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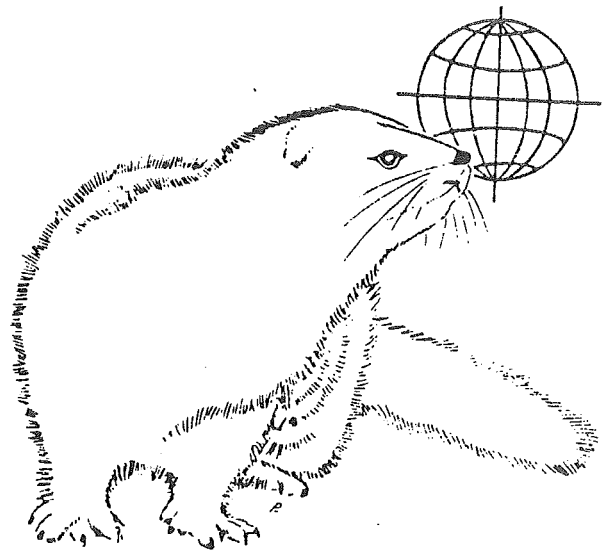
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- Methods for evaluating the microbiological quality of mink feeds. H. Søgaard. Dansk Veterinærtidsskrift, 72, 17, p. 983-992, 1989. In DANH. Code 8-14-M.**
- Processed slaughter byproducts as feed for fur bearing animals in Finland. I. Pölönen, K. Tuomo, M. Jaakko. Finsk Pälstidskrift, Vol. 26 (1), p. 22-25, 1992. In SWED. Code 7-6-M-F.**
- Influence of cereal flour on the fur quality of mink. D. de Jonge. Deutsche Pelztierzücher, Vol. 65 (3), p. 48-50, 1991. In GERM. Code 7-2-M.**
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- Acute allergy of food origin in foxes. V. Stanescu, O. Daradici, S. Stroia, P. Adamescu. Zootehnie si Medicina Veterinara, 40 (2), p. 51-52, 1990. In RUMAN. Code 9-6-F.**

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Notes

SCIENTIFUR

Vol. 17, No. 3, 1993

The slight optimism which is obvious in all branches of the fur industry is a good background for various evaluations and for thinking ahead.

During the past years the fur breeders have learned - although they have always been aware of this - that the market mechanism where the price depends on the relations between production and demand is operating very fast in a free market. What they have also learned is that there are extremely many factors to be taken into consideration if the future market situation is to be estimated with such certainty that it will in due time give the ultimate signal and thereby the choice to act in the right direction.

The same problems have been prevailing in the history of SCIENTIFUR and the books (Mink Production, Beautiful Fur Animals - and their colour genetics, and Haematology and Clinical Chemistry of Fur Animals) initiated and produced by SCIENTIFUR.

In the preliminary phase the number of potential readers was estimated on the basis of different criteria, and a lot of friends throughout the world forced us to make these productions.

Time has taught us that there is an extraordinary gap between the "potential" and the real interest in a given production.

Regarding the books mentioned, I am today facing the problem of burning 3,000 copies (approx. 1,5 tons) or moving them to Norway in the hope of a future demand.

The realists tell me that the best thing for me would have been to burn them in connection with the recent midsummer celebrations.

I myself - the super optimist - and the ones who know how much work and money these 1,5 tons represent have decided to bring the whole stock to Norway in the hope that at least some of these books can find their users in the future.

Such books will never be produced in the future without an absolute guarantee that they are all needed.

Nobody questions the need of the information which SCIENTIFUR stands for, and the potential for subscribers is far above the economic zero point. The real picture is, however, that SCIENTIFUR - and all other journals dealing with the production side of fur animals - cannot exist without substantial support from the fur breeder organizations and the supply industry.

This was a long story with the aim of thanking the European Fur Breeders Associations for their support in granting approx. USD 36,000 to the 1993 production of SCIENTIFUR. The former considerable contributions from the same organizations, and especially their expression of willingness also in the future to make such contributions provide the best hope and optimism regarding international scientific cooperation and communication in the years to come.

We are still looking forward to receiving payment from some subscribers and IFASA-members for 1993.

The Board of IFASA is called for a meeting late October or early November this year. If members and/or subscribers have any comments to be dealt with at the board meeting, please send such comments as soon as possible to the president, Prof. Einar J. Einarsson or to the undersigned.


It has been decided that the editorial address of SCIENTIFUR and the secretariat of IFASA will be unchanged until the end of this year.

The easiest way to contact me by telephone will be on my mobile phone: No. +45 30 81 12 31, but also calls to the phone or fax numbers stated on the inside front cover of SCIENTIFUR will be forwarded to me. Furthermore, I shall be in

constant contact with Oslo Fur Center, phone +47 22 64 41 50 and fax +47 22 64 35 91, so there is no excuse for not keeping in contact.

With this I wish you a good season.

Your editor,


Gunnar Jørgensen



Original Report

Thyroid hormone levels in mink at different ages

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Summary

The experiment was carried out on 90 standard mink. The following groups depending on the age of animals were formed: females born in 1992, 1991, 1990, 1989 and 1988.

In blood samples collected from the animals the level of thyroxine and triiodothyronine was determined. The thyroid hormone activity of mink blood plasma was close to the level of the same hormones in polar fox blood. The age of the mink did not have a statistically significant effect on the level of thyroxine and triiodothyronine in the blood plasma.

Introduction

Thyroid hormones are important regulators of metabolism. There are not many papers which contain the physiological norms of thyroxine and triiodothyronine of fur animal blood (ref. 5). In a previous study we found an increase in the nitrogen retention and faster ripening of winter fur in polar foxes after the exogenic thyroxine injection (ref. 2). Similarly, as in the other species of animals, in polar foxes were noticed changes in the activity of the thyroid gland depending on the temperature of the environment (ref. 1).

Seasonal oscillations in the thyroxine level in mink (ref. 3) and changes in the same hormone in coypus during the growing period were also obtained (ref. 4). Nutrition can be a factor affecting the thyroxine level of fox blood as well (ref. 6).

Materials and methods

The experiment was carried out on 90 standard mink (females) at the Fur Animal Farm in Kraczkki. The animals were divided into five groups of 18 mink each. The following groups depending on the age of animals were formed: females born in 1992, 1991, 1990, 1989 and 1988.

In blood samples collected from animals in the first half of December 1992, the level of thyroxine and triiodothyronine was determined. The hormones were estimated by the radioimmunoassay method with a kit of RIA produced by O.P.D.J. in Swierk.

Statistical analyses of results between the group of the oldest animals (born in 1988) and the remaining groups were conducted with an analysis of variance and Duncan test.

Table 1. The level of triiodothyronine (T₃) and thyroxine (T₄) in mink at different ages (ng/ml)

| Hormone | Mink born in: | | | | |
|-----------------------|---------------|-------------|-------------|-------------|-------------|
| | 1992 | 1991 | 1990 | 1989 | 1988 |
| Triiodo- thyronine | 1.36 ± 0.23 | 1.34 ± 0.11 | 1.41 ± 0.22 | 1.29 ± 0.26 | 1.15 ± 0.21 |
| Thyroxine | 30.52±11.69 | 26.51± 5.12 | 31.89±10.68 | 29.09± 8.95 | 27.95± 9.82 |

Results and discussion

The level of thyroid hormones in mink blood plasma is presented in table 1 and diagram 1. The results approximate the level of thyroxine and triiodothyronine of polar fox blood plasma (ref. 6). The level of triiodothyronine of mink blood oscillated between 1.15-1.41 ng/ml and a slight decrease of its activity was noticed in the two groups of oldest mink (born in 1988 and 1989) but the difference was not statistically significant. For the level of thyroxine of mink blood plasma the differences also were not statistically significant. The results were similar in all animals and were contained within the range 26.51-31.89 ng/ml.

The level of thyroid hormones in mink at different ages

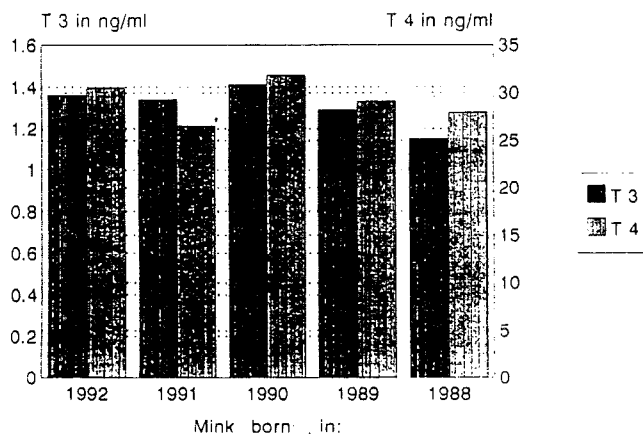


Diagram 1. The level of thyroid hormones in mink at different ages

Biological activity of triiodothyronine is several times greater than of thyroxine so we can assume that the decrease in the level of triiodothyronine in mink 4 and 5 years old can have an important influence on some physiological processes.

Conclusions

1. The thyroid hormone activity of mink blood plasma was close to the level of the same hormones in polar fox blood.
2. The age of the mink did not have a statistically significant effect on the level of thyroxine and triiodothyronine in the blood plasma.

References

1. Bieguszewski, H., Korowajczyk, Fr. 1975. Zmiany w aktywnosci tarczycy u lisow polarnych, zwiazane z wiekiem i rozna temperatura otoczenia. Pol. Arch. Wet., 17, 4, 649-658.
2. Bieguszewski, H., Szymeczko, R. 1979. Wplyw hormonu wzrostowego i tyroksyny na przyrosty ciezaru ciala, strawnosc skladnikow pokarmowych dawki i bilans azotu oraz rozwij okrywy wlosowej u rosnacych lisow polarnych. Roczn. Nauk. Roln., B 99, 46-52.
3. Boissin-Agasse, L., Maurel, D., Boissin, J. 1982. Seasonal variations in thyroxine and testosterone levels in relation to the moult in the adult male mink (*Mustela vison peale and beauvois*). Scientifur, Vol. 6, No. 2, pp. 10.
4. Jelimek, P., Picha, J., Pichowa, D. 1982. concentration of plasmatic thyroxine (T₄) in nutria males from birth to breeding age of the animals. Scientifur, Vol. 6, No. 4, pp. 26.
5. Rajs, R. 1987. The investigations of triiodothyronine, thyroxine, insulin and vitamin B₁₂ level in foxes, mink, skunks and ferrets. Acta Physiol. Pol., 38, 30(3), pp. 166.
6. Rajs, R., Bieguszewski, H. 1991. Poziom hormonow tarczycy we krwi lisow polarnych zywnionych karma z dodatkiem krwi konserwowanej chemicznie i gotowaney. Zesz. Nauk. ATR Zoot. 20, 175, 99-103.

Original Report

Social rank and reproductive performance in farmed blue foxes

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Summary

The dependence of reproductive performance on social rank and status was clarified in five blue fox groups of both sexes under farm conditions. The results showed that in each group could be found good male breeders as well as males that were very poor breeders. Older males were typically higher in rank than younger ones. Social status of neighbouring females had a significant effect on the number of kits produced. If the kit number was 7 or higher, the female next to had only from 0 to 2 kits. Kit losses were the highest in low-ranking females. It can be concluded that there can be found individuals of different social status on farms when status ranking is based on the number of kits produced.

Introduction

Recent studies on red and blue foxes both in the wild and in large enclosure conditions have demonstrated the existence of a social hierarchy in groups (Hersteinsson & MacDonald, 1982; MacDonald, 1988; Wakely & Mallory, 1988; Korhonen & Alasuutari, 1991, 1992). Accordingly, each individual has a certain rank in the social hierarchy in relation to the other group members.

On the basis of observations made on farm-raised silver foxes it is further assumed that a social rank system is obviously present under farm

conditions, too (Bakken, 1988, 1989, 1990). The mating success and reproductive performance of an animal would seem to be in relation to its social status and rank; females with lower status tend to have fewer kits and higher kit losses than females of higher status. In farm conditions, this apparently means that the whelping result markedly depends on the social status of the animals in neighbouring cages (*c.f.* Bakken, 1989).

The aim of the present study was to clarify to what extent the different social status of neighbouring individuals influenced the mating success, reproductive performance and kit losses in farmed blue foxes (*Alopex lagopus*).

Materials and methods

The experiments were carried out at the Fur Farming Research Station of Kannus, in Finland, during January–July 1991. Three large test groups (7 males and 25 females in each) and two small test groups (4 males and 10 females in each) were formed in mid-January (table 1). The groups were placed separately in shade houses, and each group formed its own breeding unit (for the locations see fig. 1). Matings within the test groups were done according to conventional, commercially employed mating systems. Each male was offered to every accepting female in the group. Each individual was housed in

the same cage throughout the experiments to test neighbouring effect.

The social rank of a female was estimated according to the number of kits she produced. The social rank of a male was based on this mating success; the more females he mated with, the higher his status value and vice versa. The activity of urinations by males into the neighbouring cages was monitored by checking their urine marks (from the snow under the cages) twice a week during the breeding season in March.

The results were statistically treated by analysis of variance, by regression analysis and by Spearman's rank correlations. When possible, the results were analyzed both by groups and by total material.

Results

Mating and whelping

The number of unpaired females varied from 3 to 6 in the groups (table 1). The pairing percentage in groups 1 and 2 was 76, and the percentage in groups 3, 4 and 5 were 88, 60 and 50, respectively. The corresponding percentage for the total material was 75. The number of barren females was 0-5 individuals per group. In the total material, 11% of the females were barren. The kit losses were highest in group 3, totalling 4 animals altogether. In the other groups the kit losses were either 0 or 1 animal. Kit losses in the

total material amounted to 0.5%. The whelping percentage was highest in group 1 (76%), and lowest in group 4 (50%).

The whelping result per paired female was best in group 1 and poorest in group 3. As calculated per whelped female, the best whelping result was found in group 2. In groups 3-5 the whelping result was of about the same of magnitude.

Social ranking of males

Table 2 presents the ranking of males according to the number of mated females. In each group there was one male that had markedly better mating success than the other males. The only exception was in group 3 where there were two good breeders. In addition, each group had one fairly good male as well as males that completely failed to mate.

Male social rank significantly depended on the number of kits produced (table 3). Day of pairing, kit losses or urination activity into neighbour cages did not have any statistical relationship with male rank. The material was also divided into age groups as follows: yearlings (29% of the total material), 2-3 years old males (14%), and over 3 years old (15%). Rank depended significantly on age in males. The older the male, the higher his rank (table 3).

The males' social rank had no relationship with that of the females. Thus, the whelping success of a female did not depend on the number of other females that mated with the same male.

