.

In RUSS, ENGL.

1 table, 2 fig., 42 references. Authors summary

Creation of panel of hybrid clones of fox x Chinese hamster somatic cells and determination of chromosome location of LDHA, LDHB, GPI, ESD, G6PD, HPRT, and alfa-GALA genes in silver fox

N.B. Rubtsov; V.G. Matveeva, S.I. Radzhabli; N.A. Kul'bakina; T.B. Nesterova, and S.M. Zakiyan

Creation of a panel of hybrid clones of fox and Chinese hamster somatic cells is described in the work, which can be used as an instrument for mapping the fox genome. As a result of segregation analysis of chromosomes and biochemical markers of the fox genome, an association is shown between the gene for GPI and chromosome 1, the ESD gene and chromosome 6, the LDHB gene and chromosome 8, the LDHA gene and chromosome 11, and G6PD, HPRT, and alfa-GALA genes and the X-chromosome of the fox. Selection of hybrid clones within the panel in several stages, combined with biochemical and cytogenetic analysis, permitted selection of clones of hybrid cells with a small number of chromosome reorganizations. This creates the prerequisites for further effective utilization of the panel of clones obtained for mapping of the genome.

Translated from Genetika, Vol. 23, No. 6, pp. 1088-1096. June, 1987. Plenum Publishing Corporation, 0038-5409/87/2306-0757, US Dol. 12.50.

In RUSS, ENGL.

2 tables, 2 fig., 7 references. Authors summary

Cytogenetic investigation of American mink (*Mustela vison*) bred in farm conditions

G.K. Isakova

The summarized data on the karyological examination of American mink bred at farms are presented in this paper. The frequency of

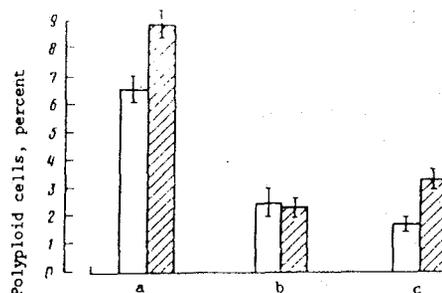


Fig. 1. Frequency of polyploid cells at different stages of spermatogenesis in mink of differing fertility: a) spermatogonial metaphases; b) metaphase I; c) metaphase II; open columns) males with normal fertility; shaded columns) mink with sharply reduced fertility.

aneuploid and polyploid cells in bone marrow of both males and females with decreased fertility (wild or mutant for coat colour genes) was found to be increased; in males, the polyploid in spermatogenesis was also increased, in comparison with the minks of normal fertility. The frequencies of embryonic mortality and heteroploid embryos correlated at the embryonic and early postnatal stages. Unusually high frequency of $2n/3n$ and XX/XY chimerism (nearly 9% of 305 individuals analysed) is characteristic of American mink. Analyses using the sex chromosome sets in $2n$ and $3n$ cell lines as markers showed that the binuclear oocytes are the most possible source of the euploid chimerism. It is suggested that the high frequency of the chimerism occurrence in American mink is the manifestation of an increase in its genetical variability at the chromosomal level, due to both marked changes in the ecological environment (mink is amphibiote in the wild) and unintentional selection for tame behaviour, which *Mustela vison* was subjected to in the process of the involvement into commercial breeding.

Translated from Genetika, Vol. 23, No. 6, pp. 1097-1103, June, 1987. Plenum Publishing Corporation, 0038-5409/87/2306-0764, US Dol. 12.50.

In RUSS, ENGL.

1 fig., 3 tables, 21 references. Authors abstract

Comparative study of properties of highly repeated DNA of silver and arctic foxes*V.A. Potapov; S.V. Ivanov; A.S. Grafodatskii; N.V. Kudryashova, and A.G. Romashchenko*

From the library of highly repeated DNA (C_{0t} 0.02) of the silver fox, eight clones were selected with DNA sequences conserved for Canidae species. It was established that two of the eight cloned DNA sequences, rsV_1 and rsV_3 , are not homologous to each other. The number of rsV_1 and rsV_3 copies in the genome of the silver fox constitutes $(0.9-1.0) \cdot 10^5$ and $(0.3-0.4) \cdot 10^5$, while in the genome of the Arctic fox it constitutes $(20-30) \cdot (7-9) \cdot 10^5$. It was shown using blot hybridization that part of the rsV_1 and rsV_3 in both the silver and in the Arctic fox is found within the Bsp repeat 680 base pairs (b.p.) long. Hybridization in situ on metaphase chromosomes established the preferential localization of rsV_1 and rsV_3 in the silver fox in pericentromeric regions, while in the Arctic fox it is in auxiliary heterochromatic arms. It follows from the data accumulated that increase in the number of Bsp repeats and redistribution of genetic material in chromosomes occurred in the silver fox in the process of divergence of species.

Translated from Genetika, Vol. 23, No. 6, pp. 1104-1112, June, 1987. Plenum Publishing Corporation, 0038-5409/87/2306-0769, US Dol. 12.50.

*In RUSS, ENGL.
1 table, 3 fig.*

*Authors summary***Selected transformation of defensive reactions to man in the American mink (*Mustela vison* SCHREB.)***O.V. Trapezov*

Study of polymorphism in reactions to man permitted three types of animals to be distinguished in American mink bred on fur farms: those with aggressive reactions to man, with fearful reactions, and with tranquil-exploratory reactions. The majority of mink (78.5%) manifested fearful reactions, desig-

nated by the rating "zero". Expressivity of aggressive and tranquil-exploratory behaviour was estimated quantitatively in points: with a "minus" sign according to a four-point scale for aggressive and with a "plus" sign according to a four-point scale tranquil-exploratory. On the whole, the average points for behaviour shifted toward aggression and constituted -0.21 ± 0.005 . In selective work to change behaviour, standard mink were used. Animals chosen for selection were characterized by clearly expressed aggression (-2.4 points for males and -2.2 points for females) and tranquil-exploratory behaviour ($+3.6$ points for males and $+2.3$ points for females). Coefficients of selection in the initial generation constituted 99.7% for males and 98.5% for females, in the next three generations from 90 to 70% for males and from 80 to 30% for females. The average point value for aggressive reactions rose from -0.29 points in the initial generation to -2.23 points for males. In the group selected for tranquil-exploratory behaviour, the point value for behaviour constituted the following: $+3.06$ points for females and $+3.33$ points for males in the fourth generation versus -0.29 and -0.14 points in the initial.

Translated from Genetika, Vol. 23, No. 6, pp. 1120-1127, June, 1987. Plenum Publishing Corporation, 0038-5409/87/2306-0781, US Dol. 12.50.

In RUSS, ENGL.

3 tables, 3 fig., 11 references.

*Authors summary***Some questions of the genetics of mutational changes in fur color of blue arctic foxes (*Alopex lagopus*)***A.I. Zhelezova*

The article is devoted to the genetics of color mutations (shadow, platinum) in blue foxes. Phenotypical manifestation of these mutations come down to lightening of the basic tone of downhair color and appearance of white mottling. The pleiotropic effect of the operation of these mutations is manifested in reduction of fertility of females in homogenic crosses because of lethality of the

homozygous class according to these mutations. The period of death of homozygous embryos is primarily applicable to the preimplantation period of development. Change in physiological condition of females during pregnancy due to change in length of daylight during this period leads to shift in competitive relationships between embryos of different genotypes and, as a result, to change in ration of mutant and nonmutant pups in progeny of these females.

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12.50.
In RUSS, ENGL.
4 tables, 11 references.

Authors summary

Identification and genetic control of two allotypes of gamma-heavy chains of polecat immunoglobulines: Pg1 and Pg2

A.V. Taranin; E.G. Ufimtseva; O.K. Baranov; D.V. Ternovskiy, and Yu.G. Ternovskaya

For the first time, two allotypes (Pg1 and Pg2) of immunoglobulines in different species of polecat and their hybrids are identified. Both allotypes belong to the gamma-heavy chains of the molecule. A genetic analysis revealed genetic relation between Pg1 and Pg2. probably, this results obtained are discussed in connection with evolutionary origin of earlier identified peculiarities in genetic control of immunoglobuline Cgamma-allotypes in domestic mink.

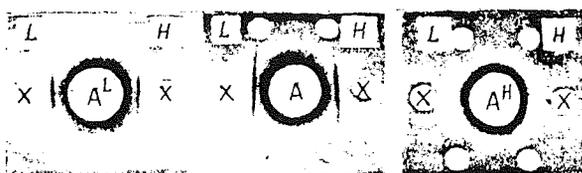


Рис. 2. Локализация аллотипов Pg1 и Pg2 на H- и L-цепях IgG. В лунках геля: анти-1,2 (A); анти-1,2, инкубированная с L-цепями (A^L) и H-цепями (A^H); x - суммарный препарат IgG хорька

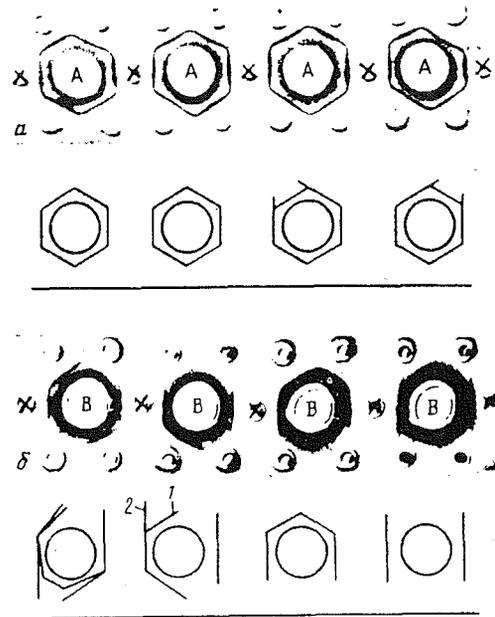


Рис. 1. Полиморфизм аллотипов IgG у хорьков. В центральных лунках: ворочья антисыворотка № 2033 до (а) и после (б) абсорбции из нее изотипических антигенов; x - суммарный препарат IgG хорька, в остальных лунках - индивидуальные сыворотки крови хорьков, размещенные на пластинках (а) и (б) по-разному

Genetika, USSR: 23(5): 863-870, 1987. In RUSS, su. ENGL.

5 tables, 3 fig., 23 references. *Authors summary*

The significance of chromosome studies in animal breeding in Norway

M. Syed; N. Nes, and K. Rønningen

Studies were carried out on cattle, pigs, horses, dogs, raccoon dogs (*nyctereutes procyonoides*) and mink over a 20-yr period for structural and numerical chromosomal aberrations. Of 6016 Norwegian Red bull calves tested for the 1/29 translocation between 1970 and 1985, the frequency dropped from 9.2% affected in 1970 to 0.5% in 1985. This was due to selection against the translocation. The XO syndrome was seen in pigs and horses; XXY and XXX were observed in cattle. Testicular feminisation was described in cattle, dogs, and raccoon dogs, and one true hermaphroditic mink had diploid-triploid chimaerism (30, XX/45, XXY) Freemartinism is described.

J. Anim. Breed. Genet. 104 (1987) 113-120. 1 table, 5 fig., 13 references.

CAB-abstract

Matings trials with the "Keke" curly silver fox*K. Saaremaa, and P. Niemela*

The "Keke" silver fox mutation appeared in Finland in 1986. "Keke" foxes have coarse, curly guard hairs, rendering their pelts practically worthless. Test matings between affected foxes and between affected and normal foxes revealed that the defect has a recessive mode of inheritance.

*Finsk Pälstidskrift; 22; 3; 100-101; 1988.**In SWED.**4 photos.**CAB-abstract***Breeding trials with Standard mink - breeding for fertility, body weight and fur density***G. Lagerkvist*

Mink females (80-160 per group) were selected for (1) fertility, (2) body weight, (3) pelt quality or (4) fertility + body weight, and their performance was compared with that of unselected controls (group 5). In the 5 groups, the number of liveborn kits per litter averaged 5.8, 4.2, 5.3, 4.7 and 6.6 resp. in 1986 vs. 5.8, 5.8, 5.3, 4.9 and 6.1 in 1987, the number of stillborn kits averaged 0.5, 1.0, 0.5, 0.7 and 0.6 vs. 0.7, 0.6, 0.8, 0.8 and 0.6, the number of kits per litter surviving to 3 weeks of age 5.2, 3.8, 4.5, 4.2 and 5.4 vs. 5.1, 4.7, 4.2, 4.7 and 5.8, and the percentage of infertile females 7, 19, 13, 13 and 14 vs. 7, 11, 11, 10 and 8. Body weight at 6 weeks of

age averaged 290, 331, 307, 315 and 309 g vs. 347, 358, 361, 337 and 340 g. Body weight at pelting of male kits from the 5 groups averaged 2270, 2463, 2266, 2410 and 2317 g and pelt length 72.7, 74.4, 73.2, 74.3 and 72.7 cm, the differences between group 1 and 4 and the other 3 groups being significant. The scores for quality of guard hairs averaged 3.0, 3.0, 3.3, 3.0 and 3.1 points in November vs. 3.3, 3.3, 3.4, 3.2 and 3.2 after pelting, those for fur density averaged 3.1, 3.0, 3.6, 3.2 and 3.2 points vs. 3.3, 3.4, 3.6, 3.4 and 3.3, and total quality score averaged 3.4, 3.5, 3.9, 3.6 and 3.6 points vs. 3.6, 3.5, 3.8, 3.5 and 3.6, the differences between group 3 and the other groups being significant.

*Våra pälsdjur; 59; 2; 46-50, 1988.**In SWED.**8 tables.**CAB-abstract***Breeding work. Crossbreeding***Lars Elofson*

An account is given of various types of crossbreeding of mink, involving 2 or 3 breeds. Crossbreeding of various colour types is also discussed, and examples are given of the results of crossbreeding between specific types.

*Våra Pälsdjur; 52; 2; 41-44, 1988.**In SWED.**CAB-abstract***Progeny testing of AI foxes has begun***Michael Sønderup*

In Denmark, 15 silver and 5 blue fox males were progeny-tested in 1987. The progeny of tested foxes produced 25, 61, 13 and 2% resp. of 1st, 2nd, 3rd and 4th quality pelts vs. 13, 47, 10 and 21% resp. for overall pelt production in Denmark.

*Dansk Pelsdyravl; 51; 2; 147, 1988.**In DANH.**2 tables, 1 photo.**CAB-abstract***Value of AI for genetic progress***H. Konnerup-Madsen*

Of 1300-1400 male foxes examined in 1987 in Denmark, 853 were selected for AI. Of blue fox, silver fox and mutation males, graded for fur quality on a 5-point scale where 1 = top quality, 122, 250 and 55 resp. were scored as group 1 and 44, 309 and 73 as group 2.

*Dansk Pelsdyravl; 51; 2; 148, 1988.**In DANH.**1 table.**CAB-abstract*

Original report

A comparative study of different methods to evaluate heat in blue fox

Henrik J.K. Falkenberg, Niels Therkildsen, and Grete Møller, Forsøgsfarm Syd, Lindknudvej 35, 6650 Brørup, Denmark.

Summary

The aim of this study was to compare 5 different methods to evaluate heat in blue fox: Electrical resistance measurements, visual control of the vulva, plasma progesterone assay, temperature measurements and assay of the proportion of cornified cells in smear from the vaginal mucosa (smear test).

The comparison was done, partly by a computational simulation method, and partly by plotting visual control, progesterone, temperature and smear in relation to the day where the electrical resistance peaked.

The results indicate, if the optimal moment for artificial insemination is to be evaluated on a single recording, that a measuring of the plasma progesterone could be the most accurate tool.

The great variations in the plasma progesterone recordings due to the elizakit suggests that a numerous recordings of the electrical resistance still could be the best heat evaluation tool in fox production, and only further experiments where insemination were based on progesterone- or electrical recordings could answer this question.

Materials and methods

The investigations, were carried out on a Danish fur breeding research farm in March, April 1988. The animal material consisted of 72 blue fox females and 10 males. When a visual control indicated a swelling of the vulva, the electrical resistance was recorded using a Norwegian heat measurer SI-LI3.

The following measurements were taken twice while the curve for the electrical resistance was rising, and once or twice while it was falling:

1. Smear test from the vaginal mucosa.
2. Temperature.
3. Blood samples for later hormone analysis.

The evaluation of the smear test was divided into 9 categories, with cat. 9 indicated a maximum amount of nonviable cornified cells.

The rectal temperature was measured in celsius (± 0.10 C.) and recorded at the same time each day.

The blood samples were collected i.v. from the hind leg, (cephalic vein) and the plasma analyzed for progesterone using Enzygnost serum progesterone test kit Vet from Hoechst. In order to fit the calibration curve, some of the samples were diluted with mare serum, tested for progesterone. The absorbance was measured by an Inter Med Eliza reader at 492 nm.

The visual control was divided into 5 categories. Categories 1-4 indicates an increasing swelling, and 5 the moment of decrease of the vulva and a color change from slightly pink towards purple. This is the moment, where the artificial insemination in general takes place.

The artificial insemination was done on the basis of changes in the electric resis-

tance. The first insemination was done on the day, when a decrease of more than 50 ohm was recorded, and the second insemination two days later. In case of a second peak in resistance, the insemination followed the

same scheme as mentioned above.

In late June, all the relevant information concerning mating, litter size etc were collected for later computation by the SAS-computer system (table 1).

Table 1.

Variable	N	Minimum	Maximum	Mean	Std dev
Number of kits.*					
Total born.	68	0	17	9.79	5.11
Live born.	68	0	17	8.96	5.02
Alive 3 weeks after birth.	68	0	16	7.19	4.80
Length of gestation.** (days).	58	52	58	54.2	1.72

Number of females inseminated:***)
Once (68), twice (58) or three times (31).

* Number of kits pr. mated female.

** Estimated from the first insemination.

*** Average number of insemination pr female = 2.18.

In order to compare the various methods, a plot was made so progesterone, smear, resistance, temperature and visual control were plotted in relation to the day where the electric resistance peaked. (fig. 1-5). An equivalent plot for progesterone and resistance were made, but this time in relation to days before whelping (fig. 6-7).

In order to compare the various heat evaluations methods, a computational simula-

tion program was constructed. The program was asked to find, in relation to days before and after the peak in resistance, observations where values for progesterone, smear, visual control and temperature were situated between meanvalues for the actual day and meanvalues for the following day (table 2). The hypothesis was, that the number of observations the program could find under the certain conditions, the more reliable heatevaluation tool it was.

Table 2. Computational simulation.

	Smearstest.	Prog.	Resist.	V.C.	Temp.
4 days before	1	3	0	0	1
3 days before	0	1	0	0	5
2 days before	0	5	0	0	14
1 day before	0	7	6	0	13
Peak in resistance	0	7	11	0	3
1 day after	0	6	1	13	12
2 days after	5	8	3	0	10
SUM	6	37	21	13	62

Number of observations in relation to the peak in resistance. The values for progesterone, smear, visual control and temperature, are situated between mean values for the actual day and mean values for the following day.

A similar program was constructed, but this time the values for the observation

should be between mean and \pm Std dev/2 (table 3).

Table 3. Computational simulation.

	Smear test.	Prog.	Resist.	V.C.	Temp.
2 days before	7	21	10	17	7
1 day before	1	6	11	17	--
Peak in resistance					
1 day after					
2 days after					
SUM	8	27	21	34	7

Number of observations in relation to the peak in resistance. The values for progesterone, smear, visual control and temperature, are situated between mean values for the actual day and \pm Std dev/2.

Finally, a program was asked to find the number of observations in this study, which

could fulfil the conditions set by H.A.P. Urling in his report (1987) (table 4).

Table 4. Computational simulation.

Column	Urlings Ng/ml 1	Mean ng/ml 2	Std.dev. 3	N 3	N 4
3 days before	< 10	10.57	30.37	15	13
2 days before	10-15	8.23	15.33	24	1
1 day before	15-30	13.88	14.50	30	3
Peak of resistance	30-45	28.40	31.37	62	9
1 day after	> 45	38.91	33.33	28	12
2 days after	> 45	68.71	39.72	28	19

Column 1: Values for plasmaprogestosterone used by H.A.P. Urlings (1987) to chose the right moment for artificial insemination.

Column 2: Values for plasmaprogestosterone found in this investigation.

Column 3: Number of observations in this investigation.

Column 4: Number of observations which can fulfil the conditions set by Urling (1987) and listed in column

Results and discussions

Progesterone in relation to the peak in resistance (fig. 1) shows a teoretical perfect course from day 4 before the peak, until day 3 after the peak, even though the recorded concentrations are not in full agreement with the data proposed by H.A.P. Urling (1987) (table 4). Progesterone in relation to days before whelping (fig. 7) shows a similar course as in relation to the peak in resistance. The variation is 7.3% between two recordings on the same sample and 24.5% on the same sample on various days (table 5).

Finally is the variation between various samples on the day before the peak in resistance 104% (table 5).

The curve showing the resistance, has as defined, a peak on day 6 and a decline after day 6, and an increase from day 1 until day 6. (fig 3). If the curve of whelping it shows a different course and without a typical maximum (fig. 7). The reason could be, that pregnancy in some cases is achieved from the second insemination and not from the first one.

Fig 1. Progesterone in relation to the peak in resistance.

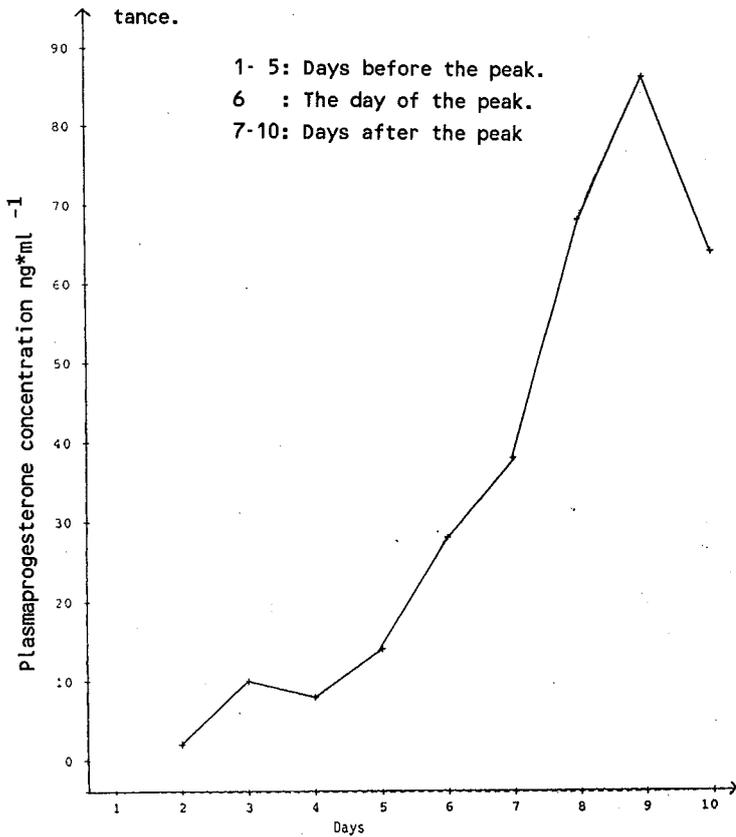


Fig. 2. Smearstest in relation to the peak in resistance.

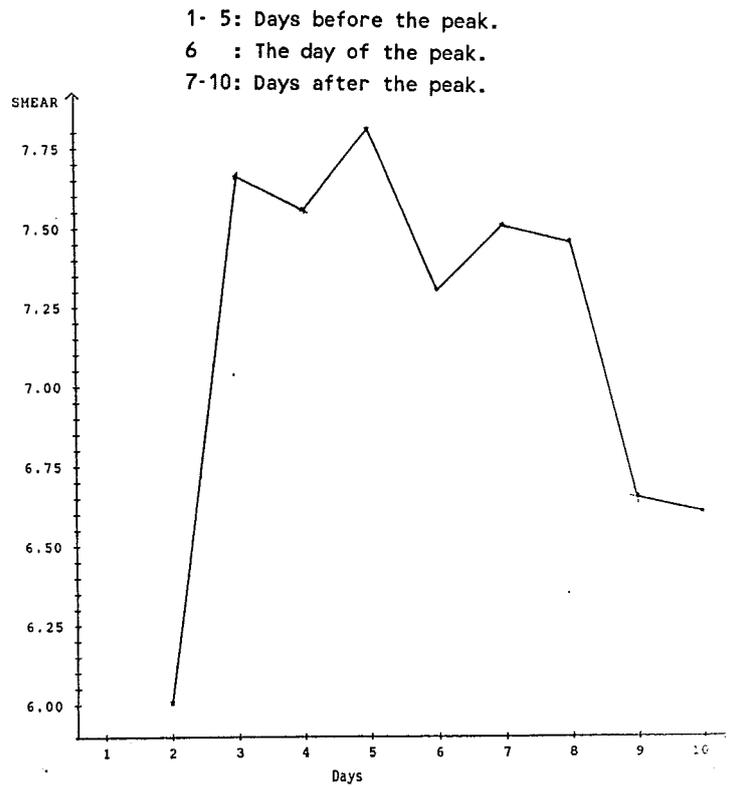


Fig 3. Resistance in relation to the peak in resistance.