Table 1. Composition and basic reproductive data of the groups

| Variable | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Total |
|---------------|---------|---------|---------|---------|---------|-------|
| Males | 7 | 7 | 7 | 4 | 5 | 29 |
| Females | 25 | 25 | 25 | 10 | 10 | 95 |
| not paired | 6 | 6 | 3 | 4 | 5 | 24 |
| barren | 0 | 5 | 4 | 1 | 0 | 10 |
| lost | 0 | 0 | 4 | 0 | 1 | 5 |
| whelped | 19 | 14 | 14 | 5 | 4 | 56 |
| Kits born | 200 | 157 | 106 | 36 | 29 | 526 |
| Kits at 1 wk | 188 | 144 | 91 | 32 | 26 | 481 |
| Kits at 3 wks | 180 | 139 | 90 | 32 | 26 | 467 |
| Kit losses | 20 | 18 | 16 | 4 | 3 | 61 |
| Kits/paired | 10.5 | 8.3 | 4.6 | 6.0 | 5.8 | 7.4 |
| Kits/whelped | 10.5 | 11.2 | 7.6 | 7.2 | 7.3 | 9.4 |

Table 2. Males listed according to their social ranks. Number of offered and paired females are given for each individual. Total number of urinations into the neighbouring cages within a four week interval during the breeding season is also given

| Rank order | Offered N | Paired N % | Urinations N |
|-----------------|--------------|---------------|-----------------|
| Group 1: male 1 | 19 | 13 68.4 | 5 |
| male 2 | 14 | 6 42.9 | 3 |
| male 3 | 15 | 4 26.7 | 3 |
| male 4 | 14 | 3 21.4 | 5 |
| male 5 | 2 | 0 0 | 5 |
| male 6 | 4 | 0 0 | 5 |
| male 7 | 5 | 0 0 | 4 |
| Group 2: male 1 | 17 | 9 52.9 | 5 |
| male 2 | 17 | 6 35.3 | 5 |
| male 3 | 19 | 6 31.6 | 4 |
| male 4 | 12 | 2 16.7 | 4 |
| male 5 | 9 | 1 11.1 | 4 |
| male 6 | 2 | 0 0 | 4 |
| male 7 | 5 | 0 0 | 4 |
| Group 3: male 1 | 17 | 10 58.8 | 0 |
| male 2 | 19 | 10 52.6 | 0 |
| male 3 | 8 | 6 75.0 | 4 |
| male 4 | 12 | 4 33.3 | 6 |
| male 5 | 9 | 3 33.3 | 5 |
| male 6 | 4 | 0 0 | 1 |
| male 7 | 5 | 0 0 | 0 |
| Group 4: male 1 | 18 | 10 55.6 | 3 |
| male 2 | 3 | 0 0 | 4 |
| male 3 | 5 | 0 0 | 1 |
| male 4 | 6 | 0 0 | 6 |
| Group 5: male 1 | 16 | 8 50.0 | 3 |
| male 2 | 8 | 1 12.5 | 5 |
| male 3 | 2 | 0 0 | 5 |
| male 4 | 3 | 0 0 | 0 |

Social ranking of females

The females were ranked in the groups according to the number of kits they produced. Day of pairing had no effect on a female's rank. However, kit losses significantly depended on rank in females; the higher the female ranked, the lower were her kit losses (table 3).

The body weights of the females at mating significantly influenced their ranks; the heavier the female, the less kits she produced and the lower her rank. On the other hand, body weights at whelping did not influence the number of kits born or kit losses. The whelping results of the females did not depend on their cage distance (location in the housing unit) from the best male in the group.

Social status of females in relation to status of neighbours

Figure 1 shows the location of each individual within the groups. The whelping result of the housed female has been indicated close to each cage. The result zero means one of the following; the female was unpaired, barren, lost its kits, or died. Furthermore, in the treatment of the data the following aspects have been taken into account: if the cage of female was located at the end of the shadehouse, the empty side was marked zero. Correspondingly, if there was a male in the next cage to a female, that male's cage was marked zero.

Table 3. Relationships between social rank and some other traits

| Independent | Dependent | F-value | Significance |
|--------------------------|-----------------------------|---------|--------------|
| Social rank of female | Kit losses | 7.691 | p<0.05 |
| Social rank of female | Day of pairing | 0.315 | NS |
| Social rank of male | Social rank of female | 0.755 | NS |
| Social rank of male | Kit losses | 0.250 | NS |
| Social rank of male | Day of pairing | 0.860 | NS |
| Social rank of male | Number of produced kits | -7.269 | p<0.05 |
| Social rank of male | Age of male | -11.817 | p<0.91 |
| Social rank of male | Urinations | 0.106 | NS |
| Urinations to neighbours | Age of male | 0.091 | NS |
| Body weight at pairing | Kits born | -9.493 | p<0.05 |
| Body weight at whelping | Kits born | 0.023 | NS |
| Body weight at whelping | Kit losses | 1.063 | NS |
| Kits born | Distance from the alfa male | 0.003 | NS |

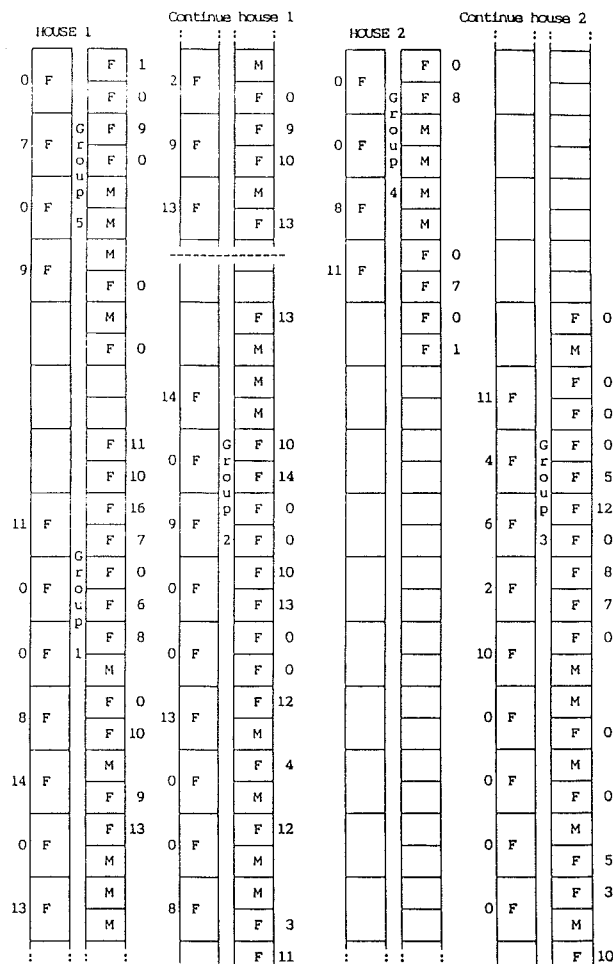


Fig. 1. Schematic presentation of the location of individual cages in the shadehouses. The number of kits produced is marked beneath the cages. M=male, F=female

As fig. 1 shows, often a female with a good whelping result had a female with a poor whelping result next to her either on one or both sides. This appeared to be quite a general trend in each group. Thus, we treated the data further ranking female (i.e. a female with a high number of kits) could still significantly explain the lower kit number of her neighbour. This limit was 7 kits ($p < 0.05$) in our present material. Thus, if the kit number was 7 or higher, the female next to her had a very low number of kits (0-2).

Discussion

The results demonstrated the existence of a social hierarchy among females under farm conditions if the ranking is based on the number of kits produced. Kit losses were a fairly good indicator of status because they were significantly highest in females of lower rank. Bakken (1989) performed an experiment with farmed silver foxes in which the social status of females was first determined by their activity as measured in the open field test. Thereafter, the animals were placed so that in every second cage there was an animal of higher status and in every second cage an animal of lower status. Both status groups whelped an equal number of kits but the kit losses were significantly higher in females of lower status. Thus, the final number of surviving kits was significantly related to social status.

The present results indicated that males have a kind of social hierarchy. While some males were very good breeders others were very poor. Thus, the total number of kits produced was significantly related to male social rank. The different breeding abilities observed among the present males depends on both sexes. Often a female would reject a male. Thus, the selection ability of the female is high. The fitness of a male depends on his breeding ability and other related behavioural traits. Since a significant relationship was found between social rank and age in males, it is obvious that older males have superior mating techniques and skills to induce female acceptance. Of course, older males are also more selected as only good breeders are kept on farms for over one year.

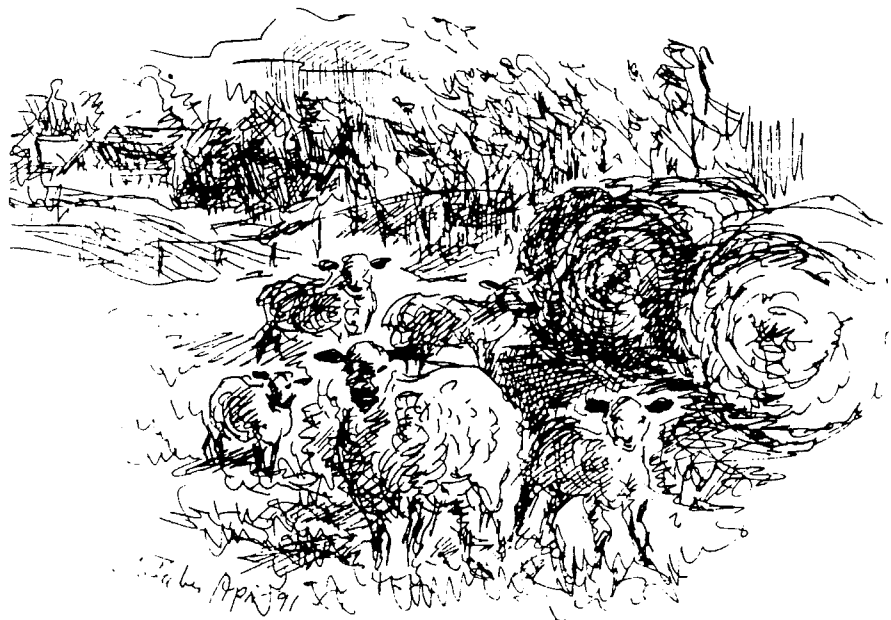
Experiments in large ground floor enclosures have shown that the highest rank male maintains a constant watch over the less dominant males during the breeding season, frequently chasing them away from the females that are in heat. There is also active urine marking, which is often most pronounced in higher-ranking individuals (Korhonen & Alasuutari, 1991, 1992).

In the present study, we attempted to clarify whether urine marking is involved with animal rank under farm conditions. However, no statistical relationship was found.

The mechanism by which social status is maintained under farm conditions is obviously the same both in the wild and in enclosures (Korhonen & Alasuutari, 1991); i.e. mainly by visual status signals, aggressive gestures and vocalizations. Bakken (1988) has tested status behaviour in farmed silver foxes; they were classified into five different behavioural categories which have later been utilized as the basis for status determination also.

References

- Bakken, M. 1988. Effekt av sosial status på morsegenskaper hos solvrev. Norsk Pelsdyrblad 62, 17-19.
- Bakken, M. 1989. Kan solvrevvalparnas kommende morsatferd forutsies? Norsk Pelsdyrblad 63, 4-6.
- Bakken, M. 1990. Sosial status som basis for testing av solvrevvalper. NJF seminarium nr. 185, Taastrup, Denmark.
- Hersteinsson, P. & MacDonald, D. 1982. Some comparisons between red and arctic foxes, *Vulpes vulpes* and *Alopex lagopus*, as revealed by radio tracking. Symp. Zool. Soc. London 49, 259-289.
- MacDonald, D. 1988. Running with the Fox. Unwin Hyman Limited, London.
- Korhonen, H. & Alasuutari, S. 1991. Features of social behaviour in an arctic fox group housed in a large enclosure. Scientifur 15, 201-210.
- Korhonen, H. & Alasuutari, S. 1992. Hierarchical development in captive arctic blue fox pac. Scientifur 16, 13-22.
- Wakely, L.G. & Mallory, F.f. 1988. Hierarchical development, agonistic behaviours, and growth rates in captive arctic fox. Can J Zool 66, 1672-1678.



Thesis on the study of the coypu (*Myocastor coypus Molina*)

R.H. Nimis

The future of the coypu today seems brighter at least around our small lakes and rivers, whereas the breeding of coypus seems to be ceasing gradually. Even though the pelt is of good quality, it is no longer in fashion, and it will only be possible to save the production as a limited "hobby production". The only way to safeguard further production and thus its existence is through cooperation between breeders regarding treatment and sale of pelts and meat. If the slaughter industry would only appreciate the value of coypu meat, this could provide considerable, new marketing possibilities. The various investigations we have carried out show that the coypu is a very robust animal, easy to breed, economic, and that a well-performed breeding policy would be enough to give new progress to this great rodent which has often been overlooked in spite of the fact that it is very attractive.

Ecole Nationale Veterinaire de Toulouse, 121 pp. 1990. In FREN. Author's conclusion translated by Hanne Artved, NIAS.

How and why may pelt length in mink be predicted? Comments on the current debate

Steen Møller

A recent paper by E. Nyengaard (see *Dansk Pelsdyravl* 55, p. 91, 1992), suggested that measuring the leg length of mink would provide a simpler method of predicting pelt length than would the determination of body weight although no investigations were made on the relationship between leg length and pelt quality.

In view of the fact that analysis of data in five previous papers on pelt length in scanblack mink revealed negative correlations of pelt quality with body weight (-0.19 to -0.37), body length (-0.02 to -0.20), body condition score (-0.23 to -0.42) and pelt length (-0.11 to -0.42), it is argued that further investigations will be necessary to confirm the alleged superiority of leg length measurements over body weight.

It is also suggested that, under farm conditions, it is no more difficult to weigh mink than to measure the leg, since they have to be restrained in either case.

Dansk Pelsdyravl 55 (3), 141-142, 1992. In *DANH. 1 table, 7 refs. CAB-abstract.*

Growth in mink

J. Hartung

For mink (155-869 animals per age group) on an experimental farm, body weight at 7, 14, 28 and 42 days averaged 29, 67, 178 and 322 g resp. for males and 26, 60, 155 and 262 g for females. On 1 July, 1 Aug., 1 Sept., 1 Oct. and at pelting on 1 Nov., the body weight of males averaged 870, 1495, 1932, 2308 and 2322 g resp. vs. 655, 946, 1099, 1247 and 1262 g for females.

Deutsche Pelztierzüchter 66 (2), p. 25, 1992. In *GERM. 2 tables. CAB-abstract.*

Farm trials with Japanese raccoon dogs (tanuki) in Finland

H. Korhonen, M. Harri, J. Mononen, P. Salonen

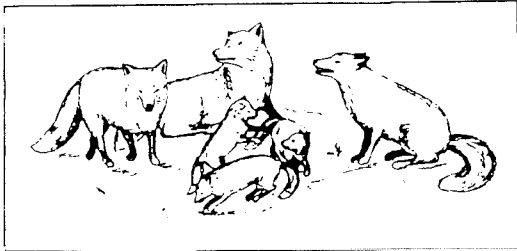
In 1983, 1 male and 2 female Japanese raccoon dogs (*Nyctereutes procyonoides viverrinus*), were imported to Finland from Japan for the purpose of comparing them with Finnish raccoon dogs, and to investigate the possibilities of crossbreeds.

Japanese raccoon dogs have a similar phenotype to that of Finnish raccoon dogs, but a different chromosome number; they are smaller than the European type, and have shorter and thinner hair. The poor reproductive performance and high mortality of the Japanese animals in Finland resulted in the survival of only 2 males and 2 females. Details on the behaviour and feed consumption of raccoon dogs of the 2 types are presented.