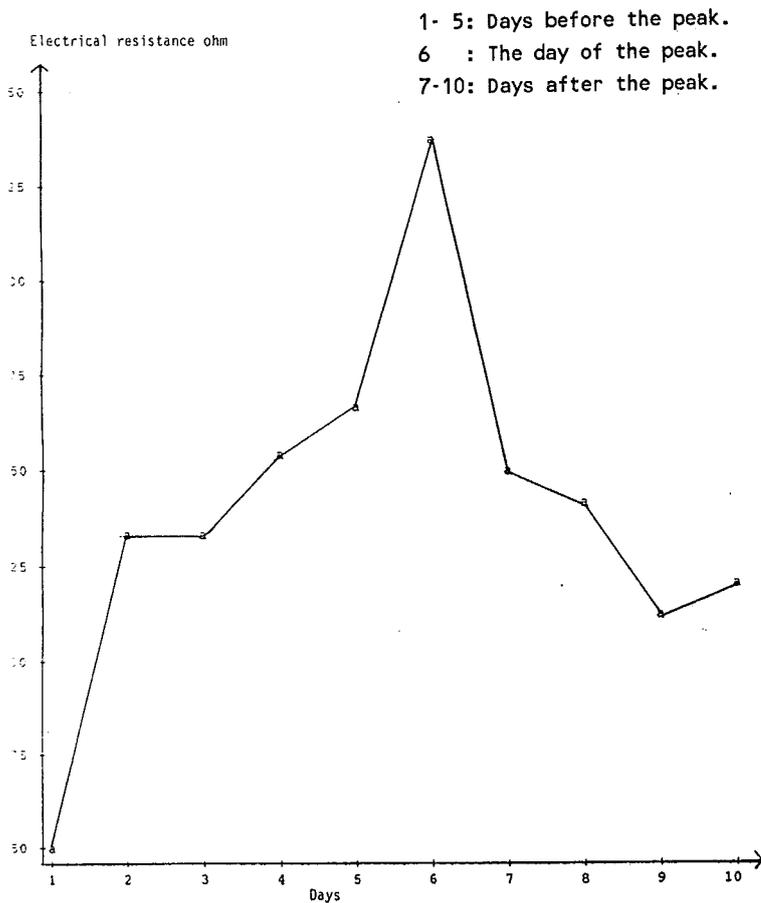
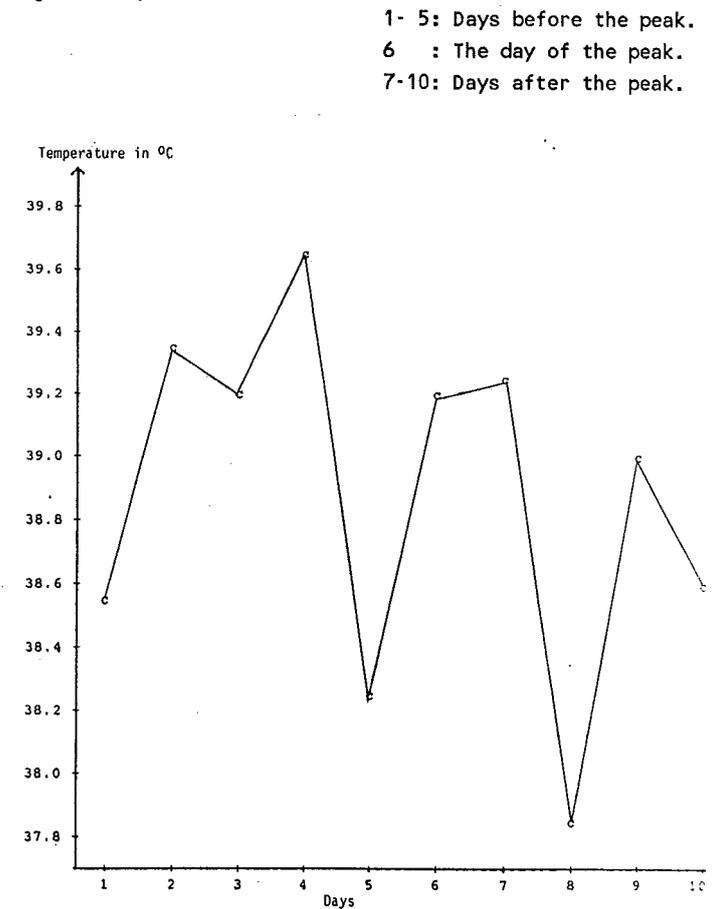


Fig. 4. Temperature in relation to the peak in resistance.



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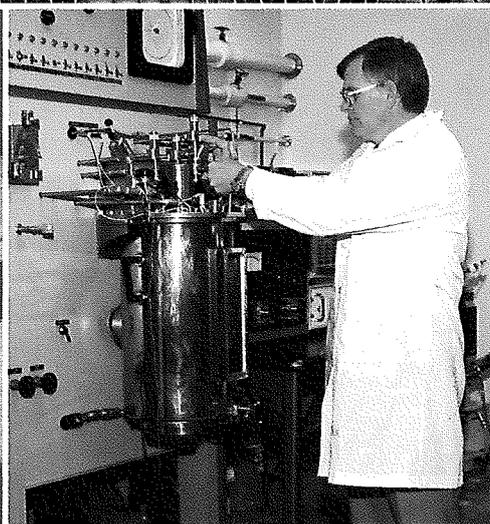
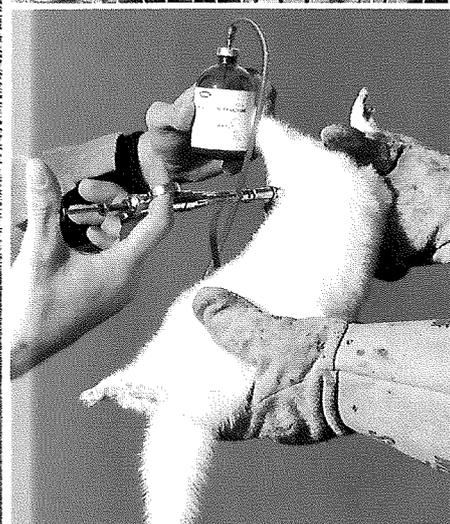
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Fig. 5. Visual control (KT) relation to the peak in resistance.

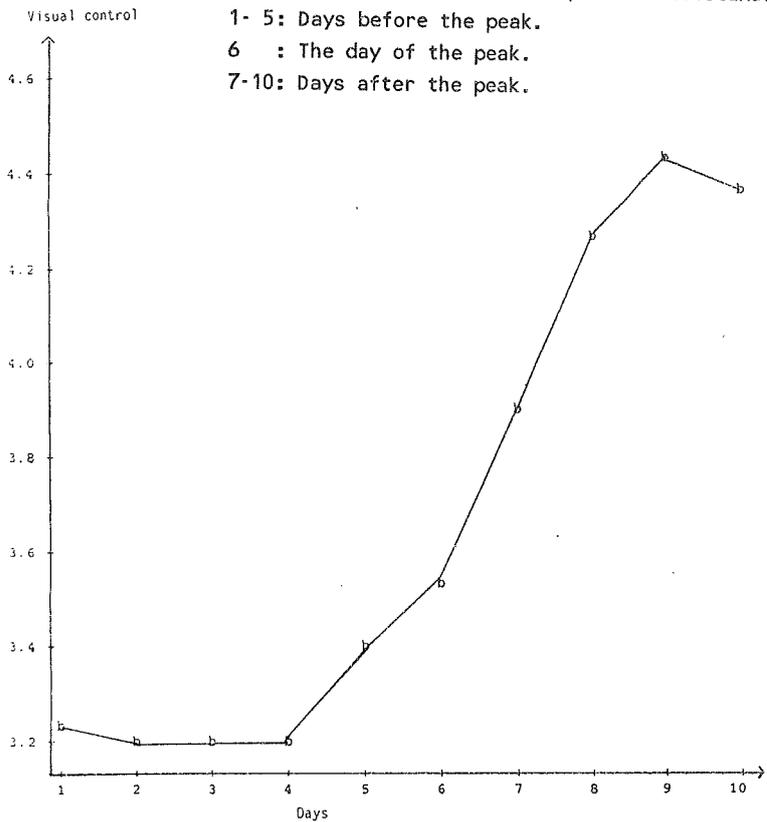


Fig. 6. Plasmaprogestosterone as a function of days before whelping.

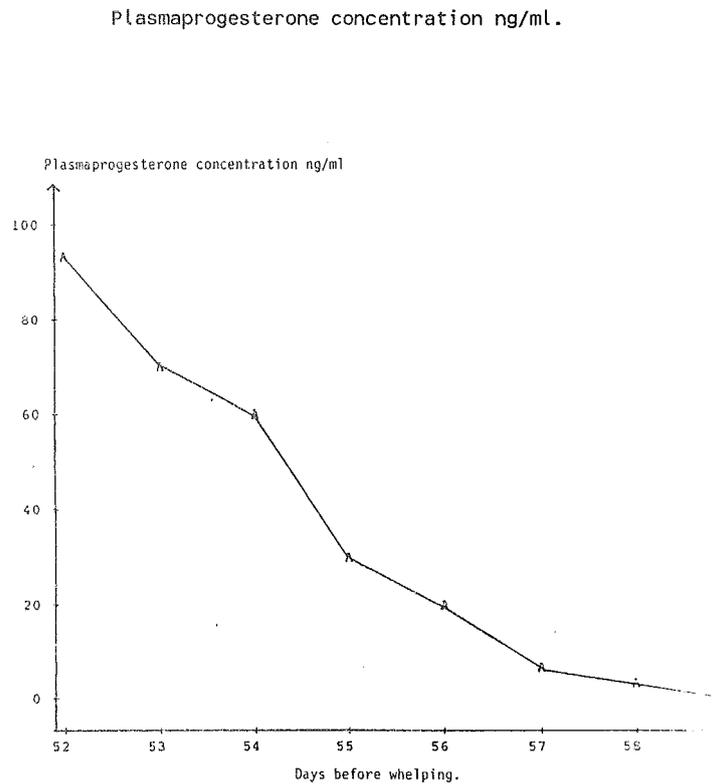
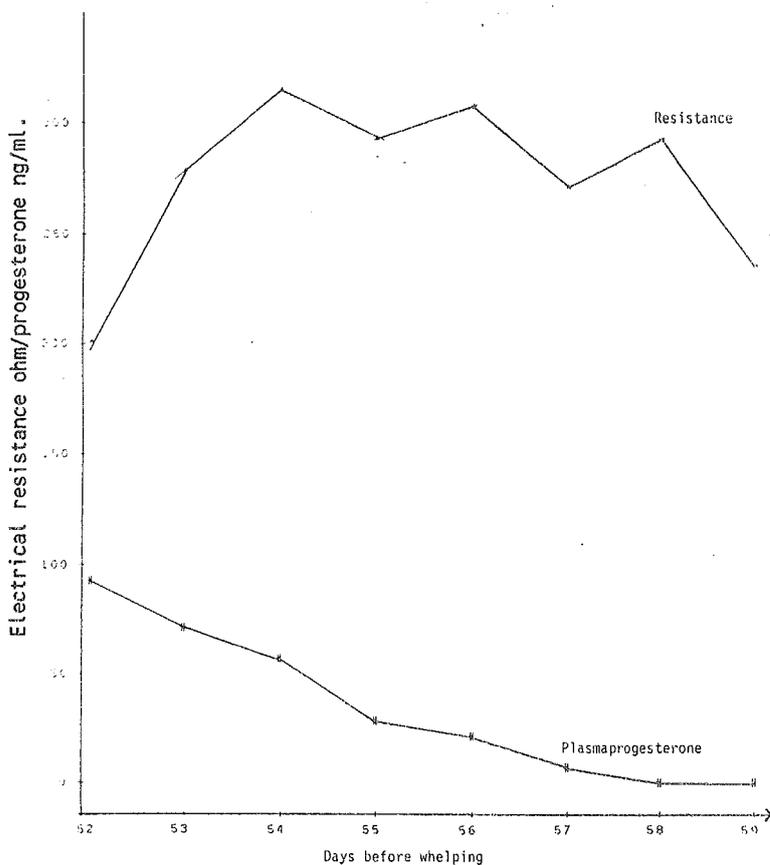


Fig. 7. Plasmaprogestosterone and resistance as a function of days before whelping.



From a teoretical point of view the curve showing smear as a function of resistance (fig. 2) should have a peak on day 7, indicating the best moment for insemination. This is not the case. The curve has its maximum on day 5 and is rather constant from day 3 until day 8.

An increase in temperature is often observed on the day of ovulation and the following days. There is an increase in temperature between day 5 and day 6 where the ovulation should have occurred. An equivalent rise is recorded between day 8 and 9, and the temperature is not higher on the days following the ovulation.

The curve showing the visual evaluation as a function of resistance, has its maximum on day 9. We expected the maximum to be on day 7, the day after the peak in resistance and at the moment for the artificial insemination.

The tables showing the results from the computational simulation (table 2 and 3) indicate that progesterone and resistance are, at the present time, the best tools to be used for heatevaluation. The high scores in the visual evaluation as indicated in table 3

Table 5. Variations between progesterone recordings.

A. Same animals, same day, same kit

N	Mean	Std.dev.	Variance
19	0.4438	0.0324	7.3 %

(Absorbans measurement)

B. Same animals on various days using kits

N	Mean	Std.dev.	Variance
26	47.05 ng/ml	11.53	24.5 %

C. Same animal (control bitch on various days using various kits.

N	Mean	Std.dev.	Variance
41	33.22 ng/ml	14.58	43.8 %

Variation between observations on the day before the peak of resistance:

	N	Mean	Std.dev.	Variance
Progesterone ng/ml	30	13.88 ng/ml	14.50	104 %
Smear test	32	7.81	1.47	19 %
Resistance ohm	34	265 ohm	100	38 %
Visual control	31	3.40	0.99	29 %
Temperature °C	33	38.24 °C	6.18	16 %

are of no use because of the inaccurate placing of the maximum value on day 9. The data in table 4 does not agree with the data used by H.A.P. Urling (1987) to estimate the moment of artificial insemination. The reason could be the use of two different eliza kits systems with two specific antibodies against progesterone.

All relevant data concerning number of kits, gestation length ect are shown in table 1.

Conclusions

If the optimal moment for artificial insemination is to be evaluated based on a single recording, a measuring of the plasma progesterone could be the most accurate tool. The great variation between various kit and days indicates that one should be careful to inseminate after conditions based on data collected by using a testkit of another manufacture or even another batchnumber. Furthermore, the use of one single progesterone recording, is more hygienic and saves the use of labour, compared to a number of electric resistance measurements.

In the light of the great variations in the progesterone assay, recording of the electric resistance throughout the heatperiod could still be a better tool, and only further experiments where inseminations were based on progesterone recordings or electric resistance recordings could answer this question. Finally estrogen recordings in plasma or urine could be an alternative to the methods already mentioned.

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- John Dee, and Susanne Forchammer: Progesteronmåling hos hund. *Dansk Vet. Tidsskr.* 1988, 71 8 15/4.
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Genetic and evolutionary aspects of the problem of homeostasis of mammalian fertility (using mink as an example)

V.I. Evsikov

The homeostasis of mammalian fertility at the populational level is brought about by close interaction of individual units of the reproductive function and is based on a nonadditive action of the corresponding hereditary factors. The main mechanisms of the homeostasis of mammalian fertility are the embryonic and early postnatal mortality. We have shown

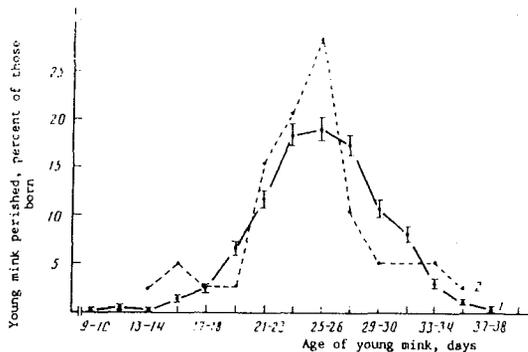


Fig. 1. Distribution of ages of young mink of genotypes $S_k S_k K$ (1) and $S^H s K$ (2) at time of death.

that the offspring of females with optimum fertility exist under more favorable conditions of development from the earliest stages of embryogenesis. The determination of the fundamental genetic and physiological mechanisms of the regulation of mammalian fertility is only possible on the basis of theories of the stabilizing and destabilizing selection, using data and methods of populational genetics, physiology, and experimental ecology of animals.

Soviet Genetics 1987; December 1987; v. 23 (6): p. 682-693. Plenum Publishing Corporation, 0038-5409/87(2306-0682, Us Dol. 12.50. In RUSS, ENGL.

3 tables, 6 fig., 63 references. Authors summary

The litter size in chromosomally polymorphic blue foxes

Auli Mäkinen and Outi Lohi

About 50% of the Finnish farm bred blue

foxes have a Robertsonian translocation in a heterozygous form, whereas the distributions of the homozygous form $2n = 48$ and the $2n = 50$ karyotype with two acrocentric autosome pairs seem to be nearly equal. The effect on fertility exerted by the heterozygous Robertsonian translocation was studied on the material from a blue fox farm in Finland during four years. It is concluded that there is a tendency to litter size reduction in mating groups $2n = 49$ compared to the $2n = 48$ and $2n = 50$ mating groups.

In this investigation, the $2n = 48$ chromosome constitution in parental blue fox groups has every year had a slight tendency to increase the litter size. In addition, the segregation of the karyotypes within the litters of the parental $2n = 49$ mating groups is in favour of the $2n = 48$ karyotype. Hence, an evolutionary tendency towards lower chromosome number without any acrocentric autosomes seems to be indicated.

Hereditas 107: 115-119, 1987.

7 tables, 10 references. Authors summary

Endocrine function of testicles in mink

N.K. Shul'gina, and T.M. Demina

The endocrine function of the testicles in mink of a pedigreed pastel group was characterized on the basis of data on the level of sex steroid hormones in the blood. The main source of testosterone and estradiol in two-month-old males is the testicles. In 3.5-4 month-old animals there is activation of the hormonal function of the testicles, and great individual variety in the testosterone level is observed. The content of this hormone was lower in young males than in adults, only before heat. The results obtained are correlated with morphological changes occurring in the testicles in ontogenesis.

Soviet agricultural sciences 1987; (3): p. 59-62. Callerton Press Inc., UDC 636.934.57:577.-175.6.

In ENGL.

2 tables, 1 fig., 7 references. Authors summary

Breeding season and pregnancy-associated increase in plasma levels of fibrin/fibrinogen in the mink

J. Hau; O.M. Poulsen; A. Brandt, and S. Alexandersen.

Antisera against a mink plasma protein complex which cross reacted immunologically with human fibrinogen were produced. During the breeding season extremely high plasma levels of fibrinogen/fibrin were recorded in female mink using rocket immunoelectrophoresis. During the subsequent gestation period the levels gradually decreased to reach non-breeding season levels at term. The mink fibrin/fibrinogen molecules were found to exist mainly in large aggregates with a

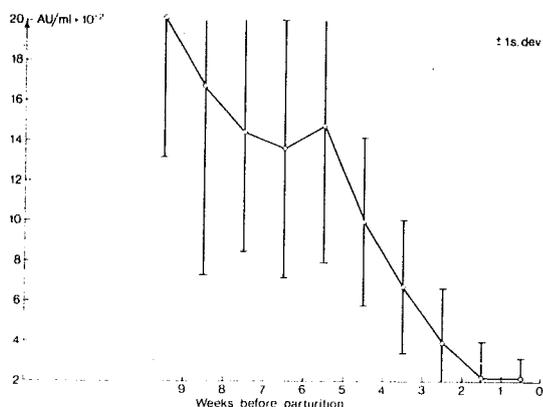


Fig. 3. Rocket immunoelectrophoresis measurements of mink fibrin/fibrinogen/FDP in 130 heparin plasma samples from 12 female mink during breeding season and gestation. One hundred Arbitrary Units (AU)/ml refers to the concentration of protein in a pool of heparin plasma from late pregnant mink ($n=10$). Values represent means \pm 1 SD.

molecular weight around 630 kD. The molecules were found to bind heparin and concanavalin A.

Animal Reproduction Science, 16 (1988) 135-144.

4 fig., 33 references.

Authors abstract

Effect of sire on litter size in mink

Ejner Børsting

For 75 standard and 78 pastel male mink, the repeatability of litter size was 0.035 and 0.062

resp. vs. 0.15-0.20 for females. Litter size of sires was not significantly correlated with that of their sons. Testis size was determined on 31 December, 31 January, 4 March, and 24 March; for standard males, the correlation of testis size on 31 December with that on 31 January, 4 March and 24 March was 0.60, 0.25 and 0.03 resp. vs. 0.57, 0.39 and 0.28 for pastel males, the correlation of testis size on 31 January with that on 4 and 24 March was 0.54 and 0.29 vs. 0.44 and 0.41, and the correlation of measurements on 4 March with those on 24 March was 0.58 vs. 0.50. For standard mink, the correlations of testis size score on 31 December, 31 January, 4 March and 24 March with the number of liverborn kits per mated female were 0.19, 0.14, 0.17 and 0.22 resp. vs. -0.66, -0.07, 0.04 and 0.04 for pastel mink, and the correlations of the score with the number of liverborn kits per litter were 0.03, 0.05, 0.04 and 0.11 vs. -0.04, -0.08, -0.06 and 0.

Dansk Pelsdyravt; 50; 12; 902-904, 1987.

In DANH.

7 tables, 3 fig., 1 references.

CAB-abstract

Effect of mating system on production in mink

Bert A.P. Urlings

Data on 579 and 1628 scan black mink females at 2 farms in the Netherlands were analyzed. For adult females mated twice, on 2 consecutive days beginning on 11-18 March or 20-30 March, the percentage of infertile females was 14.9 and 3.8% resp. the number of kits born per litter averaged 5.64 and 5.59 and the number of kits born per mated female 4.72 and 5.33; for young females mated 3 times within a 10-day period beginning on 4-7 March or 4-16 March, the corresponding values were 21.1 and 10.6%, 5.23 and 5.01 and 4.12 and 4.48. In all groups of females, those with gestation length of 47 days; the correlations of gestation length with litter size were 0.30 and 0.16 resp. for young females at the 2 farms (both $P < 0.001$) and 0.23 and 0.11 resp. for adult females ($P < 0.001$ and 0.01 resp.). It was concluded that young females should be

mated after 6 March and adult females should be mated after 20 March.

Dansk Pelsdyravl; 51; 2; 79-82, 1988.

In DANH.

7 tables, 9 references.

CAB-abstract

Formation of dimensions of the litters and proportion and of the sexual breed in relation to the age and the time-limit of the female's kitting of the polar foxes (*Alopex lagopus*) - subspecies Norwegian and Polish

Stanislaw Kubacki, and Manfred Oskar Lorek

Scientific research in respect of figures of the foxes according to the books of the fur-bearing animals in the Wiartel's farm gave the possibility to do the comparative analysis of the blue Norwegian fox in the view of some marks of the breeding's utility. Scientific research of the population between female of the Norwegian fox and the Polish fox, proved statistically essential difference in the number of pups bred (0.61^x) and in the proportion of the males to females, (1.06^x). The females of the Norwegian fox in the case of earlier breeding (to 10th of May) showed the higher index in the view of the number of pups grown up (1.04^x) the essential difference and highly essential number of males grown up (1.02^x) and in the proportion of the males to females (1.10^{xx}).

Akademia Techniczno - Rolnicza Im. Jana I Jedrzeja Sniadeckich W Bydgoszczy Zeszyty Naukowe Nr 150 - Zootechnika (15) - 1987, 37-45.

In POLH, su. ENGL, RUSS

4 tables, 7 references.

Authors summary

Effect of birth date on reproductive performance of polar fox females

Andzej Zon; Zbigniew Sieron, and Maciej Meller

Females of polar fox (40) were evaluated

considering their birth date: group 1 - born before May 10, group 2 - born after May 15.

The first rutting symptoms appeared in both groups at the end of February. Mating season in group 2 lasted 33 days and was 3 days longer than that in group 1. The percentage of females delivered was differentiated: 1 - 83.5, 2 - 73.8. Barrenness rate was 8% higher in group 2. Gestation lasted 53 days in both groups. Average litter size was 7.8 and 8.5 pups in group 1 and 2, respectively. The body weight of foxes at weaning was 1755.3-1688.7 g for males and 1672.5-1622.8 g for females, at slaughter, respectively, 6009.9-5949.3 g and 5594.7-5614.1 g. The results of licence estimation of young foxes were not differentiated between the groups. Average classification of the skins in group 1 and 2 was 3.6 and 3.7 respectively.