Finsk Pälstidskrift 25 (8-9), 160-163, 1991. 1 table, 5 figs. In *SWED. CAB-abstract.*

Importance of social factors for the reproductive performance of silver fox females

Morten Bakken



Data on 52 first and second litters from silver fox females were analysed. For females with high, medium and low social rank (HR, MR and LR, resp.), litter size at birth averaged 4.5 ± 0.38 , 3.4 ± 0.71 and 3.4 ± 0.38 cubs, and the number of undamaged cubs per litter at weaning averaged 3.5 ± 0.48 , 1.8 ± 0.88 and 0.6 ± 0.48 , the differences between HR females being significant. HR females with LR females in the adjoining cages and LR females with HR neighbours had significantly larger litters at birth (5.7 and 4.0 cubs resp.) than HR females with HR neighbours. MR females with MR neighbours and LR females with LR or MR neighbours (3.0-3.9), and HR females with LR neighbours weaned a significantly higher number of undamaged cubs (5.5) than other females (0-2.4).

There was no significant difference between HR and LR females without neighbours in litter size at birth (4.8 and 4.9, resp.), but the former had a significantly higher number of undamaged cubs at weaning than the latter (4.4 vs 2.3).

Norsk Pelsdyravt, 66 (6), pp. 10-11, 1992. In Norw. 3 tables, 6 refs. CAB-abstract.

Stereotypies in caged mink

G.J. Mason

Stereotype was studied in 105 adult mink on a commercial farm. Stereotype largely involved locomotor movements such as pacing. Individuals differed in the amount performed, in the exact movements involved, and in the complexity and variability of behavioural sequences.

All 102 stereotype individuals showed stereotype before the daily delivery of food. Pre-feeding, there were significant negative correlations between stereotype and inactivity ($r = -0.839$, $P < 0.001$), and stereotype and normal activity ($r = -0.449$, $P < 0.001$).

Immediately before food delivery, stereotypes were particularly rapid, and were usually performed in the part of the cage nearest to the approaching feeding machine. This would suggest that the stereotype is related to appetite behaviour. However, it is not simply the captive equivalent of hunting; mink also performed stereotype in response to a number of arousing situations (such as human disturbance, and enforced separation from their young), and 62% of stereotypic mink performed it in the quiet hours after feeding.

Post-feeding stereotype and inactivity were negatively correlated ($r = -0.502$, $P < 0.001$), but stereotype and normal activity were positively correlated ($r = 0.35$, $P < 0.001$).

Applied Animal Behaviour Science, 30; 1-2; p. 179-180, 1991. Proceedings of the Summer Meeting of the Society for Veterinary Ethology, Montecatini Terme, Pistoia, Italy (17-19 May 1990). Only abstract received. Author's abstract

Stress and nest boxes in farmed fox

Leif Lau Jeppesen

Farmed foxes are conventionally kept in barren wire cages without a nest box for most of the year. Only in the breeding period do they have a nest box, in which they deliver and raise their young. Without a nest box, foxes are constantly exposed to potentially stressing stimuli from neighbours and farm personnel.

With a nest box attached to the cage all year round, foxes are able to hide at will, and thereby to control their input of stressing visual stimuli. Whether foxes avail themselves of this possibility to control levels of social stress, was examined in an experiment with 100 silver fox vixens. Fifty animals were assigned to the experimental group and kept individually for 2 years in 2-m² wire cages from which they had free access to three nest boxes. The fifty other

animals were assigned to the control group and kept without access to nest boxes but under otherwise identical conditions.

Experimental animals had lower base levels of cortisol and eosinophil leukocytes, were more active in an open field, and less fearful towards humans. Experimental animals were less fearful and more aggressive or exploratory no matter how and where behaviour was assessed, whether it was assessed in the cage, during capture or in an open field runway. It is concluded that adult silver fox vixens kept with access to nest boxes all year round experience less stress than control animals kept without boxes.

Applied Animal Behaviour Science, 30; 1-2; p. 180, 1991. *Proceedings of the Summer Meeting of the Society for Veterinary Ethology, Montecatini Terme, Pistola, Italy (17-19 May 1990)*. Only abstract received. Author's abstract.

Stress and stereotypies in farmed mink

Knud Erik Heller

Stereotyped and normal behaviours were quantified from April to June 1989 among 187 adult male and female ranch mink. It was shown that mink devote no more than 3% of the day to stereotyped behaviour. The frequency of stereotypies is markedly increased leading up to feeding time in the middle of the day and declines to very low levels in the afternoon.

Environmental disturbances such as human proximity and transport and unloading at other farm sections, have strong inhibitory effects on the performance of stereotypies. The relation between stereotypies and stress is discussed, and it is suggested that chronic intermittent stress (e.g., stress induced by daily fresh food deprivation), is a prerequisite for the occurrence of stereotypies, but that additional conditions involving low level external stimulation are important.

A total of 147 adult females was divided into

two groups; one exhibiting a low level of stereotypy (n=24) and one exhibiting a high level of stereotypy (n=24). These two groups were studied from the weaning of pups in June 1989 until mating in March 1990. Normal behavioural activity as well as specified stereotypies were compared and related to stressful experiences.

Again, it appeared that acute stress reduces the occurrence of stereotypies. It was found, however, that stereotypies are differentially affected by stress.

Applied Animal Behaviour Science, 30; 1-2; p. 179, 1991. *Proceedings of the Summer Meeting of the Society for Veterinary Ethology, Montecatini Terme, Pistola, Italy (17-19 May 1990)*. Only abstract received. Author's abstract.

Fur biting in mink

Chr. Hyldgaard-Jensen

The effects of trichorrhexis, nutrition and season on the incidence of fur biting in mink are discussed.



Dansk Pelsdyravl, 54; 12; p. 544-545, 1991. CAB-abstract.

Fox enclosures, nest boxes and shelves

H. Korhonen, S. Alasuutari, P. Niemela, M. Harri, J. Mononen

An illustrated account is given of 3 trials, carried out in Finland in 1990, on the effects of different types of housing on the behaviour of foxes. There were no significant behaviour differences between foxes in standard cages and those in cages with shelves or nest boxes or with access to open enclosures.

Finsk Pålstidskrift, 25;11; p. 212-215, 1991. In SWED. 7 tables, 6 figs., 2 refs. CAB-abstract.

The influence of retreat possibilities on behaviour and performance of lactating mink females

Maria Jacobsson, Ingrid Karlsson

The aim of this investigation was to find out whether mink females experienced stress during lactation, due to the fact that farmed animals are unable to escape from their kits. A group of females was given access to a retreat den and the effects on performance behaviour, health and stress were recorded.

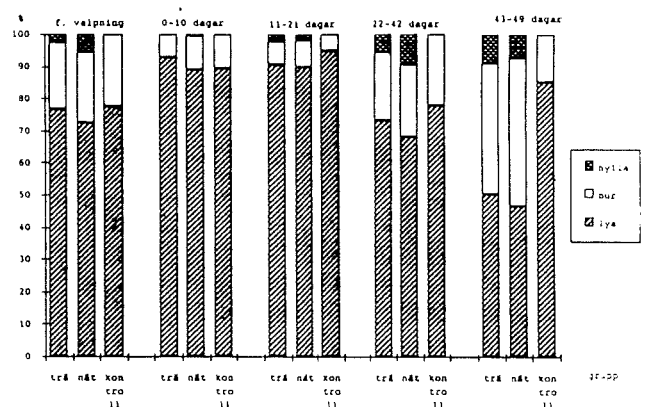
The investigations were carried out throughout the lactation period until the kits were weaned at the age of six weeks. It was performed with 85 lactating standard mink females and included two experiments, 1 and 2. Experiment 1 contained three groups, one control group (10 females), one with dens of netting (25 females) and one with dens of netting with masonite on the inside (25 females). Experiment 2 included five groups with five females in each group. By successively increasing the difficulty in entering the dens, an attempt was made to measure the females' level of motivation to get away from their kits.

Based on the results of a 24-hour behavioural observation study, further observations of the females were carried out six times per day. With a 30 minutes interval between each set of observations, 3 sets of observations were carried out in the morning and 3 sets of observations in the afternoon. Recordings on the location (in the cage, in the nest box or on the

den) and the occupation (running, resting, sleeping, etc.) of each female were made and the activity level was also recorded.

The females used the dens more frequently at the end of the lactation period as the kits grew older and were able to reach the cage by themselves. The dens were more frequently used when the ambient temperature increased. The netting dens were used more often than the masonite dens. This might be explained by the animals attempting to escape from the heat. A slight tendency for reduced use of the den was observed in experiment 2 with increasing difficulty of entering the den. Neither the females nor the kits showed any significant differences concerning weight between groups with or without access to dens, during any time of the lactation period.

The results of this investigation do not indicate that the mink females experience stress, because they are unable to escape from their kits. The behavioural studies of the females do not indicate any difference in behaviour between the females with access to dens and those without. Since other studies have indicated that the females experience being close to their kits as more stressing the older the kits grow, the dens might play a more important role when the kits are weaned later.



Figur 7. Frekvens av utrymmenas utnyttjande innan och vid olika tidpunkter efter valpnögg. (Endast honor med valpar ingår.)

Thesis, 38 pp. Sveriges Lantbruksuniversitet. Inst. för husdjurens utfodring och vård, Box 7024, S-750 07 Uppsala, Sweden. In SWED, Su. ENGL. 5 tables, 8 figs., 29 refs. Authors' summary.

The use of heated models to describe the thermal environment in shelters for farm animals

Markus Pyykkönen

The dry bulb air temperature is still the most commonly used parameter to characterize the thermal environment, though it disregards the effect of air velocity and the thermal properties of the flooring material on the heat loss from the animal.

Measurements in the laboratory confirmed that an uninsulated heated model with an overall thermal resistance of $0.11 \text{ m}^2 \text{ KW}^{-1}$ is sensitive enough to differentiate between changes in conduction, convection and radiation conditions.

Measurements on farms showed that the heat loss simulated by mechanical models gives a more diversified description of the thermal environment than the dry bulb air temperature. Although the uninsulated mechanical model is not a standardized device, it is a useful method for measuring the thermal environment especially under sheltered winter conditions.

Agric. Sci. Finl. 1, p. 539-545, 1992. 3 tables, 1 fig., 12 refs. Author's summary.

Studies on the resting site ecology of marten in the Central Rocky Mountains

Steven W. Buskirk, Henry J. Harlow, Steven C. Forrest

Studies on the resting site ecology of marten (*Martes americana*) in the central Rocky Mountains are described. Body temperature dynamics, ambient temperature-specific metabolic rates, ecological characteristics of resting sites and the relationship between resting site use and environmental factors are being studied. These studies will provide insight into the basis for the old-growth association of marten.

General technical report RM - Rocky Mountain forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service 1987, No. 147, p. 150-153. 1 table, 2 figs., 26 refs. Authors' abstract.

Mink as a predictive model in toxicology

Edward J. Calabrese, Richard J. Aulerich, George A. Padgett

This paper reviewed the biomedical and toxicological database concerning the use of mink as a predictive model of human responses. It is concluded that substantial information exists on the mink genetics, physiology, metabolism, nutritional requirements, and susceptibility to infectious disease; and provides a foundation upon which interspecies extrapolation may be considered. In addition, information on the response of mink to several dozen toxic substances revealed that mink respond in a qualitatively and quantitatively similar manner to other more commonly employed species as well as humans. Our conclusion does not infer that mink should be used routinely in toxicological testing for estimation of human responses. However, it indicates that toxicological data from this species may be a useful complement in risk assessment processes based upon data obtained from traditionally employed models such as rats and dogs.

Drug Metabolism Reviews, 24 (4), p. 559-578, 1992. 6 tables, 70 refs. Authors' summary.

Evaluation of Larvadex insect growth regulator for use with mink

R.J. Aulerich

The results of this study indicate that, when fed to mink at concentrations from 1.5 to 10 ppm, Larvadex provided a safe and effective means for controlling flies propagated in the feces of treated mink. High concentrations (100 ppm or more) of Larvadex resulted in decreased feed consumption by mink.

Research Report from the Michigan State University Agricultural Experiment Station, East Lansing, No. 508, p. 29-37, 1991. 6 tables, 1 refs. Author's conclusion.



Evaluation of rabon oral Larvicide for use with mink

R.J. Aulerich, R.K. Ringer, S.J. Bursian

Except for the reduced mink body weight gains, the results of this study indicate that ROL is a safe and effective method of fly control for use with mink.

Research Report from the Michigan State University Agricultural Experiment Station, East Lansing, No. 508, p. 18-28, 1991. 7 tables, 1 fig., 3 refs. Authors' conclusion.

Morphofunctional evidence for the involvement of hypothalamic dopaminergic and GABAergic neurons in the mechanisms of photoperiod-dependent prolactin release in the mink

Line Boissin-Agasse, Marcel Tappaz, Gisèle Roch, Claude Gril, Jean Boissin

This study was designed to examine possible relationships between the photoperiodic regulation of prolactin secretion and the activity of dopaminergic and GABAergic neurons projecting to the external layer of the median eminence. The study was carried out on the mink whose remarkable photosensitivity has been clearly demonstrated. The animals were reared in short (4L:20D) or long (20L:4D) photoperiods.

The experiment began in November when day length is short (9.5 h). Dopaminergic and GABAergic neurons were studied using immunocytochemical methods allowing evaluation of the immunoreactivities of tyrosine hydroxylase (TH) and glutamate decarboxylase (GAD), which are respective markers of these neurons. The results were quantified by image analysis. The plasma prolactin level of animals maintained in 4L:20D decreased after 60 days and TH and GAD immunoreactivity was strongly stimulated. After 110 days, the prolactin concentration and TH and GAD immunoreactivity recovered their starting levels. In animals maintained in 20L:4D, the prolactin level was 3 times higher than at the beginning of the photoperiodic treatment but only dopaminergic neurons showed a change, i.e., a decrease in immunoreactivity. At the end of the experi-

ment, prolactin secretion was no longer affected by the stimulatory effect of long-day treatment, and TH immunoreactivity remained low. These results confirm the generally accepted concept that dopaminergic neurons are potent PIF-producing components. GABAergic hypothalamic system appears to be implicated in photoperiodic PRL regulation, but this remains to be clearly demonstrated.

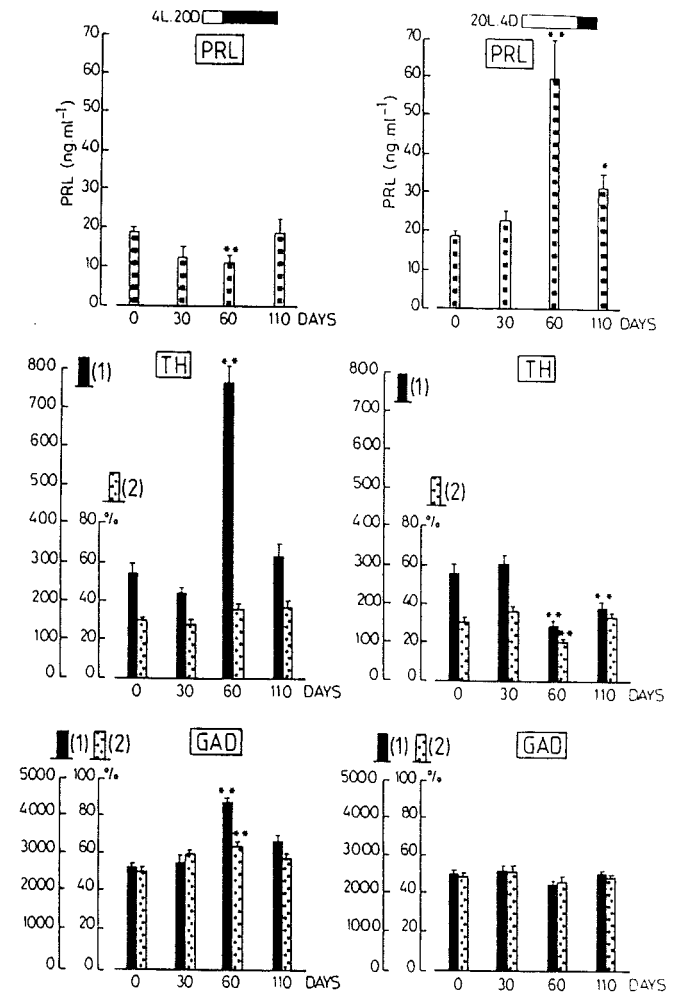


Fig. 1. Plasma PRL levels and variations of TH and GAD immunostaining of axonal endings in the median eminence of mink reared for 30, 60 and 110 days in a short photoperiod (4L:20D) or a long photoperiod (20L:4D). (1): immunolabeling intensity/immunolabeled area unit. (2): % of immunolabeled area with regard to the area of the zone where the dopaminergic or GABAergic neurons terminated. *P < 0.05; **P < 0.01 vs. initial value.

Neuroendocrinology, 53, p. 537-542, 1991. 2 figs., 36 refs. Authors' summary.

Intracranial allometry and craniological changes in relation to domestication of silver foxes

L.N. Trut, F.Ya. Dzerzhinskii, V.S. Nikol'skii

10 ratios between cranial measurements were determined on 95 female and 92 male foxes from a commercial population (controls) and on 118 female and 118 males from a population that had been selected for tameness.

There were significant differences between the 2 populations for 5 measurements in females and 7 measurements in males. Allometric coefficients are illustrated in histograms. In the controls, there was marked sex dimorphism for 8 of the ratios and for allometric coefficients in respect of 5 of them. Sex dimorphism in the selected population was much more weakly expressed, especially for allometric coefficients.

Genetika, 27; 9; p. 1605-1611, 1991. 1 table, 2 figs., 9 refs. CAB-abstract.

Serum proteins of polar foxes - separation on polyacrylamide gel

A. Brodacki, K. Kostro

Serum proteins of 7 males, 9 females and 50 offspring were separated using horizontal electrophoresis on polyacrylamide gel (pH 8.6, tris borate buffer).

The proteins were divided into 30 to 35 bands, classified among the following regions and sub-regions; prealbumins (Pa₁, Pa₂, Pa₃, Pa₄, Pa₅), albumins, postalbumins (Poa₁, Poa₂, Poa₃), pretransferrins (Ptf₁, Ptf₂, Ptf₃, Ptf₄), transferrins (tf) and posttransferrins (Potf₁, Potf₂, Potf₃). The Poa₁, Poa₂, Ptf₂, Ptf₃, Tf, Potf₂ and Potf₃ regions differed with regard to the number of bands and rate of migration.

Medycyna Weterynaryjna, 47 (5), p. 224-225, 1991. 1 fig., 10 refs. Authors' summary.

Adrenal function in ferrets: plasma cortisol and corticosterone responses to synthetic ACTH administration

K.L. Rosenthal, M.E. Peterson, K.E. Quesenberry, C.D. Lothrop

Adrenocortical diseases in pet ferrets (*Mustela putorius furo*) has recently been recognized, but there are few studies of the adrenocortical response to ACTH stimulation in ferrets. The purpose of this study was to establish a protocol for an ACTH stimulation test in ferrets. Eight normal, adult ferrets (4 males, 4 females) weighing 0.59-1.96 kg were studied. Four different dosages (0.5 µg/kg, 1.0 µg/kg, and 10 µg/kg) of synthetic ACTH (cosyntropin) were administered IV in random order, with blood samples collected before and 60 and 120 minutes after administration. After completion of the IV studies, an additional test was performed by IM administration of 1.0 µg/kg ACTH. Plasma concentrations of cortisol and corticosterone were determined by RIA. The baseline plasma cortisol concentrations from all studies ranged from 25.9 to 235 nmol/L (mean ± SEM = 73.8 ± 7.0 nmol/L), and the resting plasma corticosterone values ranged from 1.7 to 47 nmol/L (means = 8.3 ± 1.1 nmol/L). After the IV administration of the 4 dosages of ACTH, plasma concentration of both cortisol and corticosterone increased significantly and reached peak values at 60 minutes. There were no significant differences between plasma cortisol or corticosterone responses to the 4 dosages of ACTH administered. Intramuscular administration of 1.0 µg/kg ACTH elicited increases in plasma cortisol and corticosterone concentrations that were similar to the responses after IV administration. The mean molar ratio of cortisol:corticosterone, calculated from the resting concentrations, was ~ 9:1, whereas the ACTH-stimulated ratio was ~ 4:1. Results of this study indicate that administration of ACTH to normal ferrets, at dosages ranging from 0.5 to 10 µg/kg, increases plasma concentrations of both cortisol and corticosterone. Cortisol,



however, appears to be the predominate circulating glucocorticoid in ferrets. We found no difference between adrenocortical responses to IV and IM administration of ACTH, suggesting that either route of administration elicits a maximal response.

Journal of Veterinary Internal Medicine, Vol. 6, No. 2, p. 109, 1992. Only abstract received. Authors' abstract.

Adrenocortical disease in 47 ferrets

K.L. Rosenthal, M.E. Peterson, K.E. Quesenberry, E.V. Hillyer, S.D. Moroff, N. Beeber, C.D. Lothrop

Adrenocortical disease (hyperadrenocorticism) in pet ferrets (*Mustela putorius furo*) has recently been recognized, but only 3 cases have been reported. We report here 47 ferrets with hyperadrenocorticism-like disease, including clinical signs, diagnosis, and treatment. Thirty-three (70%) of the ferrets were female and 14 were male; only 1 female was sexually intact. The mean age of onset was 3.4 years. The most common clinical sign was vulvar enlargement, noted in 30 of the 33 females (91%). Alopecia, involving the tail, flanks, and trunk was present in 40 (85%) of the 47 ferrets. Other signs included pruritus in 18 (37%), and polyuria and polydipsia in 4 (8.5%). Physical examination revealed a mass at the cranial pole of the kidney in 15 ferrets (32%). Hematologic testing revealed anemia in 4 and thrombocytopenia in 2 ferrets. ACTH stimulation tests were normal in all 20 ferrets tested. Radiographs were unremarkable in all ferrets, whereas ultrasonography, performed in 36, identified an adrenal mass in 18 (50%). Surgical removal of the diseased adrenal gland was performed in 36 ferrets. Five ferrets died of complications in the immediate postoperative period. In the remaining 31 ferrets, resolution of vulvar swelling, alopecia and pruritus was noted by 5 months. Complete necropsy was performed in the 11 ferrets not treated. Histopathologic studies revealed adrenocortical adenoma, carcinoma, or nodular hyperplasia in all ferrets. Metastasis was not identified at time of surgery or at necropsy in any of the

ferrets. These results indicate that adrenocortical disease (usually adrenal neoplasia) develops with some frequency in pet ferrets. In the broadest sense of the word, these ferrets do have hyperadrenocorticism but it should not be assumed that excessive production of cortisol is responsible for the syndrome since ACTH stimulation tests were normal. Adrenal steroids other than cortisol are likely to be responsible for this disease in ferrets because clinical signs of vulvar enlargement, alopecia, and pruritus resolve after removal of the diseased adrenal gland.

Journal of the Veterinary Internal Medicine, Vol. 6, No. 2, p. 109, 1992. Only abstract received. Authors' abstract.

Early maturation of the coat in foxes

I.I. Kravtsov, G.A. Kuznetsov

Data were obtained on 3 groups, each of 10 silver-black foxes, implanted at the beginning of June with 20 or 40 mg melatonin or not implanted (controls). Maturation of the coat was completed 23 and 25 days earlier in the 2 treated groups resp., than in the controls, but there was no difference in coat quality. In a follow-up experiment, groups of 20-30 foxes were housed in sheds shaded so that the light allowance in July-Sep. would be 40 lux (groups 1-5), or were kept under natural light (groups 6-10). Various groups were given different implants of melatonin (10 or 20 mg) on different dates (1 or 16 July, 1 Aug.). At cropping, the largest animals were those housed under restricted light and given the 20 mg implants on 16 July (body weight 6973 g, body length 69.4 cm, and coat mature 6 days earlier than in controls) and those housed under natural light and given the 20 mg implants on 1 July (body weight 6803 g, body length 70.0 cm, and coat mature 24 days earlier than in unimplanted controls). The animals in the first of these 2 groups received the highest points (110.3) for overall pelt quality and a low percentage of defective pelts.

Krolikovodstvo i Zverovodstvo, No. 2, p. 8, 1990. 2 tables. In RUSS. CAB-abstract.

A scanning electron microscopic study of dermal collagen fibers in growing mink

Tadayuki Nishiumi, Fumio Nakamura, Keiji Kondo

Morphological changes in dermal collagen fibers in growing mink were investigated using a scanning electron microscope (SEM).

The SEM view of dermal collagen fibers varied throughout the newborn, growing and mature skin phases. The reticular layer of newborn mink dermis was plate-like, and appears to be composed of fine collagen fibers, proteoglycans and glycoproteins. With mink growth, randomly entangled dermal collagen fibers, which were relatively fine and curled or waved, showed regularity of the three-dimensional network.

A three-dimensional network of thick collagen fibers was observed in the mature mink dermis, and the fiber arrangement altered in relation to the depth from the epidermis, i.e. in the upper dermis, many fibers were arranged diagonally to the skin surface, whereas in the mid and deep dermis, thick fibers were conspicuously arranged parallel to the skin surface. The collagen fiber network was formed by repeated branching and anastomosis of the fibers.

There were thin elastic fibers in the dermal-epidermal junction and between the collagen fibers and skin appendages.

Journal of the Faculty of Applied Biological Science, 30; 2, p. 103-111, 1991. In ENGL, Su. JAPN. 6 figs., 19 refs. Authors' abstract.

Anisotropy of physical-characteristic functions of fur leather

E. Mäntysalo, M. Marjoniemi, E. Kempainen

According to recent investigations carried out in the LFLT the leather of fur has properties which must be considered anisotropic in nature contrary to those considered true random variables. Leather properties are functions of orientation angle and position coordinates of samples. Results are given for the leather of male and female blue fox (*Alopex lagopus*) and

scanblack mink (*Mustela vison*) in the cases of breaking and elongation experiments. Four sample groups of fox leather (46 foxes) and one sample group of mink leather (21 mink) of different backgrounds as random subsets from the production of the year 1988 were investigated. All leathers were aluminum-tanned.

The Journal of the American Leather Chemists Association, vol. 86 (4), p. 133-139, 1991. 1 table, 15 figs., 10 refs. Authors' abstract.

The arteries of the brain base in chinchilla, *chinchilla laniger* (Molina)

Tadeusz Roskosz, Ryszard Jablonski, Cezariusz Wiland

The investigations were carried out on 28 brains of animals of both sexes. The blood-vascular system was filled with latex through the abdominal aorta. The material was fixed in 5% formalin and then the bones of skull and cervical vertebrae were decalcified in 5% nitric acid. The prepared brains with blood vessels were placed in a 1% solution of hydrogen peroxide. It has been noted that the main source of vascularization of the brain in chinchilla is the basilar artery and the continuation of its division - the cerebral arterial circle which are supplied with blood by the vertebral arteries exclusively.

Annals of Warsaw Agricultural University SGGW-AR, Veterinayr Medicine, No. 14, p. 23-28, 1988. In ENGL, Su. POLH. 1 fig., 13 refs. Authors' abstract.

Studies in carcass and meat quality of nutria

Susanne Herrmann, Anne-Kathrin Müller

Studies were conducted into standard-coloured nutrias aged six to seven months. The average live weight of male animals amounted to 8.02 kg, more than one kilogram in excess of the value recorded from females. Sex-related weight differences were also recorded from carcasses and meat portions. The average slaughter yield was as high as 67.6 percent. Meat pH values 24 hours after slaughter varied between 5.4 and 6.1. Average juice retention amounted to 81 percent. Muscle fibre thick-

ness was 30 μm . Meat of juvenile nutrias was brighter in colour than that of animals in more advanced age. The average grill loss of 38.5 percent was rated high. Correlations among various meat quality parameters are discussed in some detail.

Mh. Vet.-Med. 46, p. 746-749, 1991. In *GERM, Su. ENGL.* 3 tables, 18 refs. Authors' summary.

Macrostructure differences of polar fox and dog lungs

T.V. Voyevoda, G.S. Shishkin, R.I. Valitskaya, N.D. Umantseva

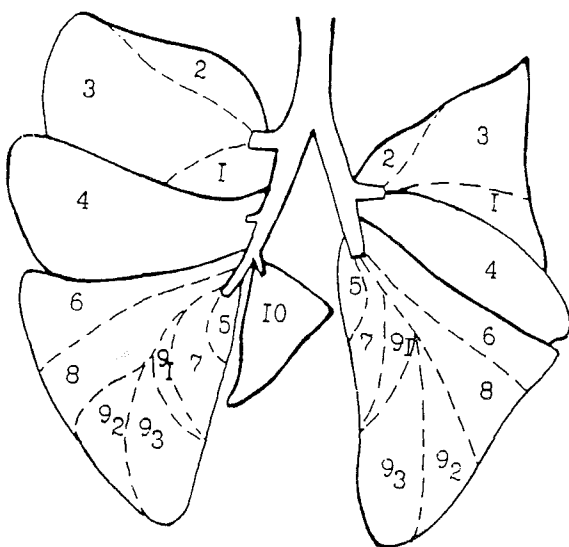


Fig. 2. Scheme of the segmentary structure of polar fox lungs: 1-3, segments of cranial lobes; 4, segments of middle lobes; 5-8, 9₁, 9₂, 9₃, segments of caudal lobes; 10, segment of additional lobe.

The lungs of the polar fox and dog have the typical form and lobular structure characteristic of beasts of prey. Both display secondary fusion of the cranial and middle lobes in the left lung, but this is more extensive in the fox. A consistent relationship between the beast body mass and the mass and volume of the lungs is present. The relative weight of dog lungs independent of body size (weight index) is 1.7 times that of the polar fox. In the latter

the parenchyma is much more subdivided than in the dog. There are 23 segments per lung pair in the polar fox, compared to 19 in the dog. Although these are of unequal size throughout the lungs of both species, corresponding segments in the fox are about half as large as those in the dog. The greater segmentation of polar fox lungs may be of assistance in restricting the spread of inflammatory processes.

The Anatomical Record 234, p. 89-92, 1992. 3 tables, 2 figs., 16 refs. Authors' abstract.