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

Rocz. Nauk. Zoot. T. 14, z 1 (1987) 113-119.

In POLH, su. ENGL, GERM, RUSS.

4 tables, 7 references.

Authors summary

A study of spontaneous sexual maturation of the female ferret

Kathleen D. Ryan, and Susan L. Robinson

Although ferrets long-day breeders, females reared exclusively in nonstimulatory short days will undergo spontaneous sexual maturation by 30-50 wk of age. In the following report, this spontaneous sexual maturation of ferrets was studied to determine mechanisms regulating sexual maturation in nonstimulatory

photoperiods. Study of ovariectomized females treated with low, constant levels of estradiol suggest that a marked decrease in the efficacy of estradiol to inhibit luteinizing hormone secretion occurs shortly before sexual maturity becomes evident in intact controls (both groups housed in short days). During this long juvenile period, a marked increase in body weight occurred, but ovarian responsiveness to exogenous gonadotropin did not change. Older, larger females did respond more rapidly to stimulatory photoperiod than did younger females. These studies that the mechanisms of spontaneous puberty in ferrets are likely the same as those regulating photoperiod-stimulated puberty in this species.

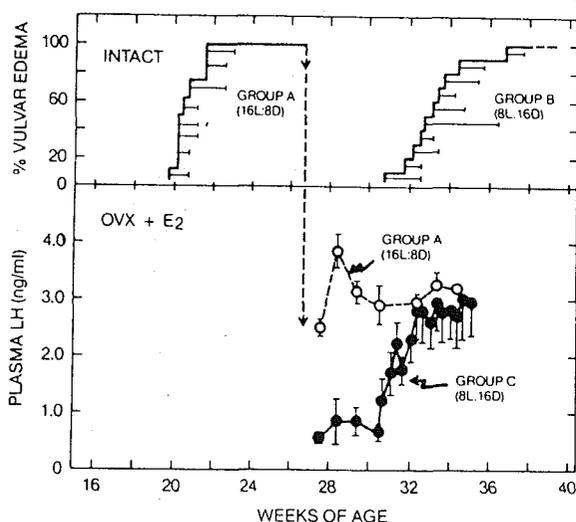


FIG. 1. Onset of vulvar edema in 2 groups of female ferrets (top panel). Solid vertical line indicates date of edema = 0.5 cm; horizontal line with cross bar shows establishment of full edema = 1.0 cm (-). Group A was moved to stimulatory long-day photoperiod at 16 wk of age. Group B remained in nonstimulatory short days for the duration of the study. All females in Group A were ovariectomized and treated with low levels of estradiol (OVX + E₂) at the time shown by the vertical, dashed line. A third group of immature females was OVX + E₂ at the same time (Group C); these females remained in short days. Plasma LH profiles for Groups A and C after OVX + E₂ are shown in the bottom panel.

Biology of Reproduction 36, 333-339 (1987).
6 fig., 23 references.

Authors summary

Collection and freezing of nutria (*Myocastor coypus*) semen

C. Hellemenn; C. Saenz, and G. Gomez

Semen was collected from three male nutrias, kept in individual cages, by the use of

artificial vaginas during copulation on slightly sedated females. Trials to replace the females by a dummy, or to obtain semen by electroejaculation didn't succeed. The liquid fraction of the 20 ejaculates collected yielded about 1.1 ml volume, 0.2 mill. sperms/mm³, 80% motility and more than 90% normal acrosomes.

Three diluters (B = TRIS-extender to bovine semen, H = EDTA-OEP-extender for stallion semen and K = TRIS-DMSO-extender for rabbit semen) were tested for fresh semen preservation, as well as freezing in Minitubstraws. Using a 3 x 2 factorial design, the 1st trial with 10 ejaculates was conducted to find out, if semen needs an adaptation time to the extender before freezing. In the 2nd 2 x 2 trial, the addition of the Na-lauryl sulphate containing OEP to the B- and K-extenders was tested. Motility (MOT) and normal acrosomal ridges (NAR) were used as quality criteria of semen. Statistical analysis of results were submitted to tests of Kruskal-Wallis or Mann-Whitney.

H-extender was rejected after the first trial, because of the rapid loss of sperm motility soon after dilution. MOT was significantly higher with B- and K-extenders in fresh as well as in frozen semen. However, NAR-rates were significantly lower compared with H-extender. Addition of OEP to B- and K-extenders comparatively increased NAR-rates significantly. Semen frozen immediately after dilution with B- and K-extenders had significantly higher MOT-rates.

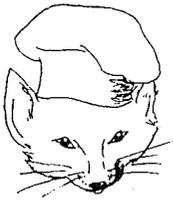
The rapid loss of acrosome integrity in nutria semen probably leads to loss of sperm fertility. In the present trials a minimum of normal acrosomes in motile presumptive fertile sperm cells was present in fresh semen only immediately after dilution with B- and K-extenders, as well as in OEP containing frozen semen. However, considering the low NAR-rates, further trials should be conducted to increase them. For the practical use of artificial insemination in nutria it seems also necessary to find out, if in this species ovulation can be induced.

Dtsch. tierärztl. Wschr. 94, 456-460.

In GERM, su. ENGL.

2 tables, 8 fig., 22 references.

Authors summary.

**Results from rearing trials in 1986**

Ilpo Pölönen, and Jaakko Mäkelä

The main results from experimental farm trials with mink and blue foxes in Finland in 1986 are presented as tables and histograms.

*Finsk Pälstidskrift; 21; 5; 286-291; 1987.
In SWED.*

3 tables, 11 fig.

CAB-abstract

Results of feeding experiments during the 1987 breeding season

Ilpo Pölönen, and Jaakko Mäkelä

Of mink females at Maxmo (100 per group) fed a standard diet during the breeding season (controls), diets containing (1) 4% maize gluten, (2) lactic acid-treated offal, (3) 10% tinned fish, (4) 40% protein, 36% fat and 24% carbohydrates or (5) 15% sardines, 6.5, 17.3, 14.0, 7.2, 3.1 and 7.3 resp. were infertile or killed their young, and the number of kits produced per mated female averaged 4.51, 4.43, 4.01, 4.34, 5.25 and 5.41. For blue fox females, (50 per group) fed the standard diet or diets 1, 2, 3 or a diet containing 15% cereals (5% wheat, 5% raw oats and 5% raw barley), the percentage of infertile females plus females which killed their young was 20, 21, 36, 38 and 42% resp., and the number of cubs weaned per mated female averaged 6.95, 7.49, 5.38, 5.26 and 4.27. Of silver fox females (20 per group), fed a standard diet or a diet containing 4% rumen and 4% liver, 29 and 40% resp. produced no young, and litter size at weaning per mated female averaged 2.18 and 1.60.

*Finsk Pälstidskrift; 21; 11; 610-612, 1987.
In SWED.*

2 tables.

CAB-abstract

Observations concerning the ethyopathogeny and the symptomatology in the biotine deficiency at carnivorous fur animals

N. Pastirnac, and R. Gruia

In the study were described the biotinic, ethyologic and symptomatologic deficiency at mink and fox, with detailed observations linked to the negative effects upon the fur quality and the reproduction of these species.

The biotine deficiency effects were exemplified through an experiment with 144 standard minks distributed in 10 lots, from which 9 were experimental ones, to which had been gradually administrated in the ratio up to 45 antibiotine units (by avidine). The gradual manifestation of the biotine deficiency at the level of the fur and skin has been richly illustrated for alive animals as well as for furs.

*Revista de cresterea animalelor nr. 10 - 1986.
In ROMN, su. ENGL.*

1 table, 7 fig., 8 references. Authors abstract

Poultry byproducts as feeds for fur animals

Eva Aldén

Cold storage periods at different temperatures for individual cleaned poultry are considered, depending on fat content or presence of internal organs, also need for prompt consumption after thawing. Because of the avidin content of egg albumen, biotin must be added to feed high in laying hen carcass waste. Ash in mink feed should not exceed 7 to 12% of DM, with lower values during lactation, so use of poultry byproducts rich in ash, which would impair digestibility of protein, must be restricted. Clear declaration of raw materials contained in such byproducts and adherence to relevant feed tables and legislation are essential.

*Våra Pälstur; 58; 10; 320, 322, 1987.
In SWED.*

2 tables, 2 references.

CAB-abstract

Digestibility trials on mink given fish meal and meat meal*Eva Aldén*

Diets containing 9, 18 or 27 g fish meal, prepared from high-quality whole fish, per daily portion were given to 6 adult male standard mink before and during a 3-day collection period. With increasing fish meal the digestibility of protein tended to decline and that of fat increased. Digestible protein and fat and metabolizable energy (ME) in fish meal reached 563 and 87 g and 14 MJ/kg. In a similar trial with meat meal, intended primarily for cat and dog food, at 13.8, 34.4 or 55.0 g per daily portion, digestibility of protein, fat and carbohydrate declined with increasing amount of meat meal. Digestible protein, fat and carbohydrate and ME in meat meal reached 360, 60 and about 0 g and 9.1 MJ/kg. Feed intake with both test meals was satisfactory and no upsets occurred. Appropriate amounts for incorporation according to season were examined.

Våra Pälsdjur; 58; 8-9; 276, 278, 1987.
In SWED.

4 tables, 6 references.

CAB-abstract

Digestibility trials on mink given powdered egg yolk*Eva Aldén*

Digestibility was tested with 3-day collection period in 6 adult male standard mink given a diet of cod filleting waste, Baltic herring, mixed cattle offal and extruded cereal mixture with alcohol-treated powdered egg yolk at 6, 12 or 18 g per daily portion. Vitamins were supplied. Poor appetite was not ascribed primarily to yolk. Faecal consistency was affected slightly. Digestibility of protein and fat tended to increase and that of carbohydrate to decline with increasing amount of yolk. Digestible protein, fat and carbohydrate and metabolizable energy in powdered egg yolk reached 394, 402 and 30 g and 23.61 MJ/kg.

Våra Pälsdjur; 58 11; 378, 380, 1987.

In SWED.

4 tables, 2 references.

CAB-abstract

Evaluation of polyol mixture as a feedstuff in practical-type diets for lactating minks and mink kits*Tuomo Kiiskinen and Jaakko Mäkelä*

Polyol mixture (PM) or polyol molasses, a by-product of xylitol production, was blended in doses of 1 and 2 % into the ration of lactating minks and their kits during the first two months after birth (Expts. 1 and 2). During the main growth period (July–November, Expt. 3) 1% PM was included in the ration of the kits and acceptability of the diets containing 0.1 and 2% PM was compared using males for determining faecal dry matter and polyols (Expt. 4).

During the first 3–6 weeks after parturition supplementations of PM to the diet of lactating minks did not significantly affect the growth rate of kits. At the beginning of July, 1 % PM (Expt. 1) resulted in higher body weights for male minks than by the other diets ($P < 0.01$), and the females of each PM group were heavier ($P < 0.05$) than those of the control group. In the second experiment no significant difference between the treatments were ascertained. In the later phase of growth (Expt. 3), 1% PM resulted in a significant reduction of growth of both males ($P < 0.001$) and females ($P < 0.01$) and in the haemoglobine values of males ($P < 0.001$). A possible reason for these differences is discussed. No significant differences were found in fur quality, but the skins of the males of the PM group were shorter than those of the control group ($p < 0.05$).

The use of PM did not significantly affect consumption (Expt. 3), but if minks were unaccustomed, they seemed to reduce their feed intake as a result of the PM addition (Expt. 4). The polyol mixture did not cause watery faeces or diarrhoea, and on the basis of the small increase of polyols in faeces the authors estimated that around 95% of the polyols from PM was absorbed.

Annales Agriculturae Fenniae, Vol. 26: 157–165, 1987.

In ENGL, su. FINH.

10 tables, 12 references. Authors summary

**Causes of death in mink. Pathological-
/anatomical study of causes of death in 16
selected mink farms with a low frequency of
plasmacytosis**

Karin Wahlström

In 16 mink farms, chosen because they had a low frequency of plasmacytosis and were representative of different regions of the whole of Sweden, the results of post-mortem examinations of mink that died during 1985 were recorded. The total number of animals that died or were killed because of disease was 1252. Among these the major causes of death were metabolic disturbances (117), lung inflammation (71), urinary tract diseases (65) and plasmacytosis (44).

Våra Pälsdjur; 58; 8/9; 297-310, 1987.

In SWED.

3 tables, 7 fig.

CAB-abstract

**Immunoglobulin (IgG) allotypes of American
mink in relation to Aleutian disease**

*T.I. Kochlashvili; A.V. Taranin, I.I. Fomicheva,
and O.K. Baranov*

1928 healthy mink and 364 mink (sapphire, standard and topaz) affected by Aleutian disease were typed for light-chain allotype L1 and C-region heavy chain allotypes H2, H3, H6 and H8. The frequency of H3-positive animals was significantly higher in diseased than in healthy mink (76 vs. 53%). The percentages of sapphire and standard mink having phenotypes H3, H6, H8 and L1, H3, H6, H8 were significantly higher in healthy than in diseased mink. It is suggested that in Aleutian disease there is preferential stimulation of H3-positive, B-cell clones.

Genetika, USSR; 23(7): 1339-1341, 1987.

In RUSS, su. ENGL.

1 table, 7 references.

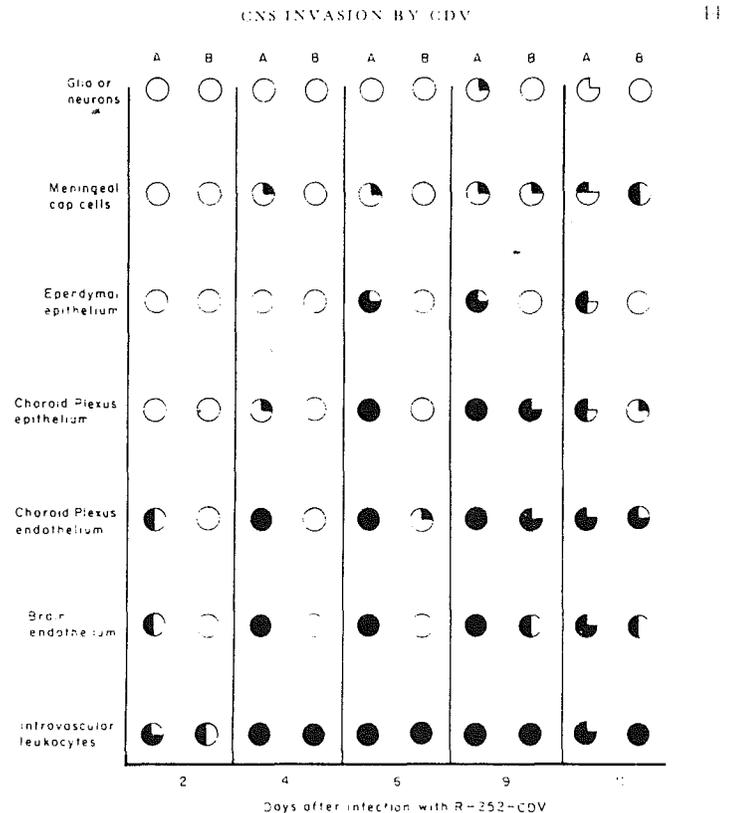
CAB-abstract

**Effects of induced thrombocytopenia on viral
invasions of the central nervous system in
canine distemper virus infection**

S. Krakowka; M.K. Axthelm, and J.R. Gorham

Groups of canine distemper virus (CDV)-susceptible ferrets treated daily with 2.0 ml of normal goat serum (NGS) or goat anti-ferret platelet serum from 2 days before to 11 days after infection. Each group was subdivided into 2 and one subgroup of each was subsequently injected intraperitoneally with virulent R252-CDV. Ferrets were killed on days 2, 4, 6, 9 and 11 after infection and tissues from the central nervous system (CNS) were examined for histopathological lesions typical for CDV and also CDV antigen by indirect immuno-flourescence methods.

In NGS-treated animals, a time course-dependent spread of CDV from CNS endothelium during days 2 to 4 after infection



A summary of results of treatment with normal goat serum (A) or antiplatelet antibody (B) upon the sequential distribution of canine distemper virus antigen in various compartments of the central nervous system. The circles represent the number of ferrets, 3 or 4, examined per group at each time interval. ○ = none of 4 IF-positive; ◐ = 1 of 4 IF-positive; ◑ = 2 of 4 IF-positive; ◒ = 3 of 4 IF-positive; and ◓ = 4 of 4 IF-positive.

through choroid plexus epithelium was observed. In contrast, CDV-infected ferrets treated with anti-platelet antibody exhibited a delay in infection of CNS endothelium until 9 days after infection. The results of this study confirm vascular endothelium as the primary route of invasion of CNS tissues by CDV and implicate the circulating platelet in the initiation of this event.

J. Comp. Path. 1987 Vol. 97.
5 fig.

Authors summary

Outbreaks of enterocolitis in nutria

N. Verdes; T. Pop; T. Bancescu, and C. Minascurta

Enterocolitis occurred in July-August in 1980 and 1981 on two privately-owned nutria farms and in early May on a state farm in one year only. Morbidity was 32-35% on the private farms and 8% on the state farm, with mortality of 13-15% and 3%, respectively. PM examination revealed diffuse haemorrhagic gastritis with ulceration. Colon and caecum contents were red in colour with foetid odour, and the mucosa was oedematous with serohaemorrhagic infiltration. Degenerative lesions were found in the liver and kidney. *Entamoeba histolytica* and *Balantidium coli* were identified in histological sections and *Salmonella typhimurium* was isolated from dead animals. The *Salmonella* isolate was susceptible to chloramphenicol, ampicillin, oxytetracycline and neomycin. Histological examination showed pronounced hyperaemia of the colon and caecum mucosa, with necrotic zones in the epithelium. The outbreaks were cured by administering "Clorovit" at 6 g/animal per day and dimetridazole at 32.5 mg/kg. Prophylactic measures included use of a multivalent *Salmonella* vaccine and through hygiene.

Revista de Cresterea Animalelor: 36(4): 41-44, 1986.
In ROMN.
3 fig., 2 references.

CAB-abstract

Bacteriological investigations on urolithiasis of mink

H. Zimmermann, and W. Witte

Infection with involvement of specific *Staphylococcus intermedius* strains was found to be the cause of disorders of the urinary tract of juvenile mink males eventually leading to urolithiasis. The infection was attributable to sources relating to endogenous microbial flora. Coagulase-negative staphylococci which occurred in urine samples of clinically intact minks are believed to be of no importance to pathogenesis of urolithiasis.

Mh. Vet.-Med. 43 (1988): 314-315.
In GERM, su. RUSS, ENGL.
2 tables, 13 references.

Authors summary

Coccidiosis of fur-bearing animals. Advances in protozoological research. Proceedings of the 1st International Conference of Hungary on protozoology, and Memorial Session for Jozef Gelei (1885-1952), Budapest, Hungary, 3-6 September 1985

Edited by *M.C. Bereczky*

The species responsible for coccidiosis of coypu, silver and arctic foxes, mink and sable on fur farms in the Kazakh SSR and the Altai and Novosibirsk regions of the USSR are listed, with information on age and seasonal variations in prevalence and clinical disease. 15 anticoccidials were tested over several years and those found most effective in each of the hosts are listed with their dosages.

Symposia Biologica Hungarica Vol. 33.

CAB-abstract

Aplastic anemia in ferrets

W. Baumgärtner, and R. Juchem

The present report describes both estrus

associated and estrogen induced aplastic anemia in 7 female ferrets. The animals were presented with emia, anorexia, apathy, melena and subcutaneous hemorrhages. Histologically, the animals showed panmyelophthisis and cystic endometrial hyperplasia.

Tierärztl. Prax. 15, 333-335 (1987).
In *GERM*, *su. ENGL.*
2 fig., 14 references.

Authors summary

Pathological changes in the kidneys of mink with fatty liver disease

V.V. Fedorov

Mink on a farm in the Leningrad region were fed a diet rich in fat (41%) and low in carbohydrate (17%). The meat and fish used had undergone fat oxidation during storage. Portions of kidney and liver were obtained from 4 dead and 16 killed mink out of 80 which died or had to be killed at 5-19 months of age. It was concluded that disease was a hepato-renal syndrome, originating from acute, catarrhal gastroenteritis.

Veterinariya, Moscow, USSR: (No. 8): 59-61, 1987.
In *RUSS.*
2 fig., 8 references.

CAB-abstract

Brain and spinal cord lesions in encephalitozoonosis in the blue fox

Inge Bjerkås, and Jahn M. Nesland

The central nervous system lesions in encephalitozoonosis were studied in 11 naturally infected blue foxes. Immunohistochemical staining was employed in the acute to subacute stages included granulomatous meningoencephalomyelitis and vasculitis, with arterial lesions similar to polyarteritis nodosa. Chronic stages were dominated by arteriosclerosis, perivascular mononuclear infiltrations and gliosis, with less prominent granulomatous reaction. Parasites were almost constantly

observed in association with active lesions both in vessels and nervous tissue. Parasitophorous vacuoles (PV) occurred in endothelial cells and in the medial layer of arteries. Neurons, including even their processes, were widely parasitized, a fact that may account for the brain being an important target organ. PV also occurred in ependymal cells of the choroid plexus and occasionally in macrophages. A great number of parasites was demonstrated in phagolysosomes of macrophages, a fact that probably reflects a relative resistance to digestion, and may consequently contribute to the development of the prominent granulomatous reaction. It was concluded that the brain lesions, except in chronic stages of mild infections, seem to be pathognomonic for encephalitozoonosis in the blue fox.

Acta vet. scand. 1987, 28, 15-22.
2 tables, 13 fig., 31 references.

Authors summary

Brain and spinal cord lesions in encephalitozoonosis in blue foxes

Inge Bjerkås

The brains and spinal cords from 3 young foxes suffering from acute to subacute encephalitozoonosis, were examined by transmission and scanning electron microscopy. Parasitophorous vacuoles (PV) were demonstrated more frequently in vascular smooth muscular cells than in endothelial cells. The present study also indicated that the parasite has great affinity for neurons, including their processes. In addition, PV occurred in macrophages and probably also in intravascular monocytes. PV were readily differentiated from phagosomes by the bleb formations of the limiting membrane. An accumulation of host cell mitochondria near the PV in areas where developmental stages were attached, was a most striking feature. The inflammatory lesions, mainly of the granulomatous type, were almost constantly associated with the presence of released parasites, both in vascular walls and the nervous tissue. Phagocytosed parasites were probably killed by the lysosomal enzymes,

although the spores were only slowly degraded.

Acta path. microbiol. immunol. scand. Sect. A,
95: 269-279, 1987.
19 fig., 15 references. *Authors summary*

Cystic mucinous hyperplasia in the gallbladder of a ferret

J.F. Reindel, and M.G. Evans

An 8-year-old male ferret had icterus, hepatomegaly and an enlarged gallbladder. Microscopically, the gallbladder had numerous mucinous cysts and papillary hyperplasia of the mucosa, consistent with a diagnosis of cystic mucinous hyperplasia. No previous published reports of this condition in ferrets were found.

J. Comp. Path. 1987 Vol. 97
1 fig., 6 references. *Authors summary*

Resistance of mink to dermatomycoses

A.I. Nikiforov

Infection experiments with *Microsporum canis* (isolated from farmed foxes) on 40 mink aged 1-2 months, and with *Trichopyton mentagrophytes*, *T. verrucosum* and *M. canis* on another 20 one-month-old mink, confirmed field observations of the resistance of mink to ringworm.

Krolikovodstvo i Zverovodstvo: (NO. 4): 23,
1987.
In RUSS. *CAB-abstract*

Testing the protective effect of the vaccine for the control of *Pseudomonas aeruginosa* in mink (*Lutreola vison*)

J. Dousek

Infections by *Pseudomonas aeruginosa* have

caused losses on mink farms in recent years, particularly with a clinical manifestation of haemorrhagic pneumonia. This paper includes the first results of the practical use of the Czechoslovak soluble monovaccine of polyvalent action in the treatment of mink infected by *Pseudomonas aeruginosa*. The action of the vaccine is based on the protective effect of Original Endotoxin Protein (OEP), antigen common to all species of the genus *Pseudomonas*. After due testing, the vaccine was given to mink. Doses of 50, 200 and 500 my-g, and in another series 50 and 200 my-g of the vaccine were tested in subcutaneous administration at 0.2 ml volume in a 7-day interval. No adverse side-effects and reactions were observed in the animals. A protective action was demonstrated, resulting in a higher number of reared mink in comparison with the control groups. After vaccination, titres ranging from 2 to 160 were determined by the indirect haemagglutination method and from 320 to 164000 by the RIA method. In 1984 the vaccine was used for practical treatment on a mink farm with the stock exposed to *Pseudomonas aeruginosa* infection (5551 mink were treated). In the vaccinated group losses amounted to 3.1% whereas in the control group the mortality level was above 17%. Vaccination was demonstrated to have a favourable effect and the vaccine was then preventively used on the same farm in the subsequent year; the treatment of 29350 mink had the required protective effect.