Control of flies and fleas on mink farms

Chr. Munck

In this general account, the regulations relating to hygiene on fur farms, including the removal of manure and control of flies are outlined. The life cycles of flies and fleas are described and the insecticides recommended for the different stages are tabulated. Details are given of the active ingredients, dosage, application methods, trade names, manufactureres and importers in Denmark.

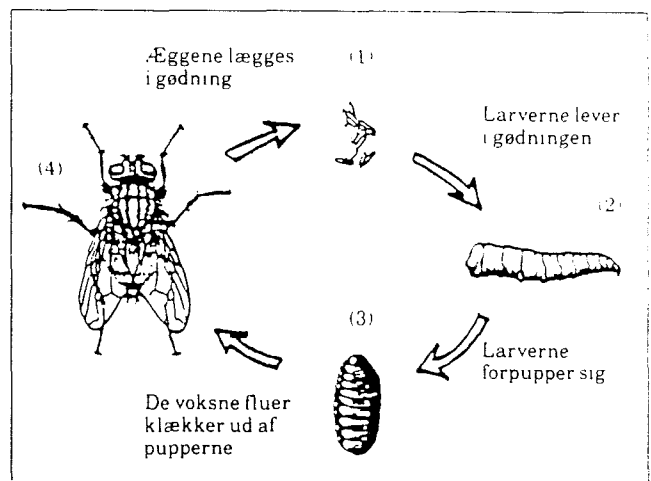


Fig. 1. Development of the common fly

Dansk Pelsdyravl, 54; 2; p. 36-39, 1991. In *DANH.* 2 tables, 3 figs. CAB-abstract.

Ecology of the European otter, *Lutra lutra*, in the Marais Poitevin. III. Spatial variations of the diet and comparisons with the fish resources.

*Roland M. Libois, René Rosoux, Etienne Delo-
oz*

During the spring 1988, spraint samples were collected on the banks of 3 watercourses (one river and two canals) crossing the marais Poitevin. Their general characteristics (low rate, conductivity, hydrographic regime) are quite different.

The fish community of the two canals was sampled by electrofishing and we estimated the relative abundance of the different fish species.

After a check of the reliability of our spraint analysis technique (feeding trials with captive otters), we made an estimate of the relative abundance of the prey items in the otters diet and an assessment of the length and of the weight of each individual fish preyed upon. There are indeed very strong length-weight correlations in fish and also close relationships between the length of some skull bones and the total length of a fish.

The diet is mostly made up of eel. It comprises also a great variety of other fish species, nearly all that were observed in the habitat. Much frogs, some snakes, birds, mammals, insects and crustaceans were also discovered. There are only slight diet differences between the main watercourses which probably are related to the characteristics of their fish fauna (e.g. much more sticklebacks when waters are becoming brackish; big amount of *Atherina* in salt marches). No marked variations were

found during a normal summer but fish are obviously less eaten during a severe drought.

Comparing the length frequency-distributions of fish in the diet and in the habitat, we found no selective predation in respect to fish (eel, cyprinids) size. From that point of view, the otter display a generalistic-opportunistic pattern of foraging. As far as the relative abundance of the various species is considered, otters take much less roaches and much more eels or tenches than present in the habitat. It remains to be seen if that is the consequence of a "deliberate choice" or of a peculiar way of underwater hunting. It is a fact that the otter principally eats bottom living fishes.

Cahiers d'Ethologie Appliquee, vol. 11 (1), p. 31-50, 1991. In FREN, Su. ENGL. 10 tables, 4 figs., 44 refs. Authors' summary.

Evaluation of the bionic[®] trap to quickly kill mink (*Mustela vison*) in simulated natural environments

Gilbert Proulx, Morley W. Barret

The Bionic[®] trap, with a bait placed at the back of a 6 cm aperture plastic cone, successfully killed nine of nine wild mink (*Mustela vison*) in simulated natural conditions. The average times to loss of consciousness and heartbeat were estimated at <60 (± 26) sec and 340 (± 55) sec, respectively, after firing the trap. This study confirmed that the Bionic trap can be expected to render >79% of captured mink unconscious in ≤ 3 min ($P < 0.05$).

Journal of Wildlife Diseases, 27 (2), p. 276-280, 1991. 1 table, 1 fig., 12 refs. authors' abstract.



Breeding and selection of mink

H. Pingel, R. Krieg

An account is given of the selection of mink for fertility, viability, body size and pelt quality. Suggestions are made regarding selection intensity, performance testing and line crossing, and data are presented.

Deutsche Pelztierzüchter, 65 (5), p. 88-91, 1991. 2 tables, 2 figs. In *GERM. CAB-abstract*.

Immunochemical and genetic characteristics of blood in mink naturally and experimentally infected with the Aleutian disease virus

N.A. Popova, D.K. Tsertsvadze, T.I. Kochlashvili, M.A. Savina, I.I. Fomicheva, L.A. Skripkina, V.I. Ermolaev, O.K. Baranov

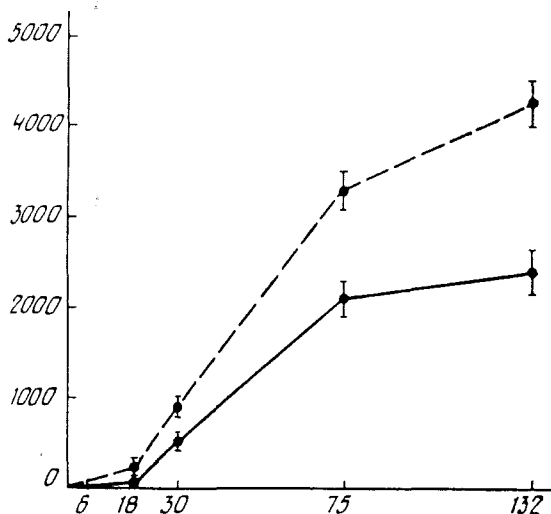


Рис. 3. Динамика увеличения титра противовирусных антител при алеутской болезни норки. По оси абсцисс — сутки после заражения; по оси ординат — обратный титр антител. Сплошная линия — норки окраса стандарт, пунктирная — сапфир.

A relationship between predisposition to Aleutian disease (AD) and a series of genetic markers, the latter being part of 4 genetical systems of serum proteins, in mink and of coat color genes has been analysed. Specifics of the disease immunopathogenesis in mink with different genotypes have been examined as well. An apparent dependence was displayed between AD-predis-

position and allotypes of hard chains of the H3 and H4 immunoglobulins as much as between the Ld²-allotype of low density lipoprotein and coat color gene a. Quantitative changes of immunoglobulin levels in all three classes, antiviral antibodies and immune complexes characterize AD immunopathogenesis in mink with two color types - sapphire and standard phases. The data obtained confirm that α -macroglobulin system is "a party concerned" in viral infection and that logically offers new approaches to understanding the mechanisms of resistance to viral infections including AD.

Sel'skokhozyaistvennaya Biologiya, No. 6, 67-73, 1989. 2 tables, 4 figs., 20 refs. In *RUSS, Su. ENGL. Authors' summary*.

Captive breeding of black-footed ferrets (*Mustela nigripes*) and comparative reproductive efficiency in 1-year-old versus 2-year-old animals

C.F. Carvalho, J.-G. Howard, L. Collins, C. Wemmer, M. Bush, D.E. Wildt

The recovery effort for the black-footed ferret (*Mustela nigripes*) is one of the most ambitious survival plans ever initiated for a wild animal species. Presently, there are three captive breeding programs for this endangered species in North America. This paper describes the facilities management protocols for the colony at the Conservation and Research Center of the National Zoological park. One- and 2-yr-old black-footed ferrets were maintained in an open-air out-of-doors environment under natural light and managed under quarantine conditions. Data were analyzed for impact of age on colony reproductive performance. When standardized to the day of copulation, all females, regardless of age, demonstrated similar ($P>0.05$) temporal profiles in vaginal cornification indices and vulvar tumescence. The only distinguishing feature between 1- and 2-yr-old females was that the older animals generally initiated copulatory activity 2-4 wk earlier than yearlings. Mean testes volume in males increased from February to April, but maximal testes volume was reached earlier in the year in older versus younger males. All six females copulated and, with the exception of a single female in both 1989 and 1990, became pregnant and produced young. The mean (\pm SEM) duration of gestation was 42.2 (\pm

silver fox (*Vulpes vulpes* Desm.) population. The population has been selected for this trait for more than 30 years. For this purpose a genetic statistical analysis of three phenotypes was made. The phenotypes are: 1) domestication index (ID) - a linear function of 24 simple behaviour patterns, 2) sociability (S) - motivation of a fox to contact with a human, and 3) critical distance (CD) - motivation of fox to escape contact.

Seventeen families (437 foxes) were used for the analysis. Each family consisted of 3-6 generations. ID was estimated for 360, S for 382 and CD for 382 foxes. Correlations 1) between sibs (Rfs) 2) parents - offspring (Rpo) and 3) common correlation (Rs) (i.e. correlation between the measured and predicted value by the method of multiple regression) were taken as a linear measure of genetically determined similarity between relatives. A hypothesis of major-gene inheritance was checked by the packet of programs MAN-17. The hypothesis is accepted only if 3 criteria, i.e. those of (1) differences in mean genotypic values, (2) equilibrium segregation of major-gene alleles and (3) predictive value of the major-gene model - are met simultaneously. This hypothesis was not accepted, because neither of the traits met all the above criteria.

As correlation Rpo, Rfs and Rs were significant for these traits seemed to have additive variability. However, the correlations were the highest for ID, which shows that the most successful was selection for this trait.

A comparison of Rpf, Rfs and Rs for ID, S and CD in two groups of animals, differing in degree of domestication, pointed to a decrease of the additive variability for ID. So, the comparative analysis of the three quantitative traits of domesticated behaviour of foxes has demonstrated that 1) all the traits studied have polygenic inheritance, 2) judging by the values of additive genetic variability and the tendency of its change in the course of selection, the phenotype most adequate for selection is ID - a linear function of initial elementary behaviour patterns.

Sibirskii Biologicheskii Zhurnal, no. 6, p. 24-27, 1991. 2 tables, 15 refs. In RUSS, Su. ENGL. Authors' summary.

Some quantitative characteristics of blastocysts of silver foxes under domestication

L.A. Kolesnikova

Several quantitative features of embryos of relatively wild and domesticated female foxes on the 10th day after mating were studied.

A tendency to increase the number of corpora lutea was noted in domesticated foxes' ovaries. The blastocyst size and the number of trophoblast and embrioblast cells in foxes of two contrasting behavioural groups did not differ at this developmental stage.

Sibirskii Biologicheskii Zhurnal, No. 6, p. 21-24, 1991. 3 tables. In RUSS, Su. ENGL. Author's summary.

Electron microscopic analysis of behaviour of sex chromosomes in meiosis of the American mink (*Mustela vison*)

P.M. Borodin, I.P. Gorlov

Behaviour of the X- and Y-chromosomes of the American mink (*Mustela vison*) was studied at metaphase I and at pachytene. During metaphase I, the Y is connected with the X through its short arm. At early pachytene, the SC is well formed along the entire length of the Y. In the next step, desynapsis of SC begins from the centromere of Y. The unpaired region of the X axis is heteropycnotic and shows a lot of splits and anastomoses. A dense structure which is similar to attachment plugs of autosomal SCs was revealed in the X axes of mink at early and midpachytene. At the later pachytene, the free centromere of partially desynapsed Y, and the above mentioned region of X (which is probably also a centromere or a long arm's telomere) form an additional anomalous synapsis. This heterosynapsis is very unstable and disappears by the end of the pachytene.

Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, Seriya Biologicheskikh Nauk, 27, No. 1, p. 10-12, 1990. 1 fig., 9 refs. In RUSS, Su. ENGL. Authors' summary.

Colour genes in foxes

L.N. Trut

Studies on the inheritance of coat colour in foxes are reviewed. The bibliography is not printed in the journal.

Doklady Vsesoyuznoi Ordena Lenina i Ordena Trudovogo Krasnogo Krolikovodstvo i Zverovodstvo, no. 2, p. 4-5, 1992. 1 photo. In RUSS. CAB-abstract.

Improved methods of selecting sires

T.D. Demina

Male mink for mating were selected on the basis of high birth, weight and the results of palpation of the testes in Oct.-Nov. Males selected by this method were more sexually active than other males (5.1 vs. 3.8 females mated per male; $p < 0.001$), but litter size was not significantly different between selected and other sires. Additional data supporting this method of selection are presented. In another experiment, 58 male mink were placed with females in the breeding season, at a ratio of 1 male to 8 females, and oestrus was synchronized by unspecified hormone treatment. 58 control males were placed with non-synchronized females, at a ratio of 1 male to 54 females. In the synchronized and non-synchronized groups resp., duration of the breeding season averaged 13.5 and 19.5 days, the number of matings per male 8.1 and 12.6, the number of matings per female 1.1 and 2.7, litter size 6.4 and 6.2, and the number of kits per female at registration 4.4 and 4.1. The differences in the number of matings were significant.

Krolikovodstvo i Zverovodstvo, No. 5, p. 7-8, 1991. Only abstract recieved. CAB-abstract.

Methodological approach to the genetic-selection analysis of the social behavior of animals (on the example of the domesticated behavior of silver foxes)

L.L. Vasil'eva, I.L. Chepkasov

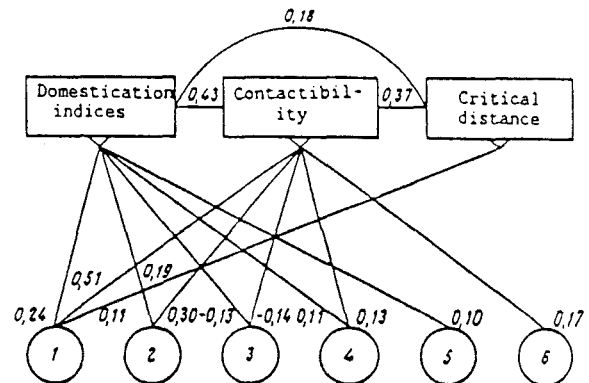
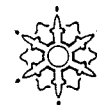


Fig. 2. Correlations of domestication indices, contactability and critical distance with one another and with forms of behavior tested in an "open field": 1) number of squares crossed; 2) number of risings onto hind legs; 3) latent period; 4) number of urinations; 5) number of defecations; 6) number of vocalizations. Note: only statistically significant correlations ($p < 0.05$) are presented.

One of the types of social behavior of animals, namely, interspecies contacts with humans, evolving in the course of domestication, is discussed. The transformation of contactability and critical distance (traits characterizing the social behavior of animals and inverted with respect to humans under conditions of domestication) is investigated on a population of silver foxes subjected to a multi-year model experiment on domestication. A parallel examination is made of



the domestication index - an integral characteristic of the behavioral response of an animal during social contacts with humans (its values are calculated as a linear function of elementary behavioral postures, acts, and reactions, determinable by the mathematical method of major components). A comparative analysis of these characteristics is performed on a population of foxes of different levels of domestication in three aspects: 1. According to the nature of the genotype-environmental interaction, where prolonged contacts with humans, reactivity to whom should play a vital role as the domestication process develops, act as the environment;

2. According to the nature of correlations with other forms of behavior that undergo a change in the course of domestication and therefore can be markers of degree of evolutionary transformations of the population to be domesticated; 3. According to the nature of the inheritance and values of the linear genetic relationships between relatives. The domestication index was found to more adequately reflect the evolutionary transformations of social interactions of humans and animals under conditions of domestication and therefore has more selection value in the course of further modeling of the domestication process.