Veterinarni Medicina - UVTIZ (Czechoslovakia); 1986; v. 31(11) p. 695-704.
In CZEC, su. GERM, ENGL, RUSS.
2 tables, 15 references. *Authors summary*

Diarrhoea in young mink and polecats

V.S. Slugin

Field investigations in the Moscow region since 1982 and infection experiments revealed the existence of a viral diarrhoea of newborn mink and polecats, the aetiology of which was not yet known. The virus did not agglutinate porcine erythrocytes. Diarrhoea was often complicated by bacterial infections.

Krolikovodstvo i Zverovodstvo: (NO. 4): 22-23,
1987.
In RUSS.
1 table. *CAB-abstract*

Isolation of an atypical rotavirus causing diarrhea in neonatal ferrets

Alfonso Torres-Medina

A rotavirus was isolated from neonatal ferrets (*Mustela putorius furo*) with diarrhea at a large commercial farm. This virus is classified as an atypical rotavirus, probably belonging to the group C rotaviruses. This classification is based on the lack of the rotavirus group A common antigen and on its distinct dsRNA electropherotype pattern in polyacrylamide gels. The diarrheal disease was reproduced experimentally in neonatal ferrets.

*Laboratory animal science (USA).; 1987; v. 37(2) p. 167-171.
2 tables, 2 fig., 33 references.*

Authors abstract

Lymphangiography in ferrets infected with *Brugia malayi*

*Hines S. A., Williams J.L., Doyle T. J.,
Crandall R. B., Crandall C. A.,
Nayar J. K.*

Adult male ferrets (*Mustela putorius furo*) were infected subcutaneously with a subperiodic strain of *B. malayi*. 3 of 10 ferrets inoculated 2 or more times with 70 infective larvae, presented unremitting oedema for one year and 4 others in this group presented episodes of clinical oedema. Visible oedema in ferrets infected once was rare. Water-soluble lymphangiography in the ferret can be used to study lymphatic filariasis; it shows lymphangiographic signs similar to those in man and in experimentally infected cats and dogs. It is as good, and cheaper, as a laboratory model than cats or dogs and is particularly suitable for studying the development of persistent lymphoedema.

*Lymphology 18 (1985) 173-174
1 fig., 7 references*

CAB - abstract

Campylobacter jejuni infection in ferret: An animal model of human campylobacteriosis

James G. Fox, Joel I. Ackerman, Nancy Taylor, Megan Claps, James C. Murphy

Campylobacter infection in weanling ferrets (*Mustela putorius furo*) was studied as an animal model for enteric campylobacteriosis in persons. The screening of fecal cultures on selective campylobacter media showed that *Campylobacter jejuni/coli* was not present in the normal enteric flora. Intra-gastric feeding of a mixture of cat feed and 2.5×10^8 *jejuni* isolated from ferrets with naturally occurring proliferative colitis was accomplished. All ferrets ($n = 8$) became infected on 3 days after they were inoculated, and at 5 to 7 days, they had bile-tinged, liquid feces with excessive mucus and blood. Ferrets gradually recovered from the diarrhea, and feces were normal 10 to 14 days after inoculation was done. Feces contained *C jejuni* at 14, 23, 28, 39, 46, 60, 91, 101, and 144 days.

In the second experiment, weanling ferrets initially were treated with 10% sodium bicarbonate, and 1×10^{10} *C jejuni* organisms were administered in the cat feed. Diarrhea with fecal leukocytes and occult blood with occasional mucus appeared in almost all of the 21 ferrets from days 4 through 7. *Campylobacter jejuni* was isolated from the blood of 11 ferrets between 3 hours to 14 days after they were inoculated. *Campylobacter jejuni* bactericidal antibodies were present in serum samples at 14 days, with titers of 1:16 to 1:32. Intestinal lesions including cellular infiltrations with mononuclear and polymorphonuclear leukocytes were in the lamina propria of the pyloric mucosa and small intestine of infected and control ferrets. The colon of 3 infected ferrets had small focal infiltrates of neutrophils on the lamina propria; one ferret had perivascular cuffing.

Since the inoculations in the ferret leads to disease mimicking that seen in persons and elicits significant circulating antibody titers to the infecting strain of *C jejuni*, the ferret may prove useful in exploring the feasibility of using vaccines to provide protection against diarrhea

caused by pathogenic strains of *C jejuni*.

Am J Vet Res, Vol 48, No. 1, January 1987; 85-90.

5 tables, 38 references

Authors summary

Morphology and immunoperoxidase studies of intestinal adenomatosis in the blue fox and swine.

Karin Eriksen, Bjørn Bratberg, Thor Landsverk

In a blue fox farm about 300 of 400 weanling pups were affected with diarrhea and prolapse of the rectum. About 40 pups died in an emaciated state after a few days of disease. Eight pups were submitted for examination. Pathological findings were restricted to the cecum, proximal colon and rectum, with occasional extension to the ileum. Affected areas revealed a thickened intestinal wall, a narrowed lumen and a thickened, wrinkled and sometimes ulcerated mucosa. Histologically, the mucosa showed long tortuous crypts outlined by a high pseudostratified epithelium which lacked goblet cells. Epithelial cells revealed increased basophilia, and mitoses were seen along the entire crypt length and in the surface epithelium. Silver impregnation showed curved organisms in the apical cytoplasm of the altered epithelial cells. Penetration of the muscularis mucosa by the altered epithelial cells was frequent. The avidin-biotin-immunoperoxidase complex (ABC) technique revealed positive organisms in the apical cytoplasm of altered epithelial cells, when rabbit antisera against different biotypes and serotypes of *Campylobacter jejuni* and *Campylobacter coli* were used. Antisera against *Campylobacter sputorum* spp. *mucosalis* and *Campylobacter hyointestinalis* were negative.

Part of thesis

From the Department of Pathology, Norwegian College of Veterinary Medicine and the National Veterinary Institute, Oslo, Norway.

19 pp., 16 figs., 47 references

Electron microscopy of intestinal adenomatosis in the blue fox

Karin Eriksen, Thor Landsverk

Scanning electron microscopy of adenomatous intestinal tissue in the blue fox revealed an irregular surface topography of the colon with increased diameter of the crypt openings and prominent ridge formations between crypts. The ileum showed villous atrophy and fusion. Microvilli were short and irregular. Small ulcerations of intestinal mucosa were seen. Freeze-fracture revealed curved intracellular organisms in the altered epithelial cells. Transmission electron microscopy showed features associated with immaturity and high protein synthesis. Basolateral plasmamembrane of altered epithelial cells sometimes extended filamentous surface projections, which occasionally penetrated the basal lamina. The cytoplasm contained numerous polyribosomes, nuclei had many indentations and large and irregular nucleoli. Intracellular bacteria, with morphology corresponding to *Campylobacter* spp. were found in the apical epithelial cytoplasm. No host-cell-derived membrane was seen to surround the bacteria.

Part of thesis

From the Department of Pathology, Norwegian College of Veterinary Medicine, Oslo, Norway.

14 pp., 16 figs., 31 references

The use of immune blotting technique for detection of aleutian disease virus protein in infected mink

Muzahed Uddin Ahmed, Bent Aasted

Aleutian disease of mink was caused by persistent infection which produced a marked polyclonal hypergammaglobulinemia. The immune blotting technique was used to study the pattern of reactivity of the proteins with sera from infected mink and progressive aleutian disease. This report gave an account of immunological reactivity of aleutian disease. This report gave an account of immunological reactivity of aleutian disease virus

proteins electrophoretically separated and transferred to nitrocellulose paper.

Intern. J. Trop. Agri. Vol. 4, No. 1, pp. 91-95 (March 1986)
12 references

Authors abstract

Immunohistological detection of the Aleutian disease virus using monoclonal antibodies and the immunofluorescence method

Greding N.

In this study it was attempted to demonstrate the virus of Aleutian Disease (ADV) of mink in tissues using monoclonal antibodies and the immunofluorescence method. As immunological reagents served monoclonal antibodies directed against the structural proteins p75 and p85 of ADV. The antibodies were applied both on ADV-infected cell cultures (Clone-81) and for the demonstration of AD viral antigen in tissues. The organs liver, spleen, kidney and mesenteric lymph node of 31 mink with spontaneous AD and of three experimentally infected mink were examined. Because of the sensitivity the indirect immunofluorescence method was predominantly applied. To increase the contrast and to suppress unspecific fluorescence tissue sections were counterstained with Eriochrome-Black.

Using the immunofluorescence-method AD viral antigen was predominantly demonstrated in single cells of spleen and lymph node. Cells with pure nuclear fluorescence were very rarely observed. In cell nuclei the fluorescence pattern was granular or coarse and thus resembled that seen in ADV-infected cell cultures. There were also cells with pure cytoplasmic fluorescence. The latter, most likely, rather represented macrophages which have taken up ADV-antigen containing immune complexes than cells with virus propagation. Eriochrome-Black proved to be a suitable dye for counterstaining in immunofluorescence. It suppressed unspecific fluorescence effectively and thus facilitated the localization of viral antigen, especially in lymphatic organs.

In comparison to conventional immunological reagents monoclonal antibodies permit the specific identification of viral antigen in tissues. Thus, the demonstration of the structural proteins p75 and p85 of ADV, especially in cell nuclei, firmly establishes the diagnosis Aleutian disease. Contrary to earlier studies it was shown that AD viral antigen is present in tissues only in minute quantities. This particularly applies to the inapparent form of Aleutian disease.

Authors summary

Thesis: Tierärztliche Hochschule Hannover (Germany, F.R.).
158 pp., 4 tables, 12 figs., 263 references
In GERM., Su. ENGL.

Replication of Aleutian Disease Virus in Mink Lymphocytes infected in vitro

O. -R. Kaaden, L. Haas, M. Löchelt, S. Roth

The kinetics of Aleutian disease virus (ADV) replication in mink lymphocytes was followed by the analysis of virus-specific antigens, infectious virus, and viral DNA. Stimulation with pokeweed mitogen (PWM; 20 µg/ml) increased the synthesis of ADV DNA in cultivated cells of the B-cell fraction. Maximum virus titers ($10^{6.5}$ fluorescence-forming units (FFU)/ml) were achieved after incubating infected cells for 60 h at 32 °C. At this time, 10.4% of the cells in the B-cell-enriched fraction contained ADV-specific antigens and there was an average of 125 ADV genome equivalents per antigen-positive cell. ADV replication also was detected in T-cell-enriched fractions (with up to $10^{5.3}$ FFU/ml, 5.3% of cells were antigen-positive, with 20 ADV genome equivalents per antigen-positive cell), but was 10 times lower compared with ADV replication in the B-cell fraction.

Intervirology 25: 201-209 (1986)
2 tables, 2 figs., 25 references

Authors summary

Prevalence of Aleutian disease antibodies in the Abruzzo region of Italy

R. Lelli; V. Caporale; A. Matteo; N. Ferri

I.E.O.P. was applied to test 6.395 mink sera for from 3 mink ranches in the Abruzzo Region Aleutian Disease Antibody. Owing to the satisfactory results obtained, after discarding positive breeders, the adoption of such a test on ranch population and on the imported breeders seems advisable.

*Atti della Societa Italiana delle Scienza Veterinarie: 39(2): 730-733, 1985.
2 tables, 4 references
In ITAL Su ENGL*

Authors summary

Giardiasis of chinchilla - a case report

W.F. Chang; C.H. Liu; S.J. Du

The report describes giardiasis confirmed by histopathology in a chinchilla farm.

A sporadic, chronic disease has been noticed in a chinchilla colony. The affected chinchillas show clinical signs of anorexia and gauntness. The morbidity is 10%, and mortality is 50%.

Histopathological, large numbers of trophozoites are found in the intestinal lumen and mucosal crypts of the jejunum and ileum. These trophozoites are 9 to 20 μ m in length, have a piriform to ellipsoidal body shape, with two prominent anterior nuclei. *Giardia chinchillae* is identified by the characteristic features of trophozoites in the small intestine. The report of giardiasis in chinchilla was first documented in this country.

*Journal of the Chinese Society of Veterinary Science: 12(2): 149-152, 1986.
3 fig., 14 references
In CHIN Su ENGL*

Authors summary

Caesarian section in the chinchilla

J.E. Prior

Caesarian section by midline laparotomy

was carried out in 3 chinchillas with primary uterine inertia. Treatment with 0.1 ml oxytocin and 0.5 ml 20% calcium solution in 2 cases failed to stimulate uterine contractions. Each chinchilla was premedicated with 0.2 mg atropine sulphate subcutaneously and general anaesthesia was induced and maintained with halothane by mask. After delivery of the fetuses (1 dead fetus in 2 cases and 1 dead and 1 live kit in the third case), the placenta was removed. The uterus was closed with continuous 3 metric chromic cat gut sutures, the linea alba with interrupted 3 metric chromic cat gut sutures and the skin with interrupted 2 metric nylon sutures. Postoperatively oxytetracycline (10 mg) and dexamethasone (0.5 mg) were given subcutaneously. Post operative recovery was rapid but warmth and heat should be provided for the dam and kits.

*Veterinary Record: 119(16): 408, 1986.
1 references*

CAB - abstract

A new natural intermediate host of *E. multilocularis* in France: the muskrat (*Ondatra zibethicus* L.).

M. Boussinesq; S. Bresson; M. Liance; R. Houin

The muskrat is a natural intermediate host of *Echinococcus multilocularis* in the Territoire de Belfort (East France). Its role in a selvatic cycle is discussed. When hunted, it can transmit the parasite to man, through dog infection.

*Ann. Parasitol. Hum. Comp., 1986, 61, No 4. pp. 431-434.
1 fig., 11 references
In FREN Su ENGL*

Authors summary





ABSTRACTS

4th International Scientific Congress in Fur Animal Production

HUDSON'S BAY AUCTION HOUSE

REXDALE, ONTARIO

AUGUST 21-24, 1988

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ACKNOWLEDGEMENTS

The scientific program of the IV INTERNATIONAL SCIENTIFIC CONGRESS IN FUR ANIMAL PRODUCTION is to be held at Hudson's Bay Fur Auction House. Funds and organizing aid were provided by Canada Mink Breeders Association. The Organizing Committee gratefully acknowledges the financial support of Agriculture Canada, the Government of Ontario, the Canada Fox Breeders Association and the US National Board of Fur Farm Organizations.

ABSTRACTS

4TH INTERNATIONAL SCIENTIFIC CONGRESS IN FUR ANIMAL
PRODUCTION

REPRODUCTION ABSTRACTS

►R1 - Designation of the optimal time for mating in nutria (*Myocastor coypus*). S. Jaroz, O. Szeleszcuk and I. Jakubicka. Agricultural University, Department of Fur Animal Husbandry, Al. Mickiewiczn, 30-059, Poland.

Studies of vaginal conductivity and exfoliative cytology of the nutria were carried out to determine the optimal time for mating in Standard and Grenland varieties of the nutria. In the Standard variety, it was determined that the estrous cycle length ranged from 10-49 days with a mean length of 24.9 days and the period of estrus ranged from 1 to 7 days with a mean of 3.95 days. In the Grenland variety, the length of the estrous cycle was observed to be from 14 to 54 days and the duration of estrus was 4.04 days.

►R2 - Electrical resistance and cytology of the vaginal tract in relation to ovarian hormone levels in the silver fox during estrus. L. Jalkanen, M. Valtonen, Finnish Fur Breeders Association, P.O. Box 5, SF-01601 Vantaa; and A. Lukola, Abo Academy, Department of Biochemistry and Pharmacy, SF-20500 Turku, Finland.

The electrical resistance and vaginal cytology were compared with the levels of serum estradiol-17 β and progesterone during estrus in five silver fox females to determine the optimal time for insemination for the purpose of increasing the conception rate with artificial insemination. The blood concentration of estrogens showed a biphasic increase during proestrus. This was reflected one day later in the increased electrical resistance of the vagina. The vixens were inseminated on the first two days of the final decline of vaginal resistance, and all conceived. The increase in blood progesterone was small, and it applies better to blue foxes for determination of ovulation than to silver foxes. Cornified cells in the vaginal smear totalled 50-60% during proestrus and estrus, and cell count was not a useful tool to determine ovulation. Measurement of the electrical resistance of the vaginal tract remains the method of choice for determination of the optimal day for insemination of the silver fox.

►R3 - The role of pregnant mare serum gonadotropin (PMSG) in the practical management of non-breeding female mink. W.B. Wehrenberg, S.M. Bejvan, J. Kurhajec, and R.J. Hutz. Department of Health and Sciences and Department of Biological Sciences, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin and Green Rock Fur Farm, Franksville, Wisconsin.

During the breeding season, there is always a certain percentage of female mink which will not breed. The present study was undertaken to evaluate if exogenous PMSG treatment could be utilized to enhance the reproductive capacity of these non-breeding female mink. Forty-four female ranch mink of the Dark variety were maintained out of doors under standard conditions. The animals were subjected to a period of artificial light from approximately 2300 hours to 0300 hours from early January, 1987 to mid February. Breeding was initiated on March 1. After repeated attempts to breed the animals, it was determined that the likelihood of their breeding was very low as a result of the artificial photoperiod. On March 24, all of the animals were randomly assigned to one of four treatment groups: saline (n=10), 25 International Units (IU) PMSG (n=12), 37.5 IU PMSG (n=11) and 50 IU PMSG (n=11). Significantly different (p<0.05) patterns of breeding success were observed following PMSG treatment. Approximately 90% of the 37.5 and 50 IU PMSG treated females bred while only 30 to 50% of the females in the saline and 25 IU PMSG treated groups bred. More importantly, there was a marked difference in successful pregnancies observed between the saline and PMSG treated animals. None of the saline treated females bore offspring while 40% of the animals treated with PMSG gave birth with litter size averaging between 4 and 5 kits per female. The significance of these results is that the exogenous use of PMSG was successful in increasing the reproductive efficiency of non-breeding female mink. While it is not suggested that PMSG be used as a substitute for proper ranch management and husbandry; it might be considered as an approach for the management of non-breeding female mink.

►R4 - Some effect of altered light regimes on the production of ranch silver type foxes. Sylvestre Muise, Paul Tufts, Tom O'Brien, Malcolm Fuller, and Lery d'Eon, Southwestern Nova Fox Study Group, Universite Sainte-Anne, Pointe-de-l'Eglise, N.S. BOW 1MO.

A survey of the 1987 production of silver type foxes on 6 ranches in Southwestern Nova Scotia indicated the number of cubs sired is reduced ($p < 0.0005$) with both adult and first year sires removed from dark furring sheds to open outside pens as compared to adult sires having been maintained in open outside pens. The observed mean sire production of cubs was: (a) for "undisturbed" adult sires: 4.67, (b) for adult sires transferred during the last 2 weeks in December: 3.12, (c) for first year sires

transferred during the last 2 weeks in December: 3.26, (d) for first year sires transferred during the last 2 weeks in November: 4.58 and (e) for first year sires transferred November 1 or earlier: 5.31. In the same study, the mean cub production of the dams was as follows: (a) for "undisturbed" adult dams: 4.25, (b) for first year dams transferred during the last 2 weeks in December: 3.83, (c) for first year dams transferred during the last 2 weeks in November: 4.83 and (d) for first year dams transferred November 1 or earlier: 5.63.

The production of the dams was increased ($0.025 < p < 0.05$) in the group of first year dams removed from the furring sheds the last 2 weeks in November and those removed November 1 or earlier as compared to the "undisturbed" dams. The data indicated both the sire production and the dam production of cubs is decreased if they are moved from dark furring sheds to outside open pens too late before the breeding season. Another survey of cub production during the 1985 breeding season on 41 ranches in Southwestern Nova Scotia revealed that enclosed conditions ($p < 0.0001$) delayed the breeding season of both adult and the first year dams. The presence of streetlights ($p < 0.05$) delayed the breeding season of the first year dams and the presence of adjacent white structures ($p < 0.0001$) delayed the breeding season of both adult and first year dams.

►R5 - The influence of photoperiodicity on the endocrine function and reproductive maturation in mink. D.V. Klotchkov, Y.S. Benimetsky, R.G. Gulevich, L.S. Onischenko, L.A. Semenova and A.V. Harlamova. Institute of Cytology and Genetics, Siberian Department, Academy of Sciences, 630090, Novosibirsk, USSR.

The first signs of the process of sexual maturation in young mink in November, as indicated by vaginal smears, (oestrus) are connected with the beginning of folliculogenesis and appearance of Graafian follicles (on the average 1.1 per ovary).

Imitation of an earlier beginning of autumn, provided by a change in photoperiodic conditions, induces folliculogenesis. The number of mature follicles in the ovary in this case is 2.6. The increased follicular development in the ovary correlates with the proliferation process in the uterus.

Females with earlier puberty have higher reproductive indices. A connection is present between the process of sexual maturation and changes in the central neuroendocrine system and function of pituitary and thyroid.

►R6 - Effect of flushing on plasma progesterone and plasma estradiol throughout gestation in mink. A.H. Tauson, Fur Animal Division, Department of Animal Nutrition and Management, Swedish University of Agricultural Sciences, S-755 97 Uppsala, Sweden.

Three experiments into the effects of flushing on reproductive performance in standard mink females were conducted with yearlings (Expt. 1), with adults (Expt. 2) and with yearlings and adults (Expt. 3). In Expt. 1, two flushing methods differing in the length of the preceding restriction period were evaluated. In Expts. 2 and 3, two control and two flushing groups were used. One group in each treatment was mated according to the 1+8+1 system and the other was mated according to the 1+1 system starting on March 13. In each experimental group, 5 blood samples were taken for analysis of plasma progesterone and estradiol-17 β . In Expts. 1 and 2, sampling was initiated on February 27 and continued at weekly intervals until April 30. In Expt. 3, sampling was started on March 20 and continued three times per week until April 15. Estradiol-17 β concentrations peaked in the beginning of the sampling period, and the peaks were recorded on March 6 in yearlings and on March 19 in the adults. After that, levels decreased during the period in which progesterone was high. Towards the end of the sampling period estradiol-17 β increased again. In yearlings (Expt. 1) there was a significant effect of flushing on estradiol-17 β . The concentration was higher in the flushed groups. A similar tendency was found in Expt. 3. Plasma progesterone tended to increase faster and have higher peaks in the flushed groups in Expt. 1. In Expt. 2, the increase in progesterone started later in relation to mating in groups mated from March 18 than in females mated 1+8+1, but there was no effect of flushing.

►R7 - The use of artificial photoperiods for advancing the breeding season in foxes. I.J. Christiansen, Department of Animal Reproduction, Royal Veterinary and Agricultural University, Bulowsvej 13, DK-1870 Frederiksberg C, Denmark.

This study, using Blue and Silver male foxes and blue

vixens, was carried out to determine whether the breeding season in foxes could be advanced by submitting the foxes to artificial periods of light and darkness.

The foxes were initially submitted to 5 hours of light and 19 hours of darkness per day. The regimen was changed 120 days later, to 16 hours of light and 8 hours of darkness per day. The result of this light regimen was that spermatogenesis in the silver foxes was advanced by 1 month. In the blue foxes, spermatogenesis was advanced by 2 months, as was oestrus in the blue vixens.

►R8 - Selected blood parameters in the blue fox (*Alopex lagopus*), during pregnancy and puerperium. A. Naveri, College of Veterinary Medicine, P.O. Box 6, SF-00551 Helsinki, Finland; L. Wallenius and R. Ingo, Finnish Fur Breeders Association, P.O. Box 5, SF-01601 Vantaa, Finland.

Blood parameters were studied in normal healthy blue fox vixens during pregnancy and puerperium. Blood samples from 66 mated vixens on four fur farms in Finland were analyzed. Blood sampling was carried out during the second trimester of pregnancy (I), about one week before whelping (II), and one week after whelping (III). The following hematological clinical-chemical analyses were performed: total leukocyte count, erythrocyte count, hemoglobin, hematocrit, alkaline phosphatases, alanine and aspartate aminotransferase, creatinekinase, gamma-glutamyltransferase, glutathioneperoxidase, total protein, albumen, urea and cholesterol.

The number of leukocytes decreased during the sampling period, but remained within the normal ranges. The erythrocyte counts, as well as hemoglobin and hematocrit values, decreased during the latter half of pregnancy. There was a tendency for slightly elevated levels in puerperium - although the reference values for blue foxes were not reached. Several clinical-chemical parameters showed statistically significant changes during pregnancy and puerperium, but the means for all parameters remained within normal ranges; the average litter size, including still-born pups, was 12.4.