Soviet genetics (USA), Vol. 27 (5), p. 620-627, 1991. 4 tables, 2 figs., 30 refs. In ENGL, RUSS, Su. ENGL. Authors' summary.



Original Report

Morphological and biochemical indices as well as the iron level of blood of mink fed a diet with chemically preserved feed additives

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Summary

The experiment was carried out on 30 standard mink divided into three groups. In the meal ration of the first experimental group, 25% of meat-fish fodder was replaced by slaughter blood preserved with sulphuric acid. The meal ration of the second experimental group was the same as that of the control group but formic acid was added to the fodder.

The supplementation of mink feed with sulphuric and formic acid did not have any negative influence on the morphological and biochemical picture of peripheral blood. Chemical preservatives did not result in changes in the iron level of blood plasma, total iron binding capacity with plasma proteins nor in tested acid-base balance parameters.

Introduction

In Poland, chemical preservation experiments on fur carnivorous animals have been carried out since the 1980s (1;2;3;4;5). The effect of different raw materials as, for example, slaughter blood, fish and slaughter offals preserved with organic and nonorganic acid as well as with formaldehyde on physiological and performance

indices of polar foxes, mink and ferrets were tested. In the Scandinavian countries there have been carried out experiments with different kinds of acids (refs. 6, 7, 8, 9, 10, 11, 12). Scientists in Denmark observed the effect of non-organic acids on the digestibility of nutrients (ref. 7), acid-base balance of blood (ref. 10) and the passage time through the stomach and intestines in mink (ref. 6). Pölönen et al. (ref. 9) examined young mink during the growing period when 20% of slaughter offals preserved with acids were added to the meal ration. There were no differences in tested parameters between control and experimental groups.

Material and methods

The experiments were carried out on 30 standard mink divided into three groups. The control group of animals was fed a standard diet. In the meal ration of the first experimental group (E1), 25% of meat-fish fodder was replaced by slaughter blood preserved with sulphuric acid (0.7 kg sulphuric acid was added to 100 kg blood). The meal ration of the second experimental group (E-2) was the same as that of the control group but 5 ml formic acid was added to 1 kg fodder. The investigations covered the period from 1 September to 15 December 1991.

In blood samples collected twice from all mink (November and December) the following morphological indices were indicated:

1. Number of red blood cells;
2. Number of white blood cells;
3. Haemoglobin content;
4. Haematocrit index;
5. Number of reticulocytes;
6. Leukogram.

In blood plasma collected in December also some biochemical indices were determined:

1. Total protein;
2. GOT activity;
3. GPT activity;
4. Cholesterol level;
5. Urea content;
6. Iron level;
7. Total iron binding capacity with plasma proteins (TIBC);
8. Iron saturation index (ISI);

pH and partial pressure of O₂ and CO₂ were also indicated in blood samples. Statistical analyses of results between control and experimental groups were conducted with analysis of variance and with Duncan test.

Results and discussion

The addition of 25% of slaughter blood preserved with sulphuric acid to the rations did not have any significant effect on the haematological indices of mink blood. The experimental feeding with formic acid also did not result in any unfavourable effects on the morphological indices of the blood (table 1).

Table 1. Haematological indices of mink blood

| Indice | Group of animals | | | | | |
|------------------|------------------|------------|----------------|-----------|-----------------|------------|
| | Control | | Experimental I | | Experimental II | |
| | I sample | II sample | I sample | II sample | I sample | II sample |
| Haemoglobin g/l | 209.4±0.74 | 206.4±1.21 | 204.5±1.09 | 209.4±0.7 | 206.9±1.57 | 204.1±0.98 |
| Haematocrit % | 0.58±0.03 | 0.59±0.02 | 0.58±0.03 | 0.59±0.2 | 0.59±0.18 | 0.59±0.02 |
| Leukocytes G/l | 6.17±1.48 | 4.38±2.56 | 6.21±1.62 | 4.35±2.05 | 5.09±1.27 | 4.03±1.21 |
| Erythrocytes T/l | 8.94±1.55 | 9.01±0.73 | 9.30±1.28 | 9.33±0.54 | 9.24±0.75 | 9.27±0.68 |
| Reticulocytes % | 23.5±5.18 | 23.9±5.37 | 22.4±4.57 | 21.5±3.26 | 20.1±4.85 | 21.1±5.53 |
| Lymphocytes % | 46.6±5.2 | 47.5±4.72 | 44.6±12.78 | 42.2±7.45 | 40.8±5.91 | 36.5±7.43 |
| Neutrophils % | 42.7±6.8 | 42.2±5.8 | 48.6±12.26 | 49.2±7.79 | 51.9±6.47 | 53.10±9.59 |
| Eosinophils % | 4.5±1.5 | 5.0±2.05 | 2.5±1.36 | 4.6±1.91 | 3.4±1.28 | 5.6±0.49 |
| Basophils % | 0.1±0.3 | 0.4±0.49 | 0.1±0.3 | 0.6±0.92 | 0.5±0.67 | 0.4±0.49 |
| Monocytes % | 6.2±2.99 | 3.6±1.85 | 3.2±1.66 | 3.4±2.06 | 3.4±1.02 | 4.5±2.33 |

Table 2. Biochemical indices of mink blood

| Parameter | Group of animals | | |
|----------------------|------------------|----------------|-----------------|
| | Control | Experimental I | Experimental II |
| Total protein (g/l) | 56.0±7.78 | 61.6±4.62 | 52.4±7.52 |
| GOT (umol/ml) | 4.50±1.3 | 3.72±1.75 | 5.51±3.1 |
| GPT (umol/ml) | 3.48±1.44 | 2.83±0.95 | 2.90±2.19 |
| Cholesterol (mmol/l) | 6.19±1.74 | 7.55±0.54 | 5.6±1.41 |
| Urea (mmol/l) | 6.06±1.04 | 6.55±0.54 | 6.6±0.54 |

The haemoglobin content was similar in all groups of animals and oscillated between 204.1-209.4 g/l blood. The haematocrit index was contained within the bounds of physiological norms. The number of red blood cells oscillated between 8.84-9.33 T/l. Also the number of reticulocytes in the blood of the control and experimental group was similar.

On the grounds of the morphological indices of the blood erythroblastic system in this experiment we can assume that the supplementation of mink fodder with sulphuric acid preserved feed in the 1st experimental group and with formic acid in the 2nd experimental group did not have any negative influence on the erythropoiesis.

The number of white blood cells was contained within the bounds of physiological norms and oscillated between 4.03 ± 6.21 G/l. The leukocytical picture did not show any deviation from physiological norms so we can assume that replacement of meat-fish fodder by preserved blood or addition of formic acid did not have an effect on leukopoiesis.

The total protein of blood plasma of the experimental groups was nearing the control group and hesitated between 52.4-61.6 g/l.

The activity of tested indicatory enzymes-aminotransferases of blood of mink fed the diet with chemically preserved feed additives did not increase so we can ascertain that acid-preserved feed did not have a negative effect on liver function.

As is well known, urea is the final metabolite of protein metabolism. The urea content of blood plasma in our experiment was similar in all animals and oscillated between 6.06-6.60 mM/l. Thus the intensity of catabolism of constitutional proteins was at the same level in all mink.

Iron is an important element of mineral balance in organism and plays a great part in biosynthesis of haemoglobin, myoglobin and some enzymes. The iron level in blood plasma and the content of proteins carrying iron are good indices of normal metabolism of this element. In our study the experimental feeding with sulphuric and formic acid did not result in any unfavourable effects on the iron level of blood plasma, total iron binding capacity with plasma proteins and iron saturation index (table 3). In experiments on polar foxes (ref. 1) the fresh slaughter blood was replaced by preserved slaughter blood and a part of meat offals was replaced by chemically preserved offals. The use of chemical additives did not affect the iron level of blood plasma and total iron binding capacity with plasma proteins.

The acid-base balance in the organism is the basic condition of homeostatis and the normal course of vital functions. The supplementation of mink fodder with acid preserved feed did not have a statistically significant influence over hydrogen ion concentration (pH) and the partial pressure of O_2 and CO_2 (table 4). In our experiment, carried out earlier we found a decrease in the pH of blood, the sum of hydrocarbonate and base excess in ferret fed a diet with a high content of slaughter blood preserved with sulphuric acid and sodium benzoate.

Table 3. The iron level and total iron binding capacity of mink blood

| Parameter | Group of animals | | |
|--------------------------------------|------------------|----------------|-----------------|
| | Control | Experimental I | Experimental II |
| The iron level (umol/l) | 43.9±7.53 | 39.84±4.59 | 38.8±2.12 |
| Total iron binding capacity (umol/l) | 59.96±7.64 | 65.12±6.59 | 67.05±15.99 |
| Iron saturation index (%) | 65.3±30.4 | 59.9±10.71 | 50.1±22.68 |

Table 4. pH and partial pressure of O₂ and CO₂ of mink blood

| Parameter | Group of animals | | |
|-------------------------|------------------|----------------|-----------------|
| | Control | Experimental I | Experimental II |
| pH | 7.18±0.14 | 7.24±0.08 | 7.23±0.05 |
| pCO ₂ (mmHg) | 42.5±6.77 | 47.91±10.53 | 45.63±6.34 |
| pO ₂ (mmHg) | 72.9±9.92 | 70.14±12.87 | 67.56±8.59 |

Conclusions

1. Mink willingly eat the diet with the addition of chemical preservatives.
2. The supplementation of mink feed with sulphuric and formic acid did not have any negative influence on the morphological and biochemical picture of peripheral blood.
3. Chemical preservatives did not result in changes in the iron level of blood plasma, total iron binding capacity with plasma proteins as well as in tested acid-base balance parameters.

References

1. Bieguszewski, H., Stanislawski, B., Lorek, O., Rewers, W. 1983. Zelazo i calkowita zdolnosc jego wiazania przez bialka osocza krwi tchorzofretek i lisow polarnych zywnionych karma z dodatkiem pasz konserwowanych srodkami chemicznymi. Zeszyty Naukowe ATR, 104, pp. 13.
2. Bieguszewski, H. 1984. Przyrosty masy ciala, strawnosc skladnikow pokarmowych dawki i wybrane wskazniki hematologiczne rosniacych lisow polarnych, zywnionych karma z dodatkiem pasz konserwowanych formaldehydem. Roczn. nauk. Rol. B 102, 3, iii.
3. Bieguszewski, H., Jaworska, G., Szymeczko, R. 1984. Czynnosc watroby i wybrane wskazniki hematologiczne u lisow polarnych zywnionych karma konserwovana. Medycyna wet, pp. 552.
4. Bieguszewski, H. Glowinska, B. 1992. Morphological and biochemical indices of blood of mink fed with chemically preserved feed additives. Norwegian Journal of Agricultural Sciences, 9, pp. 293.
5. Glowinska, B., Bieguszewski, H. 1992. The effects on some physiological and performance indices of adding formic acid preserved feed to the meat ration of ferrets. Norwegian Journal of Agricultural Sciences, 9, pp. 298.
6. Hansen, N.E. 1978. The influence of sulphuric acid preserved herring on the passage time through the gastrointestinal tract in mink. Zeitschrift für Tierphysiologie, Tierernährung und Futtermittelkunde, 40, 6, pp. 285.
7. Hansen, N.E., Glem-Hansen, H. 1980. Digestibility of crude protein, crude fat and carbohydrates in growing mink related to feeding with sulphuric acid preserved fish. Dansk Pelsdyravl, 43, pp. 59.
8. Jørgensen, S., Poulsen, J.S.D., Bendixen, P. 1976. The influence on breeding, production and acid-base balance when mink are fed on acidified feed. Nord. Vet.-Med. 28, pp. 592.
9. Pölönen, J., Dahlman, T., Mäkela, J. 1991. Feeding experiments on mink and foxes with acid preserved raw materials. Zesz. Nauk. ATR Zootechnika 20, 175, pp. 91.
10. Poulsen, J.S.D., Jørgensen, G. 1977. The influence of the pH of fed on the acid-base balance of mink. Nord. Vet.-Med. 29, pp. 488.
11. Poulsen, J.S.D., Jørgensen, G. 1986. Examination of mink (*Mustela vison*) fed a sulphuric acid preserved fish silage during lactation and growth period. 1. A clinical chemical examination. Nord. Vet.-Med. 38, pp. 90.
12. Skrede, A. 1980. Fish guts as feed for mink in the breeding period. Norsk Pelsdyrblad, 54 (11), pp. 568-570.

Original Report

The effect of different diets on the reproductive performance of raccoon dogs

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Summary

Feeding is the basic factor determining high productivity of raccoon dogs, reflected in their reproductive performance. Studies were carried out on 36 females and 18 males in their first reproductive season. The animals were divided into three equal groups and given diets differing as to the proportion of plant components and the energetic value. Reproductive performance of females was determined from the following parameters: terms of their first covering, number of barren females, number of females that bore and raised the puppies and litter size. In the case of males, attention was given to the initiation of their sexual activity and number of covered females. The best results were obtained in the group of animals given the diet containing 50-55% of plant components, in which 34-39% of the metabolic energy originated from carbohydrates.

Introduction

Recent studies have shown that it is problematic whether the raccoon dogs can be considered as carnivorous animals. A number of observations and studies carried out on wild raccoon dogs revealed that these animals fed also on different plant foods and that the share of animal feed in

their diet was much lower than it had been thought so far. In view of this, some authors classify raccoon dogs as omnivorous (refs. 1, 6, 7). This view is supported by the fact that raccoon dogs are able to utilize plant feed components much better than typical carnivorous animals such as foxes. Boguszewski et al. (ref. 3) studied digestibility of feed components in growing raccoon fed the diet containing high levels (50%) of animal components and found that these animals showed higher digestibility of these components, especially of non-nitrogen extractable substances, than foxes.

Feeding of farmed raccoon dogs is far from being solved. The problem consists not only of covering living requirements of the animals but also of supplying the diet that would result in their satisfactory performance. Special attention should be given to relatively low reproductive performance in cage farming compared to biological possibilities of this species observed in wild raccoon dogs (refs. 6, 7). Hence, it is fully justified that many authors seem to be engaged in these problems (refs. 2, 3, 4).

This paper is a continuation of the studies on rational feeding of raccoon dogs with special attention given to their reproductive performance.

Material and methods

Studies were carried out on a commercial farm breeding raccoon dogs. They were divided into two stages. The first stage embraced the diet of young raccoon dogs, from their weaning till complete development of winter fur. Weaned puppies were divided into three groups; each group contained 24 animals.

The puppies were randomly selected so as to have the same number of males and females from the same litter. In this stage of the studies the animals were fed ad libitum, and the daily feed rations were regulated according to the amount of eaten feed. The experimental factor consisted of diet composition which differed as regards the proportion of animal and plant components and the energetic value in particular breeding periods (table 1). The following feeds were used: refuse and remnants from a slaughter house, poultry refuse, fish (cod) refuse, sour

milk, barley and oat meal, wheat bran, hay, silage and vegetables, Polfamix "L".