►R9 - Evaluation of progesterone assay (ELISA method) for ovulation detection in foxes. P.N.G.M. van BeeK, H.A.P. Urlings and J.C.S.M. Vrensen, Animal Health Service, Molenwijkseweg 48, 5282 SC BOXTEL, The Netherlands.

Reproduction data from 479 blue foxes (*Alopex lagopus*) and 42 silver foxes (*Vulpes vulpes*) were used to evaluate the results of a previous study on practical application of plasma progesterone assay for ovulation detection in foxes. Some 71% of blue foxes inseminated with silver fox semen, solely on the basis of progesterone assay, had litters. Plasma progesterone

concentrations of blue foxes increased almost linearly (10 to > 70 ng/ml) in about five days. For silver foxes this was 3.5 to 4 days. Prediction of optimal insemination dates on the basis of progesterone level is possible. Relating progesterone levels to days antepartum induces high variation in progesterone levels mainly due to natural variation in gestation. Prediction of the beginning of estrus on the basis of visual aspects of vulva is important, and determines the efficiency of blood sampling, i.e. this progesterone method.

►R10 - A study on reproductive physiology in silver fox. K.D. Seo, K. Kwon, K.Y. Han and S.K. Kim², Department of Animal Science, Yonam Junior College of Livestock and Horticulture, Choongnam 333-800, Korea. ¹Department of Animal Science, Ansung Junior College. ²Department of Daejeon Junior College.

The silver fox, a seasonal breeder of great economic importance, has a low reproductive efficiency in Korea. This study was carried out to obtain basic data about the reproductive physiology of silver foxes being raised in Korea. A total of 135 litters in 1987 were used for this study; 83 were raised at Taekwanryung (N: 38.5°, E:128.8°) and 52 were at Yangsan (N: 35.5°, E: 129.0°). The vixens were bred starting on January 27 and continuing until March 25. The mode and mean was March 5 with a standard deviation of 18 days for vixens raised at Taekwanryung, while the breeding of vixens raised at Yangsan began February 16 with a standard deviation of 11 days. The mean date for mating of yearlings was about a fortnight later than that of vixens of two years of age and greater. A linear model was used to measure the effect of raising region, parity and the date of mating on litter size.

The mean litter sizes were 4.78 ± 0.14 kits. The differences in litter size among the 2 raising areas, 2 parities and 4 dates of mating were not significant.

However, the vixens raised in the southern area, having the first parity and mating between March 1 and March 15 had more kits per litter than in the northern area, the 2nd parity and the other dates of mating.

►R11 - Present and future use of artificial insemination in fox breeding in Finland. L. Jalkanen, and U. Joutsenlahti, Finnish Fur Breeders Association, P.O. Box 5, SF-06101 Vantaa.

An intrauterine method for artificial insemination (AI) of dogs and foxes was developed in Norway in 1971. In Finland, it was introduced to fur farm practice in 1983. Semen is collected by digital manipulation and diluted in EDTA or citrate extender. The insemination is performed with 1 ml doses of fresh semen containing 80-100 million live sperm. A plastic speculum is

placed in the vagina to locate and fix the cervix uteri by abdominal palpation. A metal catheter is passed through the speculum and inserted into the uterus for semen deposition.

Since 1983, the use of AI has increased continuously. In 1987, the insemination rate was 23 %, which means 179,275 females. AI was mostly used to crossbreed blue fox (*Alopex lagopus*) females with silver fox (*Vulpes vulpes*) males. This combination was used in 83 % of the inseminations. Breeding between blue foxes accounted for 4 %, between silver foxes for 12 %. The conception rate was 80 % in the blue x silver and blue x blue combinations and 74 % in the silver x silver combination. The main prospect for AI in fox breeding is to improve the breeding efficiency by improving the estimation of the male breeding value.

- R12 - Management practices at Northwood, with emphasis on the first six months of the year. W. Rietveld, Northwood Fur Farms, Cary, Illinois, 60013, USA.

Various management practices are used at Northwood Fur Farms which differ from those on other mink ranches.

Dehydrated feeds are used to control quality and reduce bacterial growth. There is an intensive health care program to prevent outbreaks of disease as a well organized program for reproductive management.

In the mating scheme 1/3 of the mink are bred with the use of hCG, 2/3 of the females are mated four times, two matings are in the first cycle and two are in the second cycle.

After whelping, the females and litters are under intensive care. At three weeks, the litters of six or more are weighed and graded. This is the first step in selection for lactational success.

The combined effect of all these practices is a whelping percent of 97% and 5.7 pelts per bred female in 1987.

- R13 - Improved methods of selection for male reproduction performance. L.M. Heron, Northwood Fur Farms, Cary Illinois 60013 U.S.A.

This study is a continuation of the search for improved methods of selection for males on the basis of reproductive performance.

Testosterone levels, testicle size, and semen evaluation are used in this context. A new method of obtaining samples for semen evaluation has been developed. The sample is taken by making a small puncture in the caudal end of the epididymis, and the fluid that is released is placed on a slide and evaluated. This method is fast, inexpensive and consistent.

- R14 - Hormonal regulation of male mink reproductive system. C. Sundqvist, A. Bartke, L.C. Ellis, Department of Physiology, Southern Illinois University, School of Medicine, Carbondale, IL 62901, USA (CS & AB) and Department of Biology, Utah State University, Logan, UT 84322, USA (LCE).

A critical review of the literature on the hormonal regulation of reproductive function in the male mink indicates that very little data is available. An attempt has been made to identify the major gaps in knowledge to stimulate additional studies. New data are presented on the role of prolactin in regulation of testicular development in the mink. When a long-lasting preparation of Fluphenazine decanoate was used to elevate serum prolactin levels, testicular growth appeared to be accelerated compared with controls. Implants of Bromocriptine, an inhibitor of prolactin release, retarded testicular growth but did not prevent eventual attainment of normal gonadal size. Throughout this study serum testosterone levels were lower in the Bromocriptine-treated animals than in Fluphenazine-treated or control groups.

- R15 - Comparison of two successive whelpings of blue fox, K. Saarenmaa, Agricultural Research Centre, Department of Animal Breeding, 31600 Jokioinen, SF-Finland.

Two successive whelping results of blue fox females were compared utilizing data from the Finnish recording scheme for fur animals. The data set originated from 1985 and 1986 including about 40000 females of different ages. Only females which had offspring in both years were included. Correlation and regression between two whelpings were calculated within the farm. The model used for analysis of covariance included the ages of the female and the male but they had no statistically significant effect.

The correlation was 0.096 and the regression 0.100. The females which succeeded to whelp were compared to the females which failed to whelp in 1985. The frequency of the empty females in 1986 was larger in that group of females which had also failed in 1985.

- R16 - The ethological approach to reproduction problems in fox farming. B.O. Braastad, Department of Animal Science, The Agricultural University of Norway, P.O. Box 25, N-1432 Aas-NLH, Norway.

Applied ethology may prove to be a valuable tool in fur animal science for improving both welfare of the animals and reproduction. A Norwegian ethological project is aimed at reducing the problems of early cub mortality in silver foxes, first by analysing normal and abnormal periparturient maternal behaviour by video-recording, and then by investigating three approaches to avoiding such problems.

Infanticidal vixens were more easily disturbed and more restless than normal ones. Tail biting often preceded fatal bites. New experimental nest boxes were designed in which infanticidal vixens may show a more relaxed behaviour. Another project part deals with development of optimal methods for taming potential breeding vixens during the sensitive period of primary socialization. As the video-analyses indicated differences in the personality between normal vixens and cub biters, we tried to develop a behaviour test which could be used during selection of breeding vixens in order to eliminate potential cub biters. A "Pencil-test" performed on 562 cubs indicated the importance of high self-confidence in the vixens. Cubs showing threat signals by the ears weaned more offspring than other cubs. Farmers who did not include the most dedensive cubs in the breeding stock had better reproduction results than other farmers.

►R17 - Prolactin and melatonin in testicular growth in prepubertal mink. G.B. DiGregorio, A. Gonzalez, and B.D. Murphy, Reproductive Biology Research Unit, University of Saskatchewan, Saskatoon, SK Canada S7N 0X0

Trials were carried out with the aim of determining whether testicular growth or testosterone levels could be altered in prepubertal mink by chronic treatment with exogenous melatonin, antiserum against melatonin, prolactin (PRL) or bromocriptine, a dopamine antagonist which depresses PRL levels. Treatment groups were comprised of six or eight animals and all treatments were initiated on October 1, except for the bromocriptine treatment which began on November 1. A further untreated group served as the control. Blood testosterone and PRL and testicular size were monitored through the initiation of the breeding season in March.

In control animals, circulating levels of testosterone testis lengths increased through the period of the experiment consistent with the achievement of sexual maturity. Treatment with exogenous PRL had the expected effect of elevating the endogenous PRL levels but had no effect on testicular growth and testosterone levels. None of the other agents including bromocriptine altered PRL levels, testosterone levels or affected the growth of the testis.

The results suggest that the effects of melatonin on the advancement of puberty reported in other studies are due to its capacity to synchronize the initiation of puberty rather than any direct effect on the process. Further, PRL appears not to play an important role in the process of puberty in this species.

►R18 - Effects of mating sequence, sire order, and polyandry on 24-hour litter size in Black mink: a three-year study. R.L. Park, D.O. Richards and R.S. Crapo. Departments of Animal Science and Statistics, Brigham Young University, Provo, and RONEX Information Systems, Alpine, Utah, USA

Litter size is a very important reproductive trait in fur-bearers which produce young once a year and which have a short

breeding season. The objectives of this study were to determine the effects of number of matings, number of sires, and sire order on non-conception percentage, 24-hour litter size/conception, and 24-hour litter size/mated/female in Black mink. Records of 4471 mated females from 1985-87 were obtained from a commercial mink breeder whose primary mating frequency objective was three or four matings/female/season. Of these, 4189 records could be assigned to 30 unique mating sequence patterns based on number of matings, sires, and sire order. In this study females were not classified as to age nor day of season when mating occurred. The three-year summary non-conception averages for one, two, three, and four matings/season were 31.1, 14.3, 8.5, and 5.7, respectively with single-sired averages for respective number of matings were 31.1, 13.0, 13.5, and 8.3. Mating frequency had no apparent effect on litter size/conception with 5.37, 5.21, 5.34, and 5.36, respectively. Mating frequency effects on litter size/mated female reflected non-conception percentages with 3.70, 4.53, 4.90, and 5.07, respectively. Sire order did not appear to affect non-conception percentage, litter size/conception, or litter size/mated female. Single-sire litters can be justified with three or four matings/female. Multiple-sire combinations are needed to maximize litter size/mated female.

►R19 - Fur animals production under plastic. M. Hoglund, J. Merilainen and S. Pasanen, University of Joensuu, P.O. Box 111, SF-80101 Joensuu, Finland.

Fur animal farming in large halls is not a new concept. For instance, most Icelandic furs are produced in closed halls. To the south, as in Denmark, mink are farmed increasingly in halls. But in spite of harsh weather conditions, fur animals in Finland are kept almost entirely in open houses.

Our aim is to study fur animals in hall conditions. Also we are interested in the expense of halls constructed from modern materials. A fox hall was built in late 1987 as a part of the experimental fox farm of Articip Ltd., in the neighbourhood of the University of Joensuu. The hall is 67.5 m long, 16 m wide and 7 m high. The frame is made of laminated wood arches spaced 2.5 m apart. Cover material is a special fiber texture, coated on both sides with PVC. Ten rows of cages alternating with five passages, were installed on broken sandy soil. Manure is channelled out along the sides of each service passage, and transferred to a special composting unit. The hall provides room for 230 standard cages (each 2.4 m long).

To bring fresh air into the hall, the lower edge of the cover can be opened (up to 40 sq. m.) for inflow and the gables for outflow. Ventilation can be minimized in winter. Protection from winter wind and extreme cold are great advantages. In addition, birds are eliminated and wastes are isolated from the soil and ground water. Illumination can be controlled to accelerate rut in the spring and the development of winter hair in the autumn. In the hall, food expenses are lower and working conditions are better than outside. Expenses per unit of the traditional open house and the hall are the same.

R20 - Farmers do artificial insemination of foxes themselves. S. Passanen and J. Merilainen, University of Joensuu, P.O. Box 111, SF - 80101, Joensuu, Finland.

At the Third International Congress on Fur Animal Production (France, 1984) a new vaginal insemination method was described for foxes. In Finland, this method was accepted for use by the Ministry of Agriculture and Forestry and approximately 400 fox farmers have been trained to use this method on their farms.

Since 1982 the technique and equipment have remained unchanged: the female is activated by an erective pseudopenis and semen is then transported through the penis into the cervix area. The activated female brings semen immediately to the uterus. The basic idea was to develop an instrument which is easily and safely used by an average farmer. Temperature of semen extender, room and equipment is kept near 20°C. Ten minutes is needed to inseminate one female. Several animals (up to 10) can be inseminated simultaneously. The best farmers easily inseminate 20 females per hour and 600 animals per season with good results.

The vaginal method has been well accepted by farmers for the following reasons: independence of the farmer from AI stations; no risk of diseases from outside their own farm; time wasted in transportation of animals; use of their own males and females (this is also a limitation).

This method already has been used to inseminate around 60,000 females (most Alopex). The average conception rate is over 70% and nearly five pups were produced per inseminated female. The result is almost the same as reported from the use of the catheter method in Finland.

Annually about 100 fox farmers have been trained to use the Articip method in Finland.

▶R21 - Temperature requirements of angora rabbit production. L. Nurminen and M. Harri, Department of Applied Zoology, University of Kuopio, POB 6, SF-70211 Kuopio, Finland.

The angora rabbit is a newcomer to our group of productive animals. To produce 1 kg pre wool, angora rabbits need only about 30% of the digestible energy required by sheep and 90% of that needed by angora goats.

Temperature is one of the most critical environmental factors which influence the performance of angora rabbits. In different stages of wool growth, the angora rabbit needs different environmental temperatures. In optimal conditions, the environmental temperature should decrease when the wool is growing longer, because greater wool length is accompanied by greater difficulties in thermoregulation.

To determine the real temperature demands in different stages of wool growth the angora rabbit is placed on a thermal gradient plate. The plate is made out of a 10 mm thick

aluminium sheet, 125 cm x 140 cm. One side of the plate is warm while the opposite side is cool, producing an almost linear cool-warm temperature gradient. The position of the angora rabbit on the plate is checked by means of seven electro-optical transmitter-receiver pairs and the signals are recorded with a chart event recorder. The plate is placed into a climatic chamber which allows an accurate control of the ambient air temperature and humidity. It is possible to determine the optimal breeding conditions by modulating the environmental temperature and recording the animal's position on the plate.

PATHOLOGY ABSTRACTS

■ - The effect of dietary factors on the development of nursing disease symptoms and performance in lactating mink (Mustela vison). Asbjorn Brandt, National Institute of Animal Science, Fur Bearing Animals, Trollesminde, 48 H Roskildevej, DK-3400 Hilleroed, Denmark.

Lactating mink with large litters were fed 8 different wet feed formulas to determine a possible nursing disease (ND) effect as evaluated by general performance, relevant clinical chemical variables and histo-pathology.

Nursing disease clinical signs in lactating mink were induced by dietary stress, both by restricted feeding and by supplementing excessive fat and protein. The physiological responses were emaciation, changes in acid-base and cation equilibrium towards acidosis and hypokalemia.

A long term effect of metabolic acidosis on intracellular potassium concentration could, in combination with a general negative energy balance, be the prime factors in the photogenesis of ND with pathognomonic vacuolization of the kidney tubular cells.

■ - Measuring Long-Term Stress, L.L. Jeppesen, Institute of Population Biology, Copenhagen University.

Correlations between a number of behavioural and physiological reactions and imposed experimental and naturally occurring stressors in the life of farmed fur animals were examined. Levels of adreno-cortical hormones in the blood showed a shortlived increase in response to a single stress-treatment as well as shortlived and steadily diminishing increases in response to repeated stress-treatments. Along with the great diurnal variation, this pattern of reactivity revealed that the response of the adrenal cortex, as reflected by a single blood sample, is

difficult to use as a practical measure of long term stress. In farmed mink the level of eosinophil leukocytes was a much more reliable reflection of imposed strain. Leukocyte levels were reduced by short term strain and increased by daily repeated strains, i.e. long term strain. Exposure to long term strain also resulted in low levels of aggression and high levels of fear, as measured by reaction to a stick placed in the cage by an experimenter. Crowding of growing kits, pregnancy and weaning at the wrong time were among the aspects of caged life, which were found to increase stress. High levels of stress, as measured by eosinophilic leukocytes, were shown to increase kit mortality and the rate of infection with naturally occurring coccidia.

➤ - Reducing heat stress in mink production units: Basic principles of environmental control. W. Wustenberg and M. Wustenberg, 6230 Main St., Bay City, OR 97107, USA.

During the 1987 production year, it was estimated that 450,000 animals were lost in the U.S.A. due to high environmental temperatures. Basic factors such as air flow, exposure to direct sun, relative humidity, ambient temperature, and animal behaviour are all involved in determining the effects of high environmental temperature on mink. Husbandry considerations to maximize ventilation, minimize animal exposure to direct sunlight, and maximize the use of evaporative cooling will reduce stress. By structuring mink production units with these principles in mind it is possible to reduce loss created by high environmental temperatures.

➤ - Feedborn infections in minks and its control. H.Ch. Loliger, G. Luhrs, and S. Matthes. Division of Hygiene and Diseases. Institute of Poultry and Small Animals, Celle/FR Germany.

Feedborn infections in minks are caused by:

- bacterial, viral or fungal (mycotic) infected slaughter offals, (tuberculosis, Streptococcus sp., Staphylococcus sp., Salmonella sp., Cryptococcus, Aujeszky's disease, encephalopathy)
- secondary contaminated feed (or drinking water) with Pseudomonas sp., Proteus sp., E. coli, Clostridium botulinum and others.

The prophylactic measures to prevent outbreaks of feedborn infections or minimize the risk include:

- general hygienic measures such as feeding unobjectionable, non-infected slaughter offal, hygienic feedstorage and feed preparation
- immunizing programs to prevent botulism, Pseudomonas infections, Aujeszky's disease in cases of latent risks
- prophylactic interval medications by antimicrobial drugs at times of increasing risk and feed infection pressure such as during summer months and at weaning to prevent infections and intoxications by secondary contaminated feed.

➤ - Use of sleeping plates by racoon dogs and foxes. M. Harri, H. Korhonen and J. Momenen, Department of Applied Zoology, University of Kuopio, P.O. Box 6, SF-70211, Kuopio, Finland.

Within the frames of an Internordic project we have tested properties of rest plates and their use by racoon dogs and blue foxes. Only one in four racoon dogs preferred to lie on the plate placed on the floor of the cage. The plates became dirty very soon. Blue foxes were even more messy. If the plates were placed on a shelf, 20 cm or less down from the cage roof, the shelves remained clean. The racoon dogs were not able to use the shelves. On the other hand, blue foxes started to use the shelves. A detailed time mapping revealed that almost all animals used the shelves. Only one in 18 animals used the shelf as a sleeping place. The other animals preferred to sleep on the net floor of the cage. The shelves were used mostly during the working hours of the day. All the animals were usually lying on the shelves in the morning. They knew that food was coming and wanted to make sure that they did not miss this most important happening. The animals also wanted to inspect foreign visitors from the shelves. Wooden shelves were used markedly more than the shelves made with net. The use of the shelves was not dependent on ambient air temperature. All these findings supported the conclusion that the animals did not perceive the shelves as a protection against weather. Rather they used the shelves because they wanted to sit on a higher place.

➤ - Effect of variable cage sizes and lack of admission to nest box on the behaviour, physiology and production of mink kits. S.W. Hansen, National Institute of Animal Science Fur Bearing Animals, Trollesminde, 48 H Roskildevej DK 3400 Hilleroid, Denmark.

228 pastel mink kits were caged male and female in pairs in five types of experiment cages. The cages were of different sizes varying from 1.056 square meters to 0.105 square meters. Some boxes were without a nest box.

The size of cages had no effect on the behaviour of mink kits but the smallest of the cages had an inhibitory effect on the frequency of marking and climbing behaviour and some other types of stereotypic behaviour.

The behavioural results gave no opportunity for evaluation of the effect of cage size on the welfare of mink kits.

The physiological arousal level was significantly higher in the biggest cages which suggested that larger naked areas stressed the animals or that the conventional housing conditions inhibited the "natural" physiological arousal level.

The cage size had no effect on the pelt quality but mink housed without access to nest boxes had poorer pelt quality.

■ - Application of diagnostic enzymology to fur animal breeding. L.K. Kozhevnikova, Institute of Biology, USSR Academy of Sciences, Karelian Branch, 185610, Petrozavodsk, Pushkinskaya, 11, USSR.

Spectrophotometric methods were used to determine the activity of the blood serum enzymes, lactate dehydrogenase (LDH; EC 1.1.1.27), - amylase (EC 3.2.1.1), alanine aminotransferase (ALAT; EC 2.6.1.2), aspartate aminotransferase (ASAT; EC 2.6.1.1) and alkaline phosphatase (AP; EC 3.1.3.1) in healthy and infected mink. An increase of LDH, amylase and ASAT activity with anaemia is associated with a disturbance of energy metabolism, a decrease of LDH and amylase activity with fatty hepatosis and Aleutian disease.

■ - Congestive heart failure juvenile foxes. D.K. Onderka, Alberta Department of Agriculture, Animal Health Division, Veterinary Laboratory, 6909 - 116 Street, Edmonton, Alberta, Canada, T6H 4P2.

A 10-15 % mortality of 5 to 6-month-old foxes on 3 ranches in Western Canada was associated with congestive (dilated) cardiomyopathy. A total of 170 animals died after a brief period of respiratory distress. Cardiac hypertrophy with ventricular dilation together with secondary congestive heart failure characterized by ascites, pulmonary and subcutaneous edema and hepatic centrilobular congestion was seen in all animals. Ultrastructural lesions in the myocardium were typical of those described in other animals with congestive heart failure. The most prominent change was an increase in hypertrophy of mitochondria, interfibrillar edema and myofilament disorganization and lysis. There was no evidence of a Selenium deficiency or toxicity. Two ranches used 35-40 % cereal in their diet. Mortality declined after the cereal content was reduced in favour of slaughterhouse bi-products.

■ - Congestive cardiomyopathy in juvenile ranch foxes (*Vulpes vulpes*) - Report of an outbreak. L.E. Ferns¹ and M.H. Clark². Nova Scotia Agricultural College, P.O. Box 550, Truro, Nova Scotia, Canada, B2N 5Y7, ²Atlantic Veterinary College, University of Prince Edward Island, 550 University Avenue, Charlottetown, P.E.I., Canada, C1A 4P3.

An outbreak of congestive cardiomyopathy occurred in juvenile ranch foxes from June to November 1987. The outbreak involved predominantly male foxes and losses were all from ranches feeding predominantly commercial pelleted feed. One specific brand was fed on most of these affected ranches. There is circumstantial evidence that a taurine deficiency may be involved, but this has not been proven.

■ - An Investigation of the Structure and Function of Hypertrophic Cervical Apocrine Glands in Neonatal Mink. J.A. Yager, D.B. Hunter and S. Champaigne, Department of Pathology, Ontario Veterinary College, University of Guelph Guelph, Ontario, N1G 2W1

This study describes the gross appearance, histological and ultrastructural features of unique hypertrophic apocrine sweat glands in the dorsal neck, inguinal and perianal skin of neonatal mink. Morphometric studies indicate that the cervical gland enlarges during the first two weeks of life, and then regresses over the next three weeks to become vestigial by the time of weaning. Behavioral studies examined the reaction of normal Pastel females to dried secretions collected from the cervical skin and skin surface debris collected from non-glandular dorsal lumbar skin. The females were tested for their reaction to samples collected from their own kits and from unrelated kits. Females approached the four experimental samples with equal frequency indicating that the putative semiochemicals do not act over distance. Following contact, samples impregnated with cervical gland secretions from either its own or a nonspecific kit, elicited significantly greater interest whether measured by total time spent with the sample (P=0.002), % time spent with the sample of the total time out of the nesting box (P=0.003) or number of times the female returned to retrieve the sample (P=0.026). These results are consistent with the hypothesis that these hyperplastic but transitory cervical apocrine glands are associated with maternal recognition in mink.

■ - Ringworm in Swedish farmed and wild fox. L. Englund¹, L. Treiberg² and R. Mattsson². Division of Furbearing Animals, ¹Laboratory of Bacteriology, The National Veterinary Institute, P.O. Box 7073, S-750 07, Uppsala, Sweden.

This paper reviews the literature on ringworm in farmed foxes. It describes the clinical signs, treatment and prevention of ringworm on Swedish fox farms. A study of hair from clinically normal farmed fox and wild fox indicated that ringworm fungus was not present in hair of healthy animals.

■ - The effect of Maternally Derived Antibody on the Immunization of Young Mink Against Mink Virus Enteritis (MVE), J.R. Gorham, C. Parrish, and D. Shen, USDA Agricultural Research Service, Pullman, WA and J. A. Baker, Institute for Animal Health, Cornell University, Ithaca, NY.

Field observations have revealed that female mink that have been previously vaccinated and later exposed to virulent MVE or have received a second MVE vaccination pass antibody levels to their kits that interfered with early vaccination. Female kits were vaccinated with a commercial inactivated vaccine in the

summer of 1985 to provide MVE immunized females. The females were injected with a live virus cell culture of feline panleukopenia virus (a closely related virus to mink virus enteritis) to increase the female's immunity to MVE in January, 1986. The kits from these hyperimmunized breeder female mink were vaccinated with a commercial inactivated MVE vaccine at 6, 7, 9, 11, and 13 weeks of age in the summer of 1986. All kits were challenged with virulent MVE virus approximately one month following vaccination. The results of the trial suggested that kits from breeder female mink that have had their immunity to MVE increased by field virulent MVE challenge or winter time vaccination should be at least 13 weeks of age before they are vaccinated. In a second trial, female kits were vaccinated with a commercial inactivated MVE vaccine in the summer of 1986. These females were not revaccinated or exposed to virulent MVE. Their kits were vaccinated at 3, 4, 5, 6, 7, and 8 weeks of age with an inactivated MVE vaccine in the summer of 1987. The results of MVE challenge revealed that all mink kits 7 weeks of age or older were immunized.

➤ - Evidence that transmissible mink encephalopathy results from feeding infected cattle. R. F. Marsh* and G. R. Hartsough+. *Department of Veterinary Science, University of Wisconsin-Madison, Madison, Wisconsin and +Emba/Great Lakes Ranch Service, Thiensville, Wisconsin.

Epidemiologic investigation of a new incidence of transmissible mink encephalopathy (TME) in Stetsonville, Wisconsin suggests that the disease may have resulted from feeding infected cattle to mink. This observation is supported by the transmission of a TME-like disease to experimentally inoculated cattle, and by the recent report of a new bovine spongiform encephalopathy in England.

➤ - "Wet Mink Kits" - Acute Enteritis in Pre-Weaning Mink, P. Henriksen, National Veterinary Laboratory, 2, Hangoevej, DK-8200, N. Aarhus, Denmark.

Diarrhea causing "wet kits" is a multifactorial disease. Bacteria, viruses, food hygiene and alternations in the composition of female milk are suspected of being important. This paper describes an outbreak of diarrhea and therapeutic and prophylactic measures taken to control the disease.

➤ - A database system for comparison between CEP results, feed hygiene and other health control parameters in mink. T. Mejerland, K. Andersson and A. Widell. Division of Furbearing Animals, The National Veterinary Institute, P.O. Box 7073, S-750 07 Uppsala, Sweden.

A process of database evaluation of the factors which are

associated with Aleutian disease incidence and severity on mink ranches was investigated. The potential for interactions between feed quality, incidence of disease and pelt quality can be investigated by this method.

➤ - Comparative experience of two systems of contraimmuno-electrophoresis (CEP) for the detection of Aleutian Disease. J. Llopis and L. Arredondo, Granjas de aclimatacion, S.A. Madrid, Spain.

In this investigation, two methods of CEP were compared based on the principle that they are different electrophoresis media.

In the experiment, serum was taken from animals on a Spanish farm and the two CEP were run simultaneously with the same samples.

The results obtained with the Cellogel technique showed clear bands that were easy to read. Some of the animals that tested negative with the Agarose method, tested positive with the Cellogel technique.

➤ - The results of ten years eradication of Aleutian Disease in Denmark. M. Hanson, Danish Fur Breeders Association, Langagervej 74, DK 2600 Glostrup.

In Denmark the production of mink has increased since 1976 from 800,000 females to around 3 million in 1988. There are today 4,600 mink farms but in some districts the farms are placed close together in colony pattern. The Danish Fur Breeders Laboratory started the CEP test in 1976 and in 1987 there has been analyzed 4 million blood samples. After ten years eradication, more than 60 percent of the farms are AD free. The specificity of the test is very high, 99.9 percent and the predictive value is 71 percent. On the other hand, it has been difficult to estimate the sensitivity of the test. All totally AD free farms are tested yearly and among 875,000 blood samples of females, the laboratory demonstrated 975 positive reactors or 0.1 percent. There have been relapses in 208 totally AD free farms but only 0.5 percent had large problems where the number of new positive reactors was so high that the farms will have to test several years before they can get free again. In districts which many farms situated close together it has been observed that 300 metres between farms render no security for aerogenic transmission of AD virus but 2,000 metres is adequate to prevent transmission. Farms with two sections for positive and negative reactors respectively have a big risk of spreading of virus in the farm, especially during the season for counting newborn kits and sexsorting.

➡ - The effects of an organophosphorus delayed neurotoxicity in the European ferret. A.M. Stumpf, D. Tanaka, R.J. Aulerich and S.J. Bursian, Departments of Animal Science and Anatomy, Michigan State University, East Lansing MI.

The delayed neurotoxic effects of tri-o-tolyl phosphate (TOTP) was studied in the European ferret (Mustela putorius furo). A single oral or dermal dose of 250, 500 or 1000 mg TOTP/kg body weight was administered to adult male ferrets. Corn oil was the vehicle in the oral test and 95% ethanol served as the vehicle in the dermal test. At 48 hours post-treatment, half the animals in each group were killed by cervical dislocation for assessment of whole-brain neuropathy target esterase (NTE) activity. The remaining five animals per group were observed on a daily basis for a subsequent 54 days. All ferrets dosed dermally with 1000 mg TOTP/kg body weight developed clinical signs characteristic of organophosphorus-induced delayed neurotoxicity (OPIDN) ranging from ataxia to partial paresis. Ferrets administered 250 and 500 mg TOTP /kg body weight via the dermal route displayed variable degrees of hind limb weakness and ataxia. In the oral trial only those animals in the 1000 mg TOTP /kg body weight group showed clinical signs indicative of OPIDN which did not progress beyond mild ataxia. Some axonal degeneration was noted in the dorsolateral part of the lateral funiculus and in the fasciculus gracilis of spinal cords in ferrets receiving dermal doses of 1000 mg TOTP /kg body weight. Whole brain neuropathy target esterase activity was also maximally inhibited (46%) in animals receiving 1000 mg TOTP /kg body weight dermally. These results suggest that the ferret is a susceptible species to OPIDN.

➡ - Prevalence of Pseudomonas aeruginosa in the vagina of empty blue fox (Alopex lagopus) vixens. Bert A.P. Urlings, Ingrid J.R. Visser*, Peter G.H. Bijker and Sandor Kocsis. Department of the Science of Food and Animal Origin, Faculty of Veterinary Medicine, University of Utrecht, P.O. Box 80.175, 3508 TD Utrecht, The Netherlands. *Present address: Department of Veterinary Pathology, Faculty of Veterinary Medicine, University of Utrecht, P.O. Box 80.158, 3508 TD Utrecht, The Netherlands.

The prevalence of Pseudomonas aeruginosa in feed, water, faeces and vagina of the blue fox was assessed. This bacteria was detected in all feed samples (with and without antibiotics) for foxes. In the feces of foxes the prevalence of P. aeruginosa increased when antibiotics (oxytetracycline and furazolidon) were added to the feed (28% versus 42%). Between one and two weeks after the last mating 34% of the vixens fed antibiotics with the feed and 14% of the vixens fed without antibiotics had intra-vaginal Pseudomonas aeruginosa. In the empty blue fox vixens, P.

aeruginosa could be detected in more than 50% of the cases. The prevalence was increased in the artificially inseminated vixens. In the drinking water of the foxes, the bacteria could not be detected.

These results and literature data demonstrate that infection of the blue fox with P. aeruginosa is triggered by the intake of contaminated feed or water. Consequently contaminated faeces may infect the external genitalia of the blue fox. Mucosal lesions of the vagina caused by heat detection can facilitate the growth of P. aeruginosa; this may be an explanation of the increased morbidity of P. aeruginosa endometritis in artificially inseminated blue foxes.

Good manufacturing practices to avoid growth of P. aeruginosa in fox feed and also to avoid contamination of drinking water is the best way to prevent this P. aeruginosa endometritis in the blue fox.

➡ - Criteria of animal welfare in domesticated fur bearing animals - Suggestions for recommendations on animal welfare appropriate farming. H.Ch. Loliger. Division of Hygiene and Diseases, Institute of Poultry and Small Animals, Celle/FR Germany.

The farming of fur bearing animals is criticized by animal welfare organizations world wide. Criticism includes the cage housing systems and the all mash feeding, that in the opinion of the welfare association have an adverse effect on the health and the natural behaviour and therefore, the welfare of the engaged animals.

To exclude unqualified criticism and also to prevent adverse welfare situations in the fur animal industry, general binding recommendations (and regulations) for farm conditions and objective criteria for evaluation of the welfare and health situation in the fur animals should be developed. Appropriate farming conditions include proper housing and feeding systems, the attendance of the animals and measures for health assessment and disease prevention.

The criteria of evaluation of the health situation should be measurable and objective, as follows:

1. reproduction rate (average) of females,
2. raising rate and number of losses per litter until weaning,
3. body weight at weaning and pelting (random sample test),
4. fur quality (average),
5. number and causes of losses between weaning and pelting: by accidents, by infections and intoxications, by feed disorders and others.

The health situation of the farmed animals is the most sensitive indicator for animals welfare to evaluate appropriate housing, feeding and attending.

★ - Influence of different zinc intake on zinc absorption, retention and turnover in mink. H. Mejborn, National Institute of Animal Science, Fur Bearing Animals, Trollesminde, 48 H Roskildevej, DK-3400 Hilleroed, Denmark.

The effect of zinc content in the diet on zinc metabolism was investigated. In balance studies with growing and adult male mink it was shown that the zinc balance (mg) increased with increasing zinc intake and that most zinc was excreted in the feces. In percent of intake, the zinc excretion in feces was rather constant, 60% in adult and 80% in growing mink receiving normal to high amounts of zinc (40-340 mg/kg dry matter) while it was lower in animals fed less than 25 mg zinc/kg dry matter. Excretion of zinc in uring increased with increasing zinc intake. In percent of zinc intake the excretion was highest (up to 24 %) in animals fed diets with low zinc concentrations and lower (2-9 %) in animals fed normal and high amounts of zinc.

The endogenous zinc excretion to the digestibility tract was measured using the radioisotope dilution technique adapted to mink. At very low zinc intake (<12 mg/kg dry matter), the endogenous zinc excretion was low, but it accounted for an important part (57 %) of the total amount of fecal zinc. At very high zinc intake (500 mg/kg dry matter) the absolute amount of endogenous zinc was higher but in percent of total fecal zinc excretion it was a less important part (7 %).

There was no significant difference between mink receiving diets with 10, 130 and 555 mg zinc/kg dry matter in the turnover of zinc in the plasma pool. Turnover rate was about 15 % of the pool per minute. The plasma zinc pool and its flux rate seemed to be a little higher in animals fed 555 mg zinc/kg dry matter compared to animals fed 10 and 130 mg zinc/kg dry matter, but these differences were not statistically significant.

★ - Effects of cysteine on iron absorption in mink. A. Skrede, Department of Animal Science, The Agricultural University of Norway, P.O. Box 25, N-1432 Aas-NLH, Norway.

Iron absorption in mink was studied using the ⁵⁹Fe-labelling technique. The absorption of radioiron was measured by counting in a sodium iodide "whole body" type gamma counter 4-6 days after the administration of doses of ⁵⁹Fe in the diet. The basal diet contained high levels of raw marine fish species, which earlier have been shown to inhibit iron absorption in mink.

Dietary cysteine, given as L-cysteine monohydrochloride monohydrate in amounts exceeding 0.1 % of the diet, enhanced the absorption of iron from ferrous fumarate and ferrous carbonate. When 0.6 % cysteine was given there was a 15-fold increase in

iron absorption from ferrous fumarate. The effect of cysteine was dependent on the iron source, since there was little response when ferrous sulphate was applied. The studies indicated that cysteine had no effect on iron absorption. The cysteine-containing tripeptide glutathione, on the other hand, may improve iron absorption in mink.

★ Sardina pilchardus Walb. in mink nutrition. M.A. Angela Fini, R. Romiti and C. Bruscolini. Istituto di Zoocolture, Facoltà di Agraria, 2^a Cattedra Anatomia e Nutrizione Animale, Facoltà di Veterinaria, Università di Bologna, Italia.

The trial took place between May and September 1987. One hundred standard and wild adult mink were divided into four groups, according to the diet. The control group was fed the conventional mixed farm diet while the experimental groups received the same feed with the cod partially or totally replaced (30, 15 and 6% respectively) by fresh sardines.

All the groups showed weight loss, as frequently occurs with the high summer temperatures, but the control group showed the biggest loss in weight for both sexes, with statistically significant differences when compared to the treated groups.

No mortality occurred in the three treated groups, whereas one of the females of the control group died.

The evaluation of fur quality was made at slaughter, at the end of November. The results obtained for the experimental groups were as good as those of the controls with respect to density, brightness and colour purity of fur.

The replacement of cod by sardine had no negative effects on the parameters studied, despite the clearly higher thiaminase content of the sardine and was economically more advantageous, significantly reducing feed costs.

★ - Urinary orotic acid excretion of the mink as an assay of feedstuff arginine availability. W.L. Leoschke and L. Zawadzke, L. Valparaiso University and National Research Ranch, Oshkosh, Wisconsin, Milk Specialties Company.

Dehydrated protein feedstuffs such as fishmeals, bloodmeals and poultrymeals available to the world fur animal industry vary widely in the biological value of the proteins present in these products. In the dehydration of any feed product, the Maillard reaction may destroy lysine and bind arginine in a structure unavailable to the digestive processes of the mink. Experimental data presented in this report supports the concept of a chemical assay of the biological value of dehydrated protein resources involving an inverse relationship between arginine content and/or availability in fish meals and the urinary orotate excretion of mink fed these protein resources. It is noted that higher protein diets, 7.8 grams of digestible protein/100 Calories, provided a higher orotate excretion, 350 ± 250 ug/day, than a lower protein

diet, 6.2 grams of digestible protein/100 Calories, 180 ± 92 ug/day. Mink fed a diet containing a low moisture white-fishmeal, 3.4 % H₂O, with a potential for higher arginine bonding via the Maillard reaction, excreted more orotate, $1,000 \pm 260$ ug/day, than mink fed a diet containing a higher moisture white-fishmeal, 9.6 % H₂O, 690 ± 110 ug/day. However, no significant difference was noted with mink fed diets, containing a low moisture poultrymeal, 3.5 % H₂O, $1,300 \pm 750$ ug/day, or a high moisture poultrymeal, 9.8 % H₂O, $1,200 \pm 390$ ug/day.

★ - Biogenic amines in relation to quality of mink feed. B.O. Eggum, N.E. Hansen, P. Moller and H. Sorensen, Chemistry Department, Royal Veterinary and Atricultural University, 40, Thorvaldsensvej, DK-1871 Frederiksberg C, Denmark.

The accumulation of biogenic amines in products of animal or plant origin in diets used for fur animals has been studied. In this context, techniques most often used for quantitative determination of non-protein bound amino acids, amines and total volatile nitrogen (TVN) have been investigated. Systematic investigations of the degradation of high molecular weight (HMW) compounds and the metabolism of low molecular weight (LMW) compounds were performed using a load test. Appreciable differences were found between mink feed of various origins with respect to formation of LMW compounds, including amino acids, from HMW compounds. Further metabolism of the amino acids and other LMW compounds varied with the temperature used in the load test. ¹⁴C-labelled precursors have been used in load test investigations to reveal the relative importance of the metabolism of different protein amino acids formed from protein hydrolysis. These trials gave important information on the degree of amino acid transformation into biogenic amines. Amino acid decarboxylases catalyze the direct transformation of amino acids into biogenic amines. The studies now performed have shown that a high number of biogenic amines can be found in mink feed. It is not only the direct decarboxylation products of protein amino acids which are formed; transformation of these primary amines into other biogenic amines also occurs. TVN has only limited value in the quality control of mink feed. More detailed information on putrefaction can be obtained by selection of some of the quantitatively important biogenic amines combined with some few non-protein bound amino acids and quantitative determination of these compounds in relation to each other.

★ - Effect of heat processing on amino acid availability from mink feed: Possible effect on iron absorption. J. Tyopponen, College of Veterinary Medicine, Department of Biochemistry, P.O. Box 6, SF-00551 Helsinki, Finland; I. Polonen and M. Valtonen, Finnish Fur Breeders Association, P.O. Box 5, SF-01601 Vantaa, Finland.

The possible difference in the effect of raw and heat

processed slaughter offal in preventing fish induced anemia in mink was tested. Heating generally reduces the protein quality and lowers the cysteine content. Cysteine is known to promote iron absorption. Therefore, raw slaughter offal should be more effective in preventing experimentally induced anemia. Two groups of male mink kits were fed from weaning to pelting on anemiogenic fish diets containing 15 % either raw (I) or heat processed (II) slaughter offal. The feeds were supplemented with 40 mg iron/kg feed as ferripolymaltose ferrosulfate.

In both groups on anemiogenic fish feed, the weight gain and hematological values were significantly lower as compared to the control group. These parameters were slightly lower in the group fed heat processed feed. At pelting the iron stores were very low in both experimental groups. Heat processing reduced significantly the protein quality, as judged by the difference in plasma amino acid content between the two experimental groups. The plasma content of cysteine was 21 ± 6 umol/l in the group fed raw and 10 ± 4 umol/l in the group fed heat processed offal. The difference was highly significant ($p < 0.001$). However, the difference in the effect of the two feeds on iron absorption remained small because of the unexpected strong anemiogenic effect of the experimental feed and the too low amount of slaughter offal.

★ - Short time preservation of minkfeed by 0.1% sodium metabisulfite and low temperature. Bert A.P. Urlings, Peter G.H. Bijker and Cees H.C. Van Oostrom. Department of the Science of Food of Animal Origin, Faculty of Veterinary Medicine, University of Utrecht. P.O. Box 80.175, 3508 TD Utrecht, The Netherlands.

The bacteriological safety, keeping quality and pH during 48 hours storage of minkfeed, mainly produced from fresh broiler offal, at 5 and 25° C, without (M) and with the addition of 0.1% sodium metabisulfate (M+) was assessed.

In feed stored at 25° C the pH of M dropped during the first 24 hours from 6.1 to 4.9 and of M+ from 6.1 to 5.8. From 24 to 48 hours storage in M an increase of the pH to 5.3 was observed. Concurrent with the decrease in pH there was an increase in the mesophilic aerobic colony counts and lactobacilli. The increase in M was faster than in M+. 0.1% sodiummetabisulfite showed slight bacteriostatic activity. However, the number of sulfite reducing clostridia and pseudomonas aeruginosa in M+ were higher than in M. In M these bacteria decreased after 48 hours to less than 1.8 and 2.8 logN cfu per gram respectively.

In minkfeed stored at 5° C the pH of M and M+ remained stable at about 6 during 48 hours of storage. Almost no bacterial growth was observed.

In summary, chilling to a temperature below 5° C is a good way for short time preservation of minkfeed, when bacteriological parameters are concerned. Addition of 0.1% sodium metabisulfite to the minkfeed stored at 5° C, had no advantage from a bacteriological point of view. Preservation with 0.1% sodiummetabisulfite at a storage temperature of 25° C had a

reverse effect on the bacteriological safety. To enhance bactericidal activity during short time preservation addition of organic acids of suggested but more research about this is needed. Further investigation should also be done on breakdown products of proteins and amino acids, like ammonia and biogenic amines.

① - Properties of mink trypsinogen/trypsin and chymotrypsinogen/chymotrypsin compared with corresponding properties of these enzymes from other animals. J. Elnif, N.E. Hansen, K. Mortensen and H. Sorensen, Royal Veterinary and Agricultural University, 40 Thorvaldsensvej, DK-1871 Frederiksberg C, Denmark.

Pancreatic trypsin (EC 3.4.21.4) and chymotrypsin (EC 3.4.21.1) from mink, rats and pigs have been compared with respect to chemical-biochemical properties and sensitivity toward various inhibitors. Trypsinogen and chymotrypsinogen extracted from pancreas of mink, rats and pigs, respectively, were transformed into the active proteinases. These enzymes were isolated and separated by the use of efficient, fast and simple techniques based on fast polymer liquid chromatography (FLPC). Elution profiles obtained with suitable columns revealed appreciable differences between the proteinases from different animals and the occurrence of multiple forms of mink pancreatic trypsin. Activation of pancreatic chymotrypsinogens and pancreatic trypsinogens required two to three days at room temperature for maximum enzyme activity. Quantitation of both types of endoproteinases were performed on the basis of the maximum activity obtained. The activity of the enzymes produced showed appreciable but systematic and characteristic variation during the development of mink kits; trypsin activity from 20 (at birth) to 70 units/mg pancreas at week twelve, and chymotrypsin activity from 0 (at birth) to 2 units/mg pancreas at week twelve. Trypsin and chymotrypsin isolated from pancreas of mink, pigs and rats were used for inhibitor studies. The inhibitor activity was measured as units of enzyme inhibited for both chymotrypsin inhibitors (ChI) and trypsin inhibitors (TI) isolated from different feed sources. The results obtained demonstrated that inhibitory patterns determined with enzymes from one animal species cannot necessarily be extrapolated to another. Furthermore, the results reveal that especially with young mink serious problems can be expected from too high concentrations of ChI and TI in the diets owing to the limited amount or activity of pancreatic trypsinogen/trypsin and chymotrypsinogen/chymotrypsin present in kits.

② - Production of digestive enzymes in mink kits. J. Elnif, N.E. Hansen, K. Mortensen and H. Sorensen, Royal Veterinary and Agricultural University, 40, Thorvaldsensvej, DK-1871 C, Denmark.

The development of mink kits, their digestive tract, stomach

and intestine, was measured during the first period of their life; from week 0 to week 11. This was part of investigations directed at a study of the development of the pancreas and some selected hydrolase enzymes and/or zymogens produced in the pancreas. The growth rate for the pancreas and stomach was about three times greater than found for the whole body during the first weeks of life for the mink kits. The length of the intestine was nearly constant 4.1 ± 0.22 times the length of the animals during the life period 0 to 11th week.

A simple method, with an assay based on the decrease in the intensity of the starch-iodine reaction, was developed for determination of the pancreas α -amylase (1,4- α -D-glucan glucanohydrolyse, EC 3.2.1.1) activity. No detectable pancreas amylase activity was found in new born mink kits. A high pancreas amylase activity was found in the next four weeks and during the following six weeks this enzyme activity declined towards the levels found in adult pancreas.

Pancreatic trypsinogen-trypsin (EC 3.4.21.4) activity was relatively high in the first week of life for the mink, then falling to about one third this level for the next two weeks. In the following period a linear rise in this enzyme activity occurred reaching a pancreatic trypsinogen-trypsin activity at week eleven of about two thirds of the level for adults. Chymotrypsinogen-chymotrypsin (EC 3.4.21.1) activity was not detectable in pancreas of new-born mink. In the next couple of weeks this pancreatic endopeptidase activity was still low. A slow rise in activity occurred up to week ten. During week eleven and twelve an appreciable increase in pancreatic chymotrypsin activity was found.

③ - Temperature preference of drinking water in mink. S. Miller, National Institute of Animal Science, Fur Bearing Animals, Trollesminde, 48 H Roskildevej, DK-3400 Hilleroed, Denmark.

The water temperature preference of adult male pastel mink was studied. Two different methods for measuring the preference were compared. In both methods the animals were offered drinking water of 6°C and 40°C, respectively. Food intake was not restricted.

Drinking activity and behavior were registered for 24 hours with infrared video equipment, for each method and temperature.

In one method where water temperature was changed, the animals showed a clear preference for the warmer water, while the waste of water was significantly higher when cold water was offered. When both temperatures were available simultaneously, the difference in waste of water was confirmed.

The observations of drinking activity showed that when both temperatures were offered, the amount of warm water ingested in each drinking session was twice as long as that of cold water. The other method showed no differences. Both methods showed a much higher waste of cold than of warm water per drinking session.

A similar experiment with pastel mink kits after weaning showed no difference in water consumption between water temperatures of 17° and 40°C.

Some physiological explanations for the preference for a certain drinking water temperature are given.