At the end of stage 1 of the experiment 12 females and 6 males were randomly selected from each group. These animals were given diets containing different levels of plant components: 60% in group I, 50% in group II, and 40% of the total dose in group III. In the period prior to and during reproduction restrictive feeding was applied; each animal was given 200 g feeds daily. Pregnant and lactating females were fed ad libitum.

Females were covered three times on consecutive days of the heat, while the experimental males were used in the first place to obtain as many copulations as possible. Indices of reproductive performance in the first year of breeding were calculated after weaning the puppies (table 2).

Table 1. Composition and energetic value of rations

| Specification | Breeding period | | | | | | | | |
|--------------------------------|-----------------|------|------|-----------|------|------|------------------|------|------|
| | July-August | | | September | | | October-November | | |
| | I | II | III | I | II | III | I | II | III |
| Composition of rations (%) | | | | | | | | | |
| Feed of animal origin | 45 | 50 | 70 | 40 | 50 | 60 | 40 | 45 | 50 |
| Feed of plant origin | 55 | 50 | 30 | 60 | 50 | 40 | 60 | 55 | 50 |
| Protein-energetic ratio (g/MJ) | 17.4 | 20.1 | 28.4 | 16.2 | 18.4 | 24.6 | 15.8 | 17.9 | 21.0 |
| % of energy from: | | | | | | | | | |
| - protein | 32 | 36 | 53 | 30 | 33 | 46 | 30 | 33 | 39 |
| - fat | 22 | 25 | 23 | 29 | 33 | 23 | 27 | 30 | 23 |
| - carbohydrate | 46 | 39 | 24 | 41 | 34 | 31 | 43 | 37 | 38 |

Table 2. The result of raccoon dog reproduction

| Specification | | Group | | |
|-------------------------------------|--------|------------|-------------|-------------|
| | | I | II | III |
| FEMALES | n | 12 | 12 | 12 |
| Average date of first mating | | 75.8 | 73.8 | 75.0 |
| Barren | n % | 2 16.7 | - - | - - |
| After whelping | n % | 10 83.3 | 12 100.0 | 12 100.0 |
| Destroying the litter | n % | 4 40.0 | 2 16.7 | 2 16.7 |
| Rearing the litter | n % | 6 60.0 | 10 83.3 | 10 83.3 |
| Average number of puppies in litter | n | 7.3 | 10.2 | 8.0 |
| Number of reared puppies | % | 31.5 | 47.1 | 50.0 |
| MALES | | | | |
| Average date of first mating | | 75.1 | 73.0 | 76.1 |
| Average number of covered females | | 3.3 | 2.7 | 2.3 |

Results and discussion

Dates when the females were covered for the first time were given as consecutive days of the year. Analyses of this parameter revealed that the heat period appeared most early in the females from group II in which the percentage of plant components in the diet was 50-55%. Similar results were obtained for one year old females by Jezewski et al. (ref. 4). Barrenness was observed only in two females from group I. It might have been caused by their diet which contained high percentage of metabolic energy from carbohydrates (table 1). Females from this group attained the highest body weight in the first stage of the studies and, notwithstanding restrictive feeding, did not attain such reproductive potential as females from group I. This index amounted to 40% higher than in groups II and III. Barabasz et al. (ref. 2) also noticed negative correlation between body weight and reproductive performance in raccoon dogs. It is advocated that excessive fatness of raccoon dogs in autumn does not allow for optimal preparation of these animals to the reproductive season.

It was found that average litter size related to the numbers of females in the herd was the highest in the group of animals in which plant feeds represented 50-55% and amounted to 10.2 puppies per female. This index was relatively high also in other groups (I and III) compared to the data given by other authors (refs. 2, 4, 5).

Percentage of grown up puppies since the moment of their weaning is usually regarded as a most reliable index of female reproductive performance. It reflects both viability of the puppies in a given litter and milk production and carefulness of the females. This index determines final production effects of a farm. In the case of animals under study this index was relatively low irrespective of the fact that it concerned females in the first year of their reproduction. It amounted to from 31.5% in group I to 50% in group III. It may be assumed that the females given the diet with high content of energy from carbohydrates might have accumulated more subcutaneous fat and this hampered proper development of the mammary gland and resulted in worse secretion. Also Barabasz et al.

(ref. 2) found correlation between body weight and per cent of grown up puppies.

The obtained results suggest that too high (group I) as well as too low (group III) percentage of plant components in the diet should be avoided in feeding patterns of raccoon females used for reproduction.

The reproductive performance of males revealed that the animals from group II were the first to cover the females. These males were given diets with a moderate level of plant feeds. The females were covered with the same male so that it was possible to calculate the average number of females covered by one male. This index proved to be highest in group I - 3.3 females. In view of the results on reproductive performance of raccoon dogs this fact is not very understable but it confirms the results obtained by Barabasz et al. (ref. 2) which stated that males weighing over 10 kg were sexually most active.

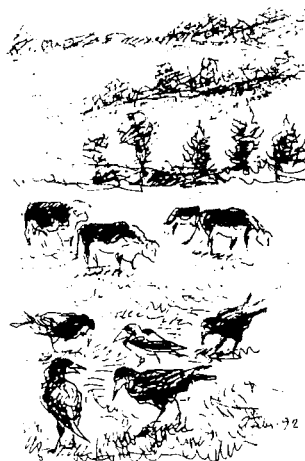
Conclusions

1. Diets containing high levels of animal feeds do not seem to be justified in the case of feeding raccoon dogs during their growth and preparation for reproduction. Reproductive performance of the animals did not confirm such a necessity.
2. Too high levels of plant components in the diets containing a high share of energy from carbohydrates and used to feed growing raccoon dogs designated for reproduction result in lower reproductive performance of the animals.

3. The most satisfactory reproductive performance was observed in the group of raccoon dogs given the diets containing 50-55% of plant components, with 34-39% of metabolic energy originating from carbohydrates. This diet was used during raccoon dog growth and preparation for reproduction.
4. Diets containing over 60% plant components, and with more than 40% of metabolic energy originating from carbohydrates may be used only in feeding raccoon dogs designated for slaughter.

References

1. Akkuratow, R.L., Tretjakowa, E.P., Bojcow, A.M. 1980. Wozwraszczajas jenotowidnoj sobakje. Krolik. i Zwierow., 5: 24-25.
2. Barabasz, B., Zon, A., Grzyb, R. 1991. Odchudzanie jenotow w okresie przygotowania do rozrodu. Zesz. nauk. PTZ Warszawa, 5: 99-107.
3. Bieguszewski, H., Lorek, M.O., 1986. Strawnosc skladnikow pokarmowy i retencja azotu u jenotow. Zesz. Nauk. ATR Bydg., Zoot., 14: 5-9.
4. Jezewska, G., Kotula, J., Maciejowski, J., Socha, S. 1991. Charakterystyka rozrod jenotow w warunkach fermowych. Zesz. Nauk. PTZ Warszawa, 5: 92-98.
5. Lykkeberg, M. 1978. The raccoon dog (*Nyctereutes procyonoides*). Scientifur, Vol. 3: 6-9.
6. Schmidt, F. 1973. Vom Marderhund (*Nyctereutes procyonoides* G.). Deutsche Pelztierzüchter, 4: 91-92.
7. Wolinski, Z. 1990. Biologia dzikiego jenota. Hod. Drobn. Inwen., 1-3: 23-25.



Tonometry in clinically normal ferrets (*Mustela putorius furo*)

J.S. Sapienza, D. Porcher, B.R. Collins, G.G. Gum, D.E. Brooks

Tonometry of 47 normal ferrets was performed with a Tono-Pen applanation tonometer*. Mean intraocular pressure (IOP) was 22.8 (± 5.5) mm of Hg. The IOP ranged from a low value of 5 and a high value of 34 mm-Hg. Significant differences were not evident between eyes, gender or coat colors, though a lower IOP was routinely observed in the sable (or fitch) coat color. There also was no significant difference with regard to neutered status. In this study, the Tono-Pen applanation tonometer proved clinically satisfactory for assessing IOP in the ferret.

Progress in the Veterinary & Comparative Ophthalmology, Vol. 1, No. 4, pp. 291-294, 1991. 1 table, 26 refs. Authors' summary.

The protein value of fish silage prepared from capelin stored under different conditions before ensiling. Effect of storing the silages for one year

Marit Espe, Herborg Haaland

Eight silages were made from capelin (*Mallotus villosus*) which was stored under different time and temperature conditions prior to ensiling. PER values were obtained in experiments with rats when the silages had been stored for 2 and 6 weeks and for 3, 6 and 12 months. Only small differences were observed in the PER values until 6 months of storage, thereafter all PER values except that from cooked raw material declined. Some of the silages were run in nitrogen balance experiments with rats when freshly prepared. The silage made from newly thawed raw material showed somewhat higher utilization compared to the others tested. No differences in protein digestibilities with neither rats nor mink could be detected.

Fiskeridirektoratets Skrifter Serie Enæring, Vol. 5, No. 1, p. 37-44, 1992. 6 tables, 11 refs. Authors' abstract.

Offal from farmed fish as a basis for fur animal feed

Ø. Ahlstrøm

For blue fox females (8-9 per group) fed diets containing 7, 14 or 21% silage made from farmed salmon offal from 30 Jan. to the weaning of their cubs in June-July, litter size at birth averaged 6.5, 8.6 and 8.7 resp. vs. 12.6 for controls fed standard rations, and litter size at weaning averaged 4.0, 5.4 and 4.0 vs. 10.4. The weight of cubs from the 3 experimental groups averaged 76.6, 73.5 and 78.5 g resp. at birth and 1867, 1652 and 1699 g at weaning vs. 75.5 and 1590 g for controls. For 144 mink females fed the 3 diets, the percentage of infertile animals was 9, 3 and 25 vs. 6 for controls, and litter size averaged 5.9, 5.9 and 6.1 resp. at birth and 5.2, 5.0 and 5.0 at weaning vs. 6.4 and 5.6 resp. Kit birth weight averaged 9.3, 8.9 and 9.2 g resp. vs. 8.3, and weaning weight 359.6, 354.4 and 342.2 g vs. 342.8. In a separate trial, 672 mink kits and 100 blue fox cubs were fed diets with 14 or 28% salmon offal silage, frozen offal or a standard diet from weaning to pelting. There were no significant differences in growth between the foxes fed the 3 different salmon offal diets, but controls tended to have a lower growth rate than experimental animals. Foxes fed salmon offal preserved using sulphuric acid had significantly poorer pelt quality than those given offal preserved using myric acid and those given frozen offal. Mink fed diets containing 28% salmon silage had a poorer growth rate than other mink, and pelts of the experimental animals were shorter than those of controls ($p < 0.05$). Diet had no significant effect on mortality. It was concluded that frozen salmon offal and salmon silage prepared with myric acid are suitable for growing animals, and may be used at low concentrations for breeding females.

Norsk pelsdyrblad, 66 (5), p. 11-13, 1992. 3 tables, 3 refs. In NORW. CAB-abstract.



Quantities, nutritive values, and applicability of offal products from slaughterhouses for fur animal feed (collection of 5 reports)

Margit Lykkeberg, Gunnar Jørgensen

Kinds and quantities of slaughterhouse offal from slaughterhouses and rendering plants.

In recent years fur animal production has increased about 10% yearly and this together with fishing quotas, competition from the petfood industry etc. cause an increasing demand for raw materials to feed production. Because of this, as well as the increasing prices of fish offal, the fur animal trade is interested in the project concerning the use of animal by-products in fur animal feed.

The first part of the project has been to map the kind and quantity of the different products from slaughterhouses as well as rendering plants.

In Denmark, about 13 mill. porkers are slaughtered a year. "Healthy offal" which can be separated directly at the slaughterhouse, are skulls, bones from tails, and trotters. The mentioned products amount to 67,000 tons yearly, corresponding to 30% of the total fur animal feed production. In addition to this, the potential quantities of the remaining herd offal from porker slaughterings amount to at least 15,000 tons yearly. It seems justified to study nutritive values and treatment costs more closely as regards skulls, bones of tails, trotters, neckbones, ham-bones, and backbones, while the "soft offal" is a known feedstuff, and is so expensive that it does not justify further investigations.

In Denmark, 1 million cattle and calves are slaughtered yearly. The "hard slaughterhouse offal" amounts to 20,000 tons and is composed of skulls and bones + feet, which might be of interest for fur animal feed and should be further investigated.

All the "soft offal" is well known as fur animal feed, and it is only the price which limits its use and appeal for further investigations.

Blood is a well investigated and good fur animal feedstuff, where only the costs in proportion to the nutritive value will set limits for its use. 33%

of the slaughter houses which were asked confirmed that they could deliver blood from healthy animals for fur animal feed: a total quantity of 8,500 tons a year.

The yearly quantity of soft poultry offal from poultry slaughterhouses amounts to 25,000 tons. Some of this is used in fur animal feed production today, either as sterilized and frozen or as sterilized acid-preserved offal.

The meal production at the Danish rendering plants amounts to 134,000 tons a year. Most of this is meat-bone meal while 10% is bloodmeal. Besides that, 33,000 tons fat of varying qualities are produced a year. As fur animal feed the normal meal products are only usable in limited amounts. Only changed production methods could make the large quantities of raw materials in the rendering plants more usable for fur animal feed and this ought to be given a high priority.

518. Report from National Inst. of Animal Science, p. 9-24, Denmark, 1981. ISSN 0105-6883. 9 tables. In DANH, Su. ENGL. Authors' summary.

The nutritive value and utility of slaughterhouse products for fur animal feed according to the literature.

Slaughterhouse offal has been used for fur animal feed for many years. However, the quantity has been reduced in recent years partly because of the interests from the petfood industry in the feedstuffs, and partly because of lower prices of fish offal. However, it has been shown in experiments with slaughterhouse offal that it is a valuable feedstuff for fur animals which must not be overlooked, although it may be a little higher in price than fish offal. Production experiments concerning ordinary slaughterhouse offal showed a positive effect upon growth and fur quality of mink kits, and at the same time the colour of dark mink is not affected in any negative way. Experiments with pig skulls have shown - in spite of 90% of the protein being bone protein with a digestibility of 30-40% - to be usable in restricted quantities, because it does not have any negative effects together with the fact that the palatability is good. Slaughterhouse

offal preserved with sodium bisulphite has also shown to be a usable feedstuff, because it has neither negative effects on fur quality nor on fur colour, and, on the other hand, gives a thicker underfur and guard hair.

Concerning slaughterhouse offal from poultries it is well known that it is an excellent feedstuff. The protein digestibility is, however, dependent on whether the raw material contains feathers or not, and how good these feathers are hydrolyzed. Ordinary poultry offal used in quantities of 15-27% of the total feed has shown normal growth and fur quality, but with a tendency to larger frequencies of wet belly. Preserved poultry offal is also a good feedstuff, which, however, only can be used in moderate quantities in the sucking period on account of a negative palatability effect in consequence of the acid content. Poultry meal ought only to be used in moderate quantities or not more than 2% of the total feed, because it shows a negative dietetic effect.