It is concluded that adult pastel mink males as well as kits accept drinking water temperatures up to 40°C. The waste of cold water is higher than that of warm water in adult males and in kits from 11 weeks of age.

★ - Digestibility of different fats and fatty acids in blue fox (*Alopex lagopus*). K. Rouvinen¹, T. Kiiskinen¹, and J. Makela², ¹Department of Animal Husbandry, Agricultural Research Center, SF-31600 Jokioinen, Finland; ²Finnish Fur Breeders Association, P.O. Box 5, SF-01601, Vantaa, Finland.

Two digestibility experiments with blue foxes were performed. In experiment A, the influence of level and type of fat on the digestibilities of fat and different fatty acids were studied. The fats used were beef tallow, capelin oil and rapeseed oil and the supplemental fat levels were 15 and 25 % in the dry matter of feed. In experiment B, the possible synergistic effect of saturated and polyunsaturated fatty acids in an animal fat-plant fat mixture was clarified. In this study the fats were beef tallow, soybean oil and their mixture (50:50) and the supplemental fat level was 20 %. The digestibilities were determined by AIA-indicator, method 0.5 % silicate (Celite 545) in feed as an indicator. The animals in experiment A were adult breeding animals, two males and 2-6 females per group. In experiment B, male-female pairs were used, 5 pairs per group. The animals were 5 months old. The apparent digestibilities of beef tallow, capelin oil and rapeseed oil on 15 % supplemental fat were 88, 96 and 95 %, respectively. The corresponding values at the 25% level were 87, 97 and 96%. The digestibilities of beef tallow, soybean oil and their mixture (50:50) were 93, 96 and 95%, respectively. In experiment A, the increase in fat level had no influence on the digestibilities of fat or of any other

nutrients although it significantly increased the metabolizable energy (ME) and its percentage of the dietary gross energy (GE). There was also a type affect x level interaction on the ME of the diet. In experiment B a compensatory increase in the digestibility of protein and carbohydrates could be seen in the tallow containing groups compared to the soybean oil group. The ME content in the fat mixture group was higher than in the oil group and also the GE utilization was higher than in the tallow group. No synergistic effect between tallow and soybean oil could be found.

★ - Regulation of energy balance in farmed canids. H. Korhonen and M. Harri, Department of Applied Zoology, University of Kuopio, P.O. Box 6, SF-70211 Kuopio 21, Finland.

Seasonal changes in body weight, feed intake and locomotor activity were studied in adult, farmed blue foxes (*Alopex lagopus*) and raccoon dogs (*Nyctereutes procyonoides*) in an attempt to evaluate seasonal regulation of their body energy reserves. All animals used were farmborn, and reared singly according to conventional farming procedures. Feed consumption and energy intake of the animals were carefully controlled year-round by accurate energy balance measurements. Locomotor activity was estimated by monitoring the time animals spent moving in 24 hours.

The results showed that both species exhibited marked seasonal changes in body weight, body energy content, energy intake and locomotor activity. Seasonal changes in food efficiency were also evident. The results emphasize the important role of both energy intake and energy expenditure in the regulation process. The conclusion was that regulation of the seasonal energy balance is a dynamic process characterized by interactions between coexisting factors.

★ - Beneficial effect of an enzymatic feed additive in mink feeding. L. Ahola, M. Harri and H. Korhonen, Department of Applied Zoology, University of Kuopio, P.O. Box 6, SF-70211 Kuopio 21, Finland.

Diets for farmbred fur-bearing carnivores are based on animal ingredients. These are palatable to these animals, highly digestible and contain high levels of protein. Animal ingredients also have many problems. They are expensive and susceptible to enzymatic and microbiological decomposition. Different enzymatic and bacterial preparations have been used to repel these problems with variable results. In this study we tested the effect of an enzymatic feed additive on the productivity of the scanbrown mink. A dry enzymatic feed additive was mixed into a standard feed to give a 0.7 % mixture. The hygienic quality of the feed was good. In our experiments the feed additive did not influence the digestibility of the diet. However, the feed additive apparently influenced the bacterial flora of the gut, which was seen in the lower total bacterial and lactic acid counts in the feces. The feed additive significantly influenced growth performance of the male mink. While the mean body weight of the control males was 2445 g the males fed on the feed additive diet weighed 2674 g ($p < 0.01$). The mean skin lengths for control and feed additive treated males were 73.6 and 75.9 cm ($p < 0.05$), respectively. Females did not respond to feed additive diet; their final body weight was the same in the control and feed additive groups. The total amount of feed consumed by an average animal (mean of females and males) from July 24 to December 10

was 34 kg/animal and did not differ between animals of control and feed additive groups. The higher body weights and skin lengths of the feed additive treated males were not achieved at the cost of deteriorated fur quality as all furs were of high quality (8.0 to 8.3 on a 10-point scale, where 1 = poorest and 10 = best). In our study the feed additive gave very promising results. Further field studies will reveal its economic significance in mink feeding.

★ - Antioxidant trace elements and enzymes in mink. J. Työppönen, College of Veterinary Medicine, Department of Biochemistry, P.O. Box 6, SF-001551 Helsinki Finland, E. Smets, Finnish Fur Breeders Association, P.O. Box 5, SF-65101 Vaasa, Finland, and I. Polonen, Finnish Fur Breeders Association, P.O. Box 5, SF-01601 Vantaa, Finland.

The contents of the most important antioxidative trace elements (Fe, Zn, Cu, Mn and Se) were measured in mink feed and tissues from weaning to pelting. The minks were fed a basal ranch diet or a diet containing high amounts of marine fish. The trace element content in the two diets was similar and approximately adequate according to previous recommendations except for iron content which was too low. The tissue content of zinc, copper manganese and selenium remained relatively unchanged or increased during the feeding period, indicating an adequate level in the feed. No significant differences in tissue trace element content between the two groups were noticed except for iron. In nematogenic fish feed, iron was more poorly absorbed.

The antioxidative trace elements exert their biochemical action in the body through different enzyme activities. CuZn superoxide dismutase (SOD) and Mn SOD activities in mink plasma were slightly higher than previously observed in the rat. In erythrocytes (RBC), the CuZn SOD activity and that of Se and Non-Se glutathione peroxidase (GSH-Px) were relatively high. In plasma, the activity of Se GSH-PX was considerably higher than previously measured in rats. The plasma content of Cu was highly significantly correlated with plasma ceruloplasmin activity.

★ - Norseamink and Norse-Lt - two special qualities of fish meal for fur animal. T. Hjertnes, K.E. Gulbrandsen, H. Mundheim, and J. Opstvedt, Norwegian Herring Oil and Meal Industry Research Institute, N-5033 Fyllingsdalen - Bergen, Norway.

Fish meal made from absolutely fresh fish (i.e. 22 mg TVN (total volatile nitrogen) per 100 g of fish) had higher true protein digestibility for adult male mink than fish meal made from stale fish (i.e. 100 mg TVN per 100 g fish) when the drying temperature was low (60°C) while the freshness of the fish had no effect when the drying temperature was high (140°C). True protein digestibility decreased with increasing drying temperature, i.e. 60, 100 and 140°C. Drying time had no effect on protein digestibility when the drying temperature was 60 and 100°C but increasing drying time from less than 5 to 30 and 60

minutes significantly reduced true protein digestibility when the drying temperature was 140°C.

Commercial samples of Norseamink and Norse-LT 94 fish meal tested in digestibility trials with mink over the years 1983 to 1987 had average true protein digestibility of 87.2% and 92.1% respectively.

Commercial samples of Norseamink and Norse-LT 94 were tested in growth trials with male mink kits. In one experiment Norse-LT 94 increased growth rate significantly ($P < 0.005$) by 19%, in other experiments by 6%. The second experiment used a sample of Norseamink which had an exceptionally high protein quality as judged from its protein digestibility.

★ - Effects of diet on water turnover in mink. M. Neil, Fur Animal Division, Department of Animal Nutrition and Management, Swedish University of Agricultural Sciences, S-755 97 Uppsala, Sweden.

In short-term experiments with yearling standard mink males in metabolism cages, effects of diets on intake and losses of water were evaluated. Consumption of feed and drinking water and weight of urine and faeces were recorded daily. Diets were analyzed for dry matter (DM), ash, crude protein and crude fat. Feces were analysed as the diets or for DM and ash only. Urine was analysed for DM and osmolality. The diets compared were: wet diets and dry diets, fed dry or soaked; a wet diet and the same diet fed soaked after freeze-drying or heat-drying; a wet diet with cereals boiled or extruded; a wet diet with or without water absorbants added; wet diets with varied levels of protein, fat and carbohydrate; a wet diet with varied water content. Faecal water output increased when feeding diets with water absorbants and dry diets - soaked or not, but was not affected by the freeze-dried diet. Daily intake of drinking water increased when dry diets were fed, and when faecal water losses were increased by the use of a powerful water absorbant or the heat-dried diet. Urinary water output decreased when faecal water increased, and was strongly correlated to water content in wet diets. Urine concentration (osmolality) varied inversely with water content in wet diet, and directly with dietary protein level.

★ - Effect of Various Levels of Dietary Protein and Energy on Nitrogen Retention in Pregnant Fitches. S. Jarosz and B. Barabasz, Department of Fur Animal Husbandry, Agricultural University, in Krakow, Al. Mickiewicza 24/28, 30-059 Krakow, Poland

The aim of the study was to determine protein digestibility and nitrogen retention in pregnant fitches fed diets with various protein and energy levels. During pregnancy (April-30 May) the fitches were fed diets with two levels of protein: 7.0 and 5.5 g of digestible protein/100 kg M.E. Each group was fed a diet with

four energy levels: 110, 130, 140 and 170 kcal. In the group with higher protein levels food intake was 216, 206, 177 and 163 g/animal/day, respectively. These diets provided daily ca. 17.4-20.8 g of digestible protein per animal. Significant differences were found between animals fed diets with a protein level of 7.0 g and those fed diets with protein level of 5.5 g. Protein digestibility in all diets was low, ranging from 70-75%; the lowest one being in group II, period 2, level (170 kcal). Nitrogen balance was positive in all groups; its peak being recorded at 24-27 days of pregnancy (1.04-1.38 g of N retained), with a subsequent gradual decrease, reaching a value of 0.64-1.10 g. At 24-27 days of pregnancy the total retention was 44, 42, 38 and 39% in groups with a higher dietary protein level compared to 39, 39, 44, and 44% for those with a lower protein level. Reproduction indices in females (fertility rate and mean litter size) were slightly higher in groups fed the diet with a low protein level. Our studies indicate that the feeding of fitch females during pregnancy can be based on low-protein diets (5.5 g digestible protein/100 kcal M.E.). The energy value of the diets should be calculated so that the animals being fed "ad libitum" will ingest daily ca. 18-20 g of digestible protein and 230-250 kcal, which meets their requirements as well as those of the developing fetuses.

13 - Digestible nutrients in corn and corn by roduce feeds for silver foxes. D.M. Anderson, Department of Animal Science, Nova Scotia Agricultural College, Truro, N.S. Canada.

Mature male silver foxes were fed diets in mash form containing raw corn (RC), extruded corn (EC), dry heated corn (DHC) (subjected to 90 °C for 24 hours), corn gluten meal (CGM) or corn gluten feed (CGF). A corn basal diet was supplemented with one of the test ingredients added at 10% (CGF or CGM) or 20% (RC, EC or DHC) of the diet. In 5 experimental periods, 2 foxes were assigned at random to each diet. Foxes were fed 2X daily (92g of dry matter/meal). Each test period was 7 days duration. On day 1 of each period the test diets contained 0.5% ferric oxide used as an inert marker to measure rate of passage of digesta. The time from feeding to appearance of red feces was used to define rate of passage. Diets with 0.5% chromic oxide were fed at all other times. Days 1 and 4 were used to adjust the foxes to the new diet with total fecal and urine production collected on days 5, 6, and 7. Samples of feed, feces and urine were frozen immediately after collection and retained at -18°C until analysed for dry matter (DM), chromic oxide, protein (CP) and gross energy (GE). Rate of passage of digesta ($5.9h \pm 1.55$) (mean \pm S.D.) was similar among diets. Corn gluten meal was found to contain 61.9% digestible protein (DP) and 4544 kcal Digestible Energy (DE)/kg DM. Raw corn contained 2638 kcal DE/kg DM and 6.9% DP compared to EC with 3074 kcal DE/kg DM and 7.1% DP. The DE in DHC was 2744 kcal/kg DM with 8.6% DP. Corn gluten feed contained 2641 kcal DE/kg DM and 24.2% DP. Digestibility of energy in corn was affected by heat treatment of RC. The dry

heat applied to corn (DHC) reduced the digestibility of GE to 63.0%. Digestibility of the GE in CGF (60.6%) was significantly poorer than the RC, EC or CGM (89.6%) ($P < .05$). Digestibility of CP in CGM was significantly greater than any other corn product. Extrusion of corn appears to improve the digestibility of GE in corn grain but have minor effect on digestibility of CP.

14 - Performance and digestive enzymatic activity of mink fed different types of cereals. M. Flamand and R.J. Belzile, Department of Zootechnie, Laval University, Quebec, Canada. G1K 7P4.

The purpose of the present study was to establish whether the enzyme activity of the mink pancreatic tissue is affected by changes in the dietary supplies of carbohydrates, the evolution in the digestive tract and the effects on live performance. Three sources of cooked carbohydrate were tested and were compared with a conventional type diet. Body weight gains, pelts length and fur quality were assessed as well as digestibility and nitrogen retention. In the fall, 20 kits per diet were killed at different times post-prandial.

No significant effect were noted for weight gain and pelt length. However, the oat diet had a negative effect on the quality of pelts. Dry matter and proteins digestibilities as well as nitrogen retention were not affected by diets. The pancreatic amylase activity was not changed by diet composition. However, the amylase activity was higher at 0.75 hr post-prandial for all diets in both the proximal and the distal segments, except for the potatoe diet. The pancreatic protease activities in the distal segment were affected by diet.

The results show that mink pancreatic amylase does not seem to be sensitive in variations in the dietary supply of carbohydrates. However, the observations on the pancreatic protease activities seem to show an ability for induction by the respection substrates and the enzyme activities appeared to be maximum at 1.5 post-prandial.

15 - Tolerance of growing-furring mink for metabolisable energy and proteins. M. Flamand and R.J. Belzile, Department of Zootechnie, Laval University, Quebec, Canada G1K 7P4.

This experiment was carried out in order to verify the tolerance levels for metabolisable energy (ME) and proteins of growing-furring mink fed conventional type diets. The diets were tested at 3 energy levels and at 3 protein levels. Body weight gains, pelt lengths and fur quality were assessed and 4 kits per diet were submitted to digestibility and nitrogen retention measurements.

The result showed a linear effect between energy levels and weight gain. Similar results were obtained in respect to pelt length. However, the energy or protein level of the diet had no effect on the fur quality. When the energy level of the diet

increased, the DM and protein digestibilities also increased. There was a positive relationship between the protein level of the diet and nitrogen retention.

These results indicate that, within the fairly wide range of dietary and protein levels used in the present experiment, energy and protein concentrations of the diet may affect live performances of growing-furring mink as well as the lengths of their pelts. However, the levels of these nutrients seem to have little or no effect on the quality of the fur.

FUR GROWTH ABSTRACTS

● - Maturation of pelage - A new aspect of determination. L. Blomstedt, Department of Zoology, Division of Physiology, University of Helsinki, Arkadiankatu 7, SF - 00100 Helsinki.

Improvement of fur quality requires, among other things, a balanced diet and a correctly chosen pelting time. In search of optimal circumstances for fur animal breeding, a histological study of pelage development was carried out in a young female mink. During the growth period of the animal, skin biopsies were taken and sections were cut tangentially to the skin surface. The mean numbers of growing and mature hairs in three types of follicular bundles were counted. The highest mean number of hairs (22.4) was observed in bundles containing only underfur, and the lowest one (14.0) in bundles including a long guard hair. In bundles containing an intermediate guard hair, the number was slightly higher (14.8). Local differences in maturation and shedding of the fur coat were found between bundles containing only underfur hairs and bundles containing one guard hair in addition to underfur hairs. This paper presents a means for judging the fur during the maturation process.

● - The pelage development of young mink (*Mustela vison*). K. Kondo and T. Nishiumi, Faculty of Agriculture, Hokkaido University, N9, W9, Kita-ku, Sapporo, Japan.

This study was carried out in order to make clear the relationship between the hair cycle and the histological parameters of the skin in young mink, i.e. the number of underfur hairs, the ratio of hair activity, the skin thickness, and the follicle length and depth. Male Sapphire minks from new born to 30 weeks of age were used in this experiment. Samples were taken from the mid-dorsal region and were sectioned into 8-12 μ m slices with a freezing microtome and stained with Hematoxylin-Eosin.

From this study the following results were obtained:

1) In the summer coat the number of underfur hairs per follicle group increased until week 10 and remained at 12-14 between weeks 10 and 16. As for the winter coat, the number of underfur hairs dramatically increased just after the beginning of moulting at week 18, and remained at 22-26 afterward.

2) The ratio of activity of underfur of the summer coat was highest (90%) at week 6 and was lowest (0-3%) between weeks 14-16. On the other hand, that of the winter coat was highest (80%) at week 22 and was lowest (0%) between weeks 26-30.

3) The dermis of both the summer and the winter coats was thick in anagen and thin in telogen. But the dermis of the winter coat in telogen was thinner by 0.2 mm than that of the summer coat (0.7 mm as opposed to 0.9 mm).

4) In telogen the hair follicles of both guard hair and underfur decreased to about 1/3 the lengths of those in anagen, did not invade the subcutis and shortened to the sebaceous gland. Guard hair follicles started catagen two weeks earlier than underfur follicles.

● - Nuclear aberrations in hair follicles associated with fur loss problem in Canadian ranch foxes. M.H. Hardy, C.E. Tackaberry and M.T. Goldberg, Department of Biomedical Sciences, Ontario Veterinary College, University of Guelph, Guelph, Ontario, Canada, N1G 2W1

A hair damage problem was reported on many fox ranches in eastern Canada in the autumn of 1985. Some histological sections of the skin showed a very high incidence of nuclear aberrations (NA) in the proliferating cell population of the hair matrix of follicles in skin regions of roughened fur with broken guard hairs. Similar changes in the skin and hair of laboratory animals are produced by environmental toxic agents rather than by nutritional or hormonal imbalances. The present investigation was undertaken to test the hypothesis that this hair damage in foxes was due to an environmental agent. In 1986, skin biopsies were obtained from 20 ranches in the Maritime provinces and from 6 in Ontario. In 1987, 31 and 3 ranches, respectively, were sampled from these regions. Serial sections of all skin samples were stained by the Feulgen-Fast Green method. In both years, the mean NA% was higher in the guard hair follicles of foxes considered to be affected than in foxes with normal pelage. In 1987, the mean values were: 0.54 ± 0.04 SE (range 0.0-8.03) for 45 affected foxes and 0.07 ± 0.02 SE (range 0.00-0.18) for 36 unaffected foxes. Omitting four extremely high values which were derived from severely affected foxes, the remaining 41 animals had a mean of 0.09 ± 0.02 , which was not significantly higher than the mean for the unaffected group. The mitotic index was similar in affected foxes (1.9 ± 0.01) and unaffected foxes (1.8 ± 0.01) in 1987 and also in 1986. From the data collected, no statistically significant correlations have yet been established between fur damage and such factors as diet, water supply and medications. An environmental agent, as yet unidentified, remains a possible cause of severe fur damage. (Supported by the Canada Fox Breeders Association and NSERC.)

● - α -MSH receptors in hair follicles of farm bred mink during fur replacement and in the inguinal pelt priming defect. A.B. Cunningham*, D.V. Sisson and L. C. Ellis. Utah Agricultural Experiment Station and Department of Biology Utah State University, Logan, UT 84322-5305 *Veterinary student, School of Veterinary Medicine, Oregon State University, Corvallis, Oregon 97331

Binding sites for α -MSH were quantified in hip and inguinal skin biopsies from dark mink during the autumnal molt using ^{125}I - α -MSH and autoradiography, coupled with photometric detection of illuminated silver grains. The specificity of α -MSH binding was demonstrated by displacement of ^{125}I - α -MSH by unlabeled α -MSH. Both the medulla and cortex in the basal portions of the hair follicles contained α -MSH receptors that increased in number from August 23 to October 18, 1985. A sharp decline in receptor binding was observed through November 27. A positive correlation was observed for receptor numbers, melanin synthesis and fur replacement. There were no differences in α -MSH receptor numbers among opaline, pastel or dark mink to explain the differences in coat color. The appearance and disappearance of α -MSH binding in both hip and inguinal regions was the same for the three color phases of mink indicating that the number of receptors does not determine coat color but it does initiate melanin synthesis. Receptor number in skin biopsies from mink with pelt priming defects were significantly greater in December than in skin biopsies from dark mink without the defect. These observations indicate that whatever causes the inguinal pelt priming defect also maintains α -MSH receptors in the growing hair follicle when they normally regress. This causes the basal shaft region of the guard hairs to be pigmented when normally they are non-pigmented.

● - Correlation between mineral content and feed and mink hair and the relation of mineral content to fur characteristics. L. Vejgaard Jensen, Biotechnisk Institut, Box 261, DK 6000 kolding, Denmark. O. Lohi, National Institute of Animal Science, Fur Bearing Animals, 48H Roskildevej, DK 3400, Hilleroid, Denmark.

Weekly feed samples collected during the period from mid-August to mid-December from 5 Danish feed kitchens were analyzed for minerals Ca, P, Mg, Na, K, Zn, Fe, Cu, Se, Mn and Sr. Scanblack male pelts were used for analyses of hair. The pelts were collected from 20 farms (4 per each feed kitchen) and chosen to represent 3 quality groups per farm.

Hair samples including underfur and guard hair were analysed for the same minerals of Mn and Sr.

In all feed kitchens the mineral content of feed was within recommended values but big variation between kitchens was discovered. For Ca, Mg, Na and Se a significant positive correlation existed between the level of minerals in feed and hair. High level of K in feed was only slightly reflected in the

hair. P and Cu were unaffected by feed. The amount of Zn in hair did not correspond to the variation of Zn in feed but was negatively correlated to the amount of most other minerals in feed. Interaction between minerals are obvious also in regard to Fe.

There was no significant correlation of the mineral content of hair to hair quality, underfur density or fur defect Metallic. A significant positive correlation was revealed between the colour of the of the hair and minerals Ca, M and P.

● - Melatonin as a furring enhancer: effects on growth rate, feed consumption and re-production in silver fox. M.L. Connor, Department of Animal Science, Nova Scotia Agricultural College, Truro, N.S. Canada B2N 5E2

Two trials were conducted in separate years to investigate the influence of melatonin and low illumination on fur growth, feed consumption, animal size, pelt quality and reproduction in silver fox. In trial 1, 60 silver fox pups were allotted to one of 3 treatments in early July: 12 mg melatonin capsule S.C.; housed under very low light conditions (<45 lux); or housed under normal pelter shed conditions (control). For trial 2, 90 silver fox pups, in 3 equal groups, were assigned to receive either 12 mg, 8 mg or 0 mg of melatonin. Implanted animals grew and furred out more quickly reaching full prime 4-6 weeks before controls. Animals under low light did not significantly outperform the controls. Final size, pelt quality and guard hair length were similar between implanted pups and controls in trial 1. More implanted animals were off color at pelting in trial 2 (4/25, 9/25, and 2/25 for 12 mg, 8 mg and 0 mg respectively). As well, guard hair length was shorter on implanted pelts in trial 2, however, this was not reflected in negative auction results. Feed consumption was similar between treatments to 23 weeks of age (trial 2) but was greater for controls from 23 weeks to pelting. Testicular development was advanced in implanted males, and semen could be collected by mid-December (trial 2) approximately one month before controls. Signs of proestrus were evident by mid-December (trial 2), 3 of 8 vixens were mated during the normal breeding season and whelped litters of 1, 6 and 7 pups respectively. Two other vixens necropsied had luteal tissue and functional mammary glands indicative of ovulation and pseudopregnancy.

● - Morphological classification of the metallic single furring defect in farm-bred mink (*Mustela vison*). K.L. Openshaw¹ and L.C. Ellis², ¹Department of Biology, Bemidji State University, Bemidji, Minnesota, USA, 56601-2699. ²Department of Biology, Utah State University, Logan, Utah, USA 84322-5305.

Gross morphological observations of mink with a metallic single were made and classified depending upon the various types

of single patterns present on the pelt and their causes. Types of single patterns were: streak, chevron, patch or diffuse. Causes of single were: irregular shaped lancets, hooked tips, and "fallen timber". In addition to the above, other guard hairs from areas of single showed significantly higher numbers of hairs with broken tips when compared to the adjacent non-singed areas. These guard hairs exhibited three characteristic types of broken tips: split tip, club tip, and deep furrow; no correlation was found to exist between the specific type of broken hair tips and the patterns of metallic single appearing on the body.

● - Seasonal patterns of cortisol, ACTH, α -MSH, β -endorphin and β -lipotrophin as related to the annual furring cycles in farm-bred mink (*Mustela vison*). R.W. McMullen*, L.C. Ellis*, *Pikes Peak Community College, Colorado Springs CO. 80906, *Utah State University, Logan, UT. 84322.

The purpose of this study was to determine seasonal patterns of five hormones in male mink of three different color phases during a year-long observation period. The following results were obtained:

1. Cortisol and ACTH - Four statistically significant peaks of cortisol were observed. These periods of corticosteroid activity corresponded with similar peaks of plasma ACTH.

2. α -MSH - Concomitant with fall and spring pelage changes (moults), α -MSH secretion was high from September through November and from May through June, but was reduced during the winter months except for a small secondary rise in January and February.

3. β -Endorphin and β -Lipotrophin - Plasma β -END and β -LPH levels were inversely related to each other. β -END was high in September and spring while β -LPH was low during the corresponding period, but high in the winter months. These results indicate that there was differential processing of β -LPH to β -END.

4. Correlation between hormones and the furring cycle results demonstrated a very strong correlation between α -MSH and cortisol secretion and fur growth in both the fall and spring.

α -MSH and β -END levels were low prior to and during the breeding season. β -END appeared to parallel the proposed profile of prolactin secretion across the year except for a September pulse. Parallel secretion of ACTH and β -END also was observed with seasonal differences.

● - Selection for underfur density and guard hair quality in scanblack mink. Outi Lohi, National Institute of Animal Science, Fur Bearing Animals, 48 H Roskildevej, DK 3400 Hilleroed, DENMARK.

A selection trial with scanblack mink was carried out to determine the genetics of the characteristic wool density and guard hair quality. Selection was imposed in three successive

generations in lines: A=selection for dense underfur, B=selection for ideal guard hair, C=control. Each line included 60-70 first year breeding females per generation. Selection was based on live animal grading where density is judged as the thickness of the underfur and guard hair quality as a combined effect of density, length and elasticity of the guard hairs. The index was calculated on the basis of own phenotype and fullsib and halfsib means.

After selection in two generations a clear difference was achieved between the lines. The heritability estimates (h^2) based on the results of the two first generations were:

	Live animal grading		Pelt grading
	1986	1987	1987
Underfur density	0.10	0.28	0.40
Guard hair density	0.26	0.24	0.22

There was a significant phenotypic correlation between the two traits in pelt grading.

● - Interaction of age, strain and date of melatonin administration in the control of winter coat growth in mink. D. Allain and F. Deletang*, I.N.R.A., Unite de neurobiologie de la reproduction, 78350 Jouy en Josas, France, *Sanofi Recherche, Rue du Professeur Blayac, 34082 Montpellier cedex, France.

A total of 1340 mink in 8 different experimental group were given sialastic implants containing 12 mg melatonin in early or late July. The investigation involved adult females and kits of both sexes and two different color strains, Wild and Dark.

Melatonin treated animals fully developed prime winter fur 12 to 14 weeks after the date of administration or 6 to 9 weeks earlier than controls depending upon the age and the strain of mink. When melatonin was given in late July both kit and adult Wild mink developed winter pelage 12 weeks after implantation while Dark kits required an additional week. When melatonin was given in early July the same interval was observed in adult Wild females while both Wild and Dark kits required one week more than those treated in late July. These differences in the response to melatonin treatment according to age are discussed in relation to hair development. All skins were graded by a professional fur assessor. Melatonin treated groups produced larger skins than controls without any modifications in fur quality no matter what the date of implantation.

● - Response of mink to implants of growth hormone releasing factor and A D-ALA Analogue, J.D. Fabricant, Biosyne Corporation, 9431 Roark Road, Suite 110, Houston, TX 77099, J.H. Chalmers, Jr., Department of Genetics, 345 Mulford Hall, University of California, Berkeley, Berkeley, CA 94720., M.W. Bradbury, Mt. Sinai School of Medicine, Annenberg 20-50, 1 Gustave Levy Place, New York, NY 10029, V.A. Lance, Center for Reproduction of Endangered Species, San Diego Zoo, San Diego, CA 92112, F. Stormshack, Department of Animal Science, Oregon State University, Corvallis OR 97331-6702.

Increased growth rates have been observed in a number of laboratory and farm animal species after exposure to growth hormones and growth hormone releasing factors (GRF). This study involved the use to two types of GRF, the amidated N-terminal 29 amino acid residues of the human hormone and a synthetic analogue containing D-alanine (D-ALA). These growth factors were incorporated into an inert, polymeric matrix and implanted into young male and female mink (*Mustela vison*). Body weights, body lengths, fur color and fur quality were compared to control and placebo implanted animals at varying times following implantation. The differences observed between initial (July 25) and October 16 weights were used for body weight analysis. The males and females treated with GRF tended to weigh more than either the controls or those receiving D-ALA. No effects on fur color or quality were detected.

● - Actual reflections on coat quality and aimed pairing of standard minks on fur characteristics. J. Schumacher, VEB Kombinat, Veterinärmpfstoffe, Dessau, DDR.

Genetic analysis of the heritability of fur color and fur quality (density guard hair length etc.) was conducted using a group of 1500 mink. It was found that there were significant correlations between coat color and coat structure and that the heritability of traits such as hair length, coat density, hair quality and general pelt quality ranged from 0.15 to 0.41.

● - Hair growth and skin metabolism in melatonin implanted mink. M. Valtonen and L. Blomstedt, Finnish Fur Breeders Association, P.O. Box 5, SF-01601 Vantaa, Finland. Department of Zoology, Division of Phys. University of Helsinki, Arkadiankatu 7, SF-00100 Helsinki, Finland.

Melatonin is known to induce early priming of winter fur several weeks ahead of normal. To study the metabolic effects of melatonin, 42 male mink kits and 49 adult female minks were treated with 12 mg melatonin implants at the end of June. Hair growth and maturation were studied in relation to changes in dermal connective tissue. The growth of winter hair was

initiated four weeks earlier, and maturation was complete six weeks earlier in the melatonin treated animals than in the untreated ones. The shorter growth period was due to more hairs being activated to grow simultaneously. The growth rate of individual hairs was not significantly changed. The mean growth rates of guard hairs and underfur were 0.44 and 0.43 mm/day, respectively, in the melatonin treated and 0.37 and 0.36 mm/day, respectively, in the normal females. In young males, the respective growth rates were 0.56 and 0.35 mm/day in melatonin treated and 0.48 and 0.45 in the normal animals. The development of the winter coat was temporarily related to high concentrations of collagen and increased excretion of highly polymerized metabolites of glycosaminoglycan in urine. At catagen the whole skin became thinner and the dermal content of collagen diminished to the baseline level seen in telogen. Reabsorption of the connective tissue in catagen caused increased excretion of low polymerized metabolites of glycosaminoglycan in the urine. The alternations in the connective tissue were principally the same in the melatonin treated and normal animals when related to the different stages of hair growth.

● - Morphological description of abnormal guard hairs of mink and silver fox. P. Rasmussen, National Institute of Animal Science, Research in Fur Animals, DK 3400, Hillerød, Denmark.

A detailed morphological description (macro- and microscopical) of abnormal hairs in fur animals is necessary to identify the real causes of their occurrence. The report deals with two morphological pilot examinations of abnormal guard hairs of mink and silver fox, respectively.

Guard hairs of mink, taken from the back, apparently light or silver in colour, thereby being different from the adjacent guard hairs, have been examined. This has been done by using a light microscope, a transmission and a scanning electron microscope. No differences between normal, long guard hairs and abnormal ditto have been found regarding the forms of cross sections, the degree of pigmentation and the ultrastructure of the cuticula. On the other hand, it has been observed that the tops/lancet parts of the abnormal guard hairs are curved in different degrees and they are significantly longer than the normal ones. These characteristics are believed to effect an altered orientation of the hair which may cause a modification or abnormality of the reflection of light. The result may be the observed light or silver colour.

Guard hairs including the "silver bar" of silver fox, taken from the back and hip and showing strange crumpled forms have been examined by using a light microscope and a scanning electron microscope. The abnormality has only been found in the "silver bar" and is here seen in the distal part. The abnormal guard hairs are characterized by being extremely collapsed and they often show aneurysmal bulges. The transition from the neckpart to the lancepart of the abnormal hairs is abrupt. The hairs seem shorter because they are crumpled.

✳ - Genetics and Evolution of Tailbiting Mink G. de Jonge, "Het Spelderholt", Ministry of Agriculture and Fisheries, Beekbergen, The Netherlands

A study was carried out to determine whether genetic or environmental conditions influenced the occurrence of tail biting in ranch mink. A number of variables were examined, including cage size, visual isolation, weaning age, diet, age, sex and heredity of tail biting.

The results demonstrated that nearly half early weaned offspring of tail biting parents were proven to be tail biters. There were no demonstrable difference between male and female offspring. Tail biting males tended to be heavier than animals that did not exhibit this behaviour. While this experiment demonstrated no relation between tail biting and housing conditioning, further studies of the relation between stress and tail biting are warranted.

✳ - Homology between colours in foxes and other mammals. S. Adalsteinsson, The Agricultural Research Institute, Keldnaholt, 112 Reykjavik, P. Hersteinsson, The Wildlife Management Unit, Baendahoellinni, 107 Reykjavik, E. Gunnarsson, Institute of Experimental Pathology, Keldur, 112 Reykjavik, and A. Palsdottir, The Blood Bank, Baronsstigur, 101 Reykjavik, Iceland.

This paper describes attempts at establishing homologies between coat colour loci in foxes and mice, as well as homologies between color loci in red (*Vulpes vulpes*) and arctic (*Alopex lagopus*) foxes.

Altogether 7 coat colour loci are postulated to be homologous in red and arctic foxes while the counterparts of two colour loci in arctic foxes have not been found in red foxes. All the nine coat colour loci in foxes are postulated to be homologous to well established coat colour loci in mice.

Some of the postulated homologies seem to be reasonably well established while others are tentative and must be regarded as working hypotheses at present.

✳ - Selection experiment with mink - selection for fertility, body size and pelt quality. G. Lagerkvist, Department of Animal Breeding and Genetics, Swedish University of Agricultural Sciences, Fundo-Lovsta Research Station, S-755 97 Uppsala, Sweden.

A selection experiment with standard mink was started in 1984. The experiment comprises 4 selected lines and a control

line (C). The qualities used to select fur were: fertility, F, (litter size at 3 weeks); body size, BS, (September weight); pelt quality, P, (density of underfur); fertility and body sizes combined, F+BS.

Each line is composed of 80 females and 20 males, except for the F+BS line, which includes double these numbers. Only 1 year old animals are used in the selected lines. The selection is carried out by use of selection indices.

The reproductive result in the F line was 5.2 kits in 1986 per mated female at 3 weeks - about 1 kit more than the average of the other selected lines. In 1987 the corresponding result was 5.1 kits - about 0.5 kits more than the other lines. In 1986 the BS line had the poorest fertility (3.8) and in 1987 the P line.

In 1986 the kits in the BS line were significantly heavier at 6 weeks than kits in the other lines. September weight for males in the BS line was 2127 g and 2281 g in 1986 and 1987 respectively, on average 150 g more than for males in the other lines. In 1987 the BS+F line reached almost the same weight as the BS line. Skin length was 74.4 cm for males in the BS line in 1986 and 76.6 cm for the BS and BS+F lines in 1987. Skins from the BS and BS+F lines were significantly longer than skins from the other lines.

The P line had the highest scores for density of underfur, quality of guard hairs and overall impression, when graded as live animals and as pelts. When graded as live animals, the P line differed significantly from all other lines in 1986. In 1987 the difference was significant also when graded as pelts. In the P line the frequency of animals with a metallic sheen tended to be lower, the highest frequency was obtained in the BS line.

✳ - Inheritance of coat color in ranch-bred ferret. U. Joutsenlahti and F. Fors, Finnish Fur Breeders Association, P.O. Box 5, SF-01601 Vantaa, Finland.

The inheritance of the color types in the ferret was studied in three combinations total 947 offspring in 112 litters. The results were in good agreement with the hypothesis of a single locus with two recessive alleles. A suggestion was made for the gene symbols C>cB>c for standard, pastel and albino respectively.

✳ - Price analyses on skins as information in the breeding work. Outi Lohi, National Institute of Animal Science, Department of Fur Animals, Hilleroed, Denmark. Ejner Borsting, Danish Fur Breeders Association, Glostrup, Denmark. Ulla Joutsenlahti, Finnish Fur Breeders Association. Kaj-Rune Johannesen, Norwegian Fur Breeders Association, Oslo, Norway.

In the Scandinavian Association of Agricultural Scientists, the Breeding Committee of Fur Animal Division has decided to

carry out a statistical analyses of prices on the most important pelt types after each auction season. In each type the analysis are based on the production from two countries and the material comprises the total pelt production excluding lowgrade pelts. Results for scanblack and pastel are also compared with similar analyses made on the Finnish production in 72/73 - 75/76.

The statistical calculations done by LS Means analyses model of SAS Institute. Each auction lot is included as one observation. The model variables are size, quality, colour, shade of colour (clarity) and auction. Auction within the marketing season is included as a variable in order to be able to eliminate the effect of differences in price level and uneven distribution of pelts in different auctions.

The average relative prices per trait and class are presented. In any of the analysed pelt types, there is very little difference between countries and auction houses.

Quality and size have the strongest influence on the price in all pelt types. Clarity or shade of colour is in both mink types of very little economical value. In all fox types, however, it is important the total effect being in blue foxes about 20 percent and in silver fox and in blue frost fox altogether 30%. The darkness of the colour is more important in scanblack mink than in pastel. In scanblack it seems to affect the price even more in female pelts. In blue fox the effect of colour has decreased. In silver fox the medium and pale group are favoured at the moment and the price declines towards both end of the colour scale.

☉ - Breeding strategies for fur animals in Norway. Erling Fimland and Einar J. Einarsson, The Norwegian Fur Breeders Association, Oslo, Norway.

The principles of breeding strategies for fur animals in Norway was put forward by the "official" breeding plan in 1983.

The breeding plan states that the traits involved are of two kinds:

- A. Traits with stability over time in the direction where selection should be aiming including reproductive traits, pelt quality, skin size, behaviour of animals, livability of animals and type characteristics.
- B. Traits where direction of the selection are dependent on short time demands and the performance of the population in question, which includes color shade of the pelt.

The breeding activities organized by the Norwegian Fur Breeder's Association are linked to the following:

- field recording system
- progeny testing of fox males (fox circle mating system)
- artificial insemination (A.I.)
- performance testing including exhibition of living animals

The activities are organized such that the farmers receive information on the performance of the breeding animals (by indicies). Based upon this information farmers may select for some important traits.

☉ - Heritability of body size and fur quality in foxes (*Vulpes vulpes*). H. Kenttämies, University of Helsinki, Department of Animal Breeding, SF-00710 Helsinki, Finland.

Heritability of body size and fur quality in foxes, and differences in the traits between some colour types were studied. A total of 9,704 foxes were subjectively judged on a private farm between 1983 and 1986. Half of the kits were silver foxes and the other half were various mutants of the red and silver fox.

Live Platina foxes and Platina crossfoxes scored high in body size and fur quality, in contrast to the recessive and the double recessive mutants of silver fox. The pelts of Silver foxes were large and high in quality and sold for good prices in comparison to the other types. The selling prices for the recessive group were fairly high, in spite of the fact that their scores for body size and pelt quality were low. The pelts of animals with high scores for body size and the fur quality traits, tended to yield better returns than those with medium or low scores. Heritabilities (and standard errors) of the traits were in 1983-1985 as follows: body size 0.26 (0.04), underfur density 0.25 (0.04), guard hair density 0.17 (0.04) and silkiness 0.19 (0.04). In 1986, the respective estimates among the pelted animals were negative for body size, 0.15 (0.06) for fur quality, 0.22 (0.07) for pelt size and 0.33 (0.08) for pelt quality.

☉ - Selection experiments in mink on a Danish research farm. N. Therkildsen, Research Farm "SYD", Lindknudvej 35, 6650 Brorup, Denmark.

The first Danish Research Farm dealing with a relatively large scale of experiments in breeding, genetics and reproduction was established in 1986. Unrelated and Aleutian disease free males and females, Standard and Pastel were mated to generate the basic population.

In the basic population, the heritabilities for fur coat characters in Standard and Pastel were about 30% and for the September-weight about 55%. From the basic population the breeding animals for the selection lines were selected.

After one year of selection the divergent selection lines for metallic (Standard) and spot (Pastel) showed respectively 19 and 24% points difference in the expected directions.

Two lines for line-breeding are mainly selected for good fur coat characteristics and good reproductive performance. After one year of selection, the lines shown a significant difference in fur quality.

⊛ - Giant blue fox - a new mutation. U. Joutsenlahti¹, L. Blomstedt², and K. Valkosalo³. ¹Finnish Fur breeders Association, P.O. Box 5, SF-01601 Vantaa; ²Department of Zoology, Division of Physiology, University of Helsinki, Arkadiankatu 7, SF-00100 Helsinki; ³Farm-Frys Ab, SF-62420 Korttesjarvi, Finland

A new dominant heritable blue fox mutation of a gigantic size was recorded in 1984 at Korttesjarvi, Finland. The distribution of giant and normal cubs was 34.6% and 65.4%, respectively, from a crossing of normal female x giant male. The growth of the fur coat was equal in both blue fox types. The giant blue foxes had significantly more hairs in the follicular bundles with only underfur hairs (55.9) than the normal fox pelts (46.5).

⊛ - Family index for live grading in mink. E. Borsting, Danish Fur Breeders Association, Langagervej 60, DK-2600 Glostrup, Denmark.

Grading of live animals for pelt quality, color, and size is found to have a significant correlation to grading done on the pelt for the same traits. Heritability values from the literature for live grading are in accordance with the author's calculations done on grading data from commercial Danish breeding companies.

A family index based on live grading may increase the genetic gain by 30 to 60 percent, depending on the h^2 and the family size according to model calculations. Results from a commercial breeding company in Denmark confirm that genetic progress is improved by that magnitude when a family index is used to estimate the breed value.

⊛ - Selection for litter size in mink - experiment and selection index. E.J. Einarsson, Box 73, N-1430 Aas, Norway.

A selection experiment for litter size at birth in dark mink was conducted at the Agricultural University of Norway. The experiment lasted for six generations, each of one year. Divergent selection was practiced in two closed lines, (High and Low), in addition a randomly selected control line (C) was kept. 792 females gave birth during 1979 and 1984. The selection response per year was predicted to be 0.12, -0.08 and 0.00 in the

H-, L- and C- lines, respectively. The cumulative effective selection differential during the experiment was 12, -4 and 2 kits respectively. At the end of the experiment, there was a difference in favour of the H-line, of 1.07 kits between the two selection lines at birth and 1.37 at weaning, both per whelped female. For the trait litter size at birth, the realized heritability was 0.14; correcting for the use of index, inbreeding and natural selection, a heritability of 0.16 was assumed to be correct. Positive correlated effects were observed in pre- and postnatal mortality. No negative effects of selecting for litter size were found in fur characteristics, however, a tendency towards reduction in body weight was observed. A selection index was developed for litter size in fur bearing animals including information from full- and half sisters and granddams of both the dam and the sire of the litter, in addition to the dam herself.

⊛ - Red cell antigens of blue foxes. M.P Christiansen¹, B. Larsen¹, T. Niini² and O. Lohi¹, ¹National Institute of Animal Science, Denmark, ²Blood Group Lab, Finland.

The increased use of artificial insemination in foxes has revealed a need for individual identification and parentage testing by means of blood typing. For preparation of blood typing antisera, 28 blue foxes were immunized by weekly intramuscular injections of full blood from donors of blue fox and silver fox types. A technique for collection of large blood samples from the saphenous vein was worked out and the prepared antisera were tested for direct agglutinins and haemolysins. For the haemolytic test, complement was prepared by absorbing fresh rabbit serum with washed red cells from J+ and J- cows.

One naturally occurring antiserum and three immune antisera detecting individual red cell antigens of foxes has been isolated. Attempts to produce monoclonal blood typing antisera were made by immunization of Balb/c mice with washed red cells from blue foxes, followed by fusion between immunized mouse spleen cells and X63/Ag 8653 mouse myeloma cells. Every fusion resulted in clones producing antibodies which agglutinated the red cells of all 24 individuals in the test panel. Clones producing antibodies differentiating individual foxes have not been isolated.

Further work is in progress on the production of antisera and their characterization.

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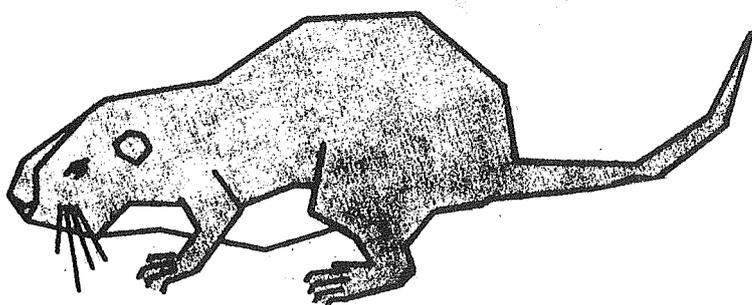
NUTRIA FARMING by D. Scaramella and G. Motti.

Edagricole Bologna - Italy has published a new handbook entitled "Allevamento del castorino" (Nutria farming) written by Domenico Scaramella and Giovanni Motti.

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Nutria Farming: 135 pp, 86 figures of which many are colour pictures, 22 tables, 196 references. ISBN 88-206-2971-2.
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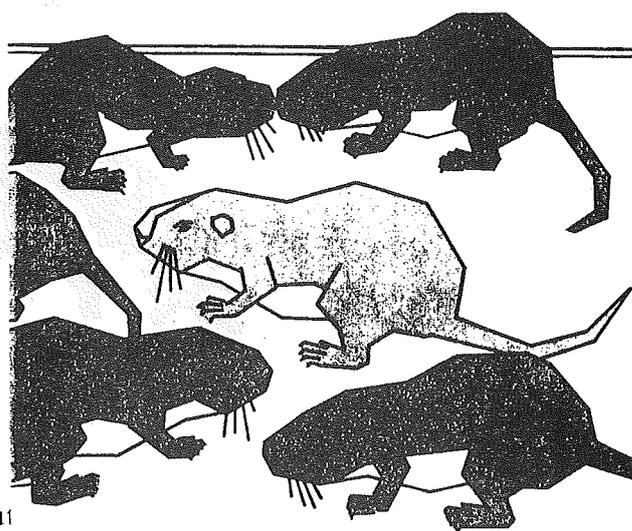
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About the author...

Alan Herscovici has been an interested observer of the fur trade for most of his life. His grandfather was a pioneer of the Canadian fur-manufacturing industry, and his father is still active in the trade.

Herscovici's research as a writer has taken him into the hinterland of the fur trade, from remote Indian and Inuit hunting communities on James Bay and Baffin Island, to the bayous of Louisiana.

His award-winning book, *SECOND NATURE: THE ANIMAL-RIGHTS CONTROVERSY* (1985), explored the ideologies and organizations behind recent campaigns against hunting, the fur trade, animal husbandry and medical research. He has also prepared a major radio documentary for the Canadian Broadcasting Corporation, "Men and Animals: Building a New Relationship With Nature."

"The extreme animal-rights doctrine is actually 'eco-fundamentalism' - a threat to the progress of the environmental movement," says Herscovici.

After graduate studies in political science, Herscovici travelled extensively in Central America, Europe and Asia. His novel, *The Tibetan Treasure* (1984), is a international "thriller" about political intrigue in Central Asia.

Alan Herscovici is a member of the Centre for Investigative Journalism and of the Fédération Professionnelle des Journalistes du Québec.



PHOTO: MR. MICHEL GRAVEL

Alan Herscovici

Furs - An Environmental Ethic

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A Fur Trade for the 21st Century	

About this book...

A fur trade for the year 2000...

The modern fur trade is a remarkable mosaic of people and cultures. Cree hunters from the Canadian north and Cajun trappers in the bayous of Louisiana; Paris fashion designers and craftsmen from the mountains of Macedonia; farmers in Scandinavia and shepherds on the steppes of Central Asia - they are all part of this fascinating trade.

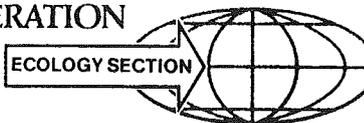
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Beautiful Fur Animals – and their colour genetics is intended as a reference book for fur farmers and fur merchants and a textbook or manual of studies about qualitative genetics.

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

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

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