As regards to blood, it has shown in experiments that by using more than 4-6% it will have a negative dietetic effect. Besides, it can cause a poorer fur colour in dark mink. Other experiments with 30% blood in the feed did not show any negative effects on growth. It is recommended to reduce the quantity during the pregnancy and sucking periods, because the blood may cause a destruction of the thiamine in the feed, which can lead to a thiamine deficiency in the animals.

Use of blood in combination with slaughterhouse offal rich in bone, blood-bone-mix, in quantities of 10-20% did not show any sign of negative effects. Experiments using spray-dried red blood corpuscles produced from sterile blood showed a positive effect on the iron absorption from other feedstuffs. However, it is recommended to reduce the quantity to 3% of the total feed in the sucking period, and to 4% the rest of the year.

Slaughterhouse offal such as throats, which contain thyroid glands, have shown to cause disastrous results on pregnancy and lactation in mink females caused by the contents of hormone and ought therefore to be avoided especially in the breeding season. Pancreas meal, which is a byproduct from the production of insulin, has

shown to have a good protein digestibility and a good palatability. The product, which is used a good deal in practice, is not yet tested in production experiments.

Slaughterhouse offal from rendering plants used for mink feed must only be used sterilized, and like this it shows that used in quantities until 15% it does not have a negative influence on neither palatability nor dietetic effects. The use may be limited by a large amount of fat. Other experiments show that destruction-mass advantageously can be used in the growing period, but it is less good in the breeding season.

Meat bone meal is made of contaminated slaughterhouse offal which is sterilized, defatted, and dried, but the use of it ought to be limited because, like poultry meal, it has a negative dietetic effect. Besides, the sterilizing process leads to a destruction of the essential amino acid cystine.

Production experiments with meat and bone meal with varying ash content it showed that the meal with the highest ash content made the largest skins. In the same experiment was shown that meat bone meal - made from slaughterhouse offal in combination with dead animals - gave an unacceptable high percentage of white underfur in dark mink.

Use of slaughterhouse offal in fur animal feed has been a good tradition for many years. This literature study suggests that you advantageously will find use for some of the 350,000 ton of slaughterhouse offal which today are sent to the rendering plants.

Before this can be done, technical, veterinary, and expense conditions must be estimated more closely. Furthermore, the single products, especially the offal rich in bone, ought to be examined more closely for nutritive value and possible influence on mineral element transformation and production results.

518. Report from National Inst. of Animal Science, p. 25-59, Denmark, 1981. ISSN 0105-6883. 25 tables, 32 refs. In DANH, Su. ENGL. Authors' summary.

Chemical analyses and results from digestibility experiments and palatability experiments with pig's trotters, trimmed pig's skulls, meat from pig's skulls, backbone, and meat from backbone. Chemical composition, digestibility, and palatability of pig's trotters, trimmed pig's skulls, meat from pig's skulls, backbone and meat from the backbone have been examined for use in fur animal feed.

Even with a relatively high content of ash in the products rich in bone, a relatively inexpedient amino acid composition and a relatively poor digestibility of the protein fraction, the examined feedstuffs must be regarded as acceptable ingredients in a well-composed feed for fur animals. The experiments carried out suggest that a quantity of 10% as being without problems of any kind.

518. Report from National Inst. of Animal Science, p. 60-69, 1981, Denmark, ISSN 0105-6883. 5 tables. In DANH, Su. ENGL. Authors' summary.

Experiments with slaughterhouse offal rich in bone in winter-, pregnancy-, and suckling periods.

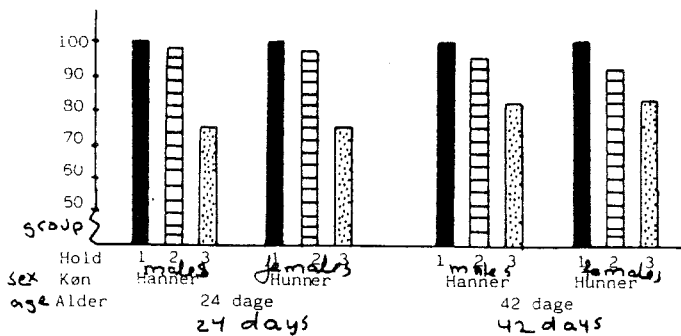


Fig. 4.1. Weights of kits, relative, corrected for litter size (group 1=100).

Experiments concerning grinded pig's skulls incl. masks and ears have been carried out on 3 groups of 70 pastel mink females. Group 1 received an ordinary Danish feed mixture, while group 2 received 15% of this feed exchanged with adequate quantities of pig's skulls and high-temperature treated barley. In the third group, which was fed as group 2, the Ca/P ratio

was regulated through the addition of monoammonium phosphate.

The breeding result as well as the growth of the kits was satisfactory, where 15% of the ordinary feed mixture was exchanged with pig's skulls, while addition of monoammonium phosphate to regulate the Ca/P ratio had a negative effect. Grinded pig's skulls may therefore be perceived as a usable feed alternative for mink used in reasonable quantities in the winter-, pregnancy- and suckling periods.

518. Report from National Inst. of Animal Science, p. 70-77, 1981, Denmark. ISSN 0105-6883. In DANH, Su. ENGL. 3 tables, 3 figs. Authors' summary.

Experiments with slaughterhouse offal rich in bone for mink kits in the growth period.

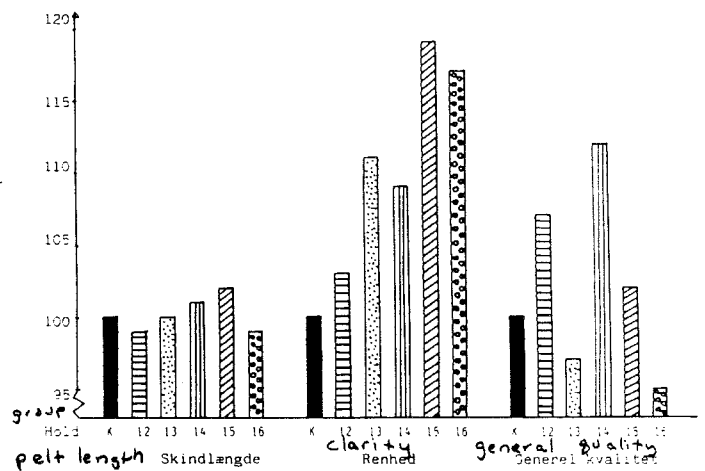


Fig. 5.3. Skin classification results

In the period from June 30 to pelting, mink kits of the pastel type were tested with 7 and 14 % trimmed and grinded pig's skulls, respectively, alone or in combination with acid-preserved fish silage. Furthermore, the Ca/P ratio was regulated to 1,1:1 in the feed which contained 14% pig's skulls and 15% fish silage preserved with sulphuric acid.

The experiments showed a tendency to a positive effect on size as well as fur qualities when fish offal and frozen industrial fish were exchanged with the tested quantities of pig's skulls and fish

silage. It is suggested that only economical and technical conditions can determine whether slaughterhouse offal rich in bone is useful for fur animal feed.

518. Report from National Inst. of Animal Science, p. 78-86, 1981, Denmark. ISSN 0105-6883. 6 tables, 3 figs. In DANH, Su. ENGL. Authors' summary.

Study on the use of chemically conserved blood in rations for polar foxes (*Alopex lagopus*)

M.O. Lorek

An experiment in the use of chemically conserved blood in the diet of polar foxes was conducted in three stages.

In the first stage (I) a trial to determine the optimal quantity of blood conserved by sodium benzoate and sulphuric acid in rations for growing foxes was undertaken. 128 foxes from weaning to slaughter were used in the experiment. Animals were divided into 4 groups, 32 foxes each. The control group (I) was fed a ration without blood. In the experimental groups (II, III, IV), the meat in the rations was partially substituted by blood by 20, 40 and 60 %, respectively.

Body weight gain, skin quality and body conformation rates, ration components digestibility and nitrogen balance, and morphological and biochemical blood parameters, anatomical and histopathological changes of some organs were analyzed.

In the second stage (II) male and female reproductive indexes were investigated for animals from stage I fed rations with different percentages of conserved blood.

In the third stage (III) the effect of acidity of the ration with conserved blood on some technological parameters and morphological and biochemical parameters of fox blood was studied.

In the third stage (III) 96 foxes were divided into 3 groups from weaning to slaughter. The control group (I) received a ration without blood substitute, and in the rations for the experimental groups (II, III) 40% of the meat components

were substituted by conserved blood and the ration for group III was neutralized by a 3% supplement of fodder chalk. Body weight gain, skin quality and body conformation rates, and morphological and biochemical blood parameters were analyzed.

The results of the current study are consistent with the hypothesis that the safe limit for using chemically conserved blood in rations for polar foxes is a substitute of 40% of the meat components.

The higher share of conserved blood causes a decrease of sodium retention and poorer fur quality.

Feeding polar foxes with a ration containing conserved blood confirmed the need for supplementation of calcium carbonate as fodder chalk for its buffer ability.

Acta Academiae Agriculturae ac Technicae Oulstenensis, Zootechnica, No. 34, Suppl. C, 42 pp. 1991. 19 tables, 102 refs. Author's summary.

β -carotene uptake and tissue distribution in ferrets (*Mustela putorius furo*)

Eric T. Gugger, Tiffany L. Bierer, Tonja M. Henze, Wendy S. White, John W. Erdman, Jr.

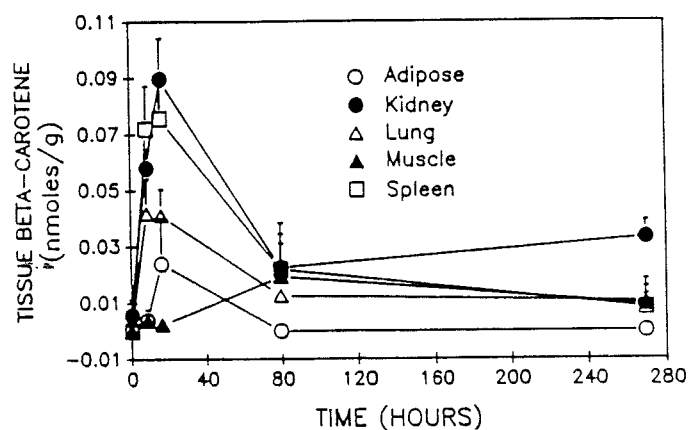


Fig. 4. Tissue β -carotene concentrations over time for 15 ferrets ($n=3$ at each time point) following a test meal containing β -carotene (10 mg/kg body wt). Error bars indicate SEM.

Ferrets accumulate β -carotene in liver and adipose tissue after chronic feeding. This study was

designed to further evaluate the time course of uptake and depletion of β -carotene in ferret serum and tissues. Male ferrets ($n=15$; 1000-1200 g) were given a single dose of β -carotene (10 mg/kg body wt) with a meal. Animals were killed at various time points over an 11-d period. Blood and tissue samples were extracted and analyzed for β -carotene by HPLC. Peak serum β -carotene levels ($0.68 \pm 0.18 \mu\text{mol/L}$) were observed 8 h after the test meal. β -carotene was essentially cleared from the blood by 76 h. Peak β -carotene concentrations (nmol/g) were observed between 8 and 16 h after ingestion for liver (1.20 ± 0.04), lung (0.042 ± 0.012), kidney (0.090 ± 0.015) and spleen (0.076 ± 0.012). Ferret liver also seemed to contain a variety of other polar and nonpolar carotenoids. Ferrets were shown to absorb β -carotene from a meal and have a consistent serum response pattern. Absorbed β -carotene is differentially distributed in a variety of tissues. The ferret seems to be a useful model for the study of β -carotene absorption and metabolism.

J. Nutr. 122, p. 115-119, 1992. 4 figs. Authors' abstract.

The use of probiotics in mink

M. Jørgensen

An initial experiment on 2 mink farms with a good health status in 1988 showed that pregnant females that had been given Cernivet (a *Streptococcus faecium* preparation) gave birth earlier, successfully weaned more kits and had a longer lactation than comparable animals not given Cernivet. In 1990 half of the animals on 2 farms with disease outbreaks were treated. A favourable response to Cernivet in feed was achieved in animals with mink enteritis virus: the disease was less severe than in untreated animals, mortality was lower and skin quality better. The probiotic had no effect on animals with Aleutian disease.

Dansk Veterinærtidsskrift, 74 (6), p. 218, 1991. In DANH. CAB-abstract.

Effect of feeding different rations to raccoon dogs on chosen performance indices

M.O. Lorek

Feeding is a basic condition for achieving high breeding and performance indices. Study of an effect of feeding different rations on chosen performance indices covered young raccoon dogs in the period from weaning till slaughter. The animals were chosen at random and divided into three groups of 24 heads in each and equal number of males and females. Different composition of diets with regard to both the protein-energetic coefficient and relation of feeds of plant and animal origin was the experimental factor. Body weight gains, cover, fur, and quantity of utilized feed per unit of weight gain were examined. The best values of performance traits were obtained for animals fed mixtures of protein-energy ratio from 8.4 to 7.5 and 50-55% of plant origin.

Acta Academiae Agriculturae ac Technicae Olsstenensis. Zootechnica (Poland), no. 34, p. 195-201, 1991. 5 tables, 5 refs. In POLH, Su. ENGL, RUSS. Authors' summary.

Effect of diet protein levels on carcass dressing in nutrias

R. Cholewa

The author studied the influence of feeding nutria two diets containing different percentages of crude protein (12 or 17 %) without animal protein on meat values of the carcasses.

The investigations were carried out in the Institute of Small Animals in Celle (GFR) due to the Alexander von Humboldt grant. Greenland nutria, males and females, were reared for 7 months and then weighed and evaluated before and after slaughter. Then some parts of the body and some organs were separated and weighed. It appeared that all dimensions were higher in males than in females. The animals fed rations containing more protein had higher weights.

There were less pronounced differences between sexes in weights of the body parts and of organs depending on feeding groups.

Roczniki Akademii Rolniczej w Poznaniu. Zootechnika (Poland), no. 220, p. 17-25, 1990. 2 tables, 6 refs. In POLH, Su. ENGL, RUSS. Author's summary.

Effects of sub-lethal concentrations of Aflatoxins on the reproductive performance of mink

R.J. Aulerich, S.J. Bursian, G.L. Watson

Previous studies pertaining to the effects of dietary aflatoxins on mink have focused primarily on growing or adult animals. To our knowledge, no research has been conducted to investigate the effects of aflatoxins on mink reproductive performance. This study was initiated to determine the effects of daily dietary exposure to sublethal concentrations of aflatoxins from naturally-contaminated feed ingredients on female mink reproduction and kit growth and survival.

The results of this study suggest that low level dietary exposure to aflatoxins B₁ and B₂ does not exert a direct effect on the reproductive performance of female mink but can impair early kit growth and survival. These adverse effects on the kits may be mediated through immune function or other physiological systems.

Bull. Environ. Contam. Toxicol. 50, p. 750-756, 1993. 2 tables, 13 refs. Author's introduction and conclusion.

The reproductive effects of dietary heptachlor in mink (*Mustela vison*)

J.A. Crum, S.J. Bursian, R.J. Aulerich, D. Polin, W.E. Braselton

Adult female mink were fed diets containing 0 (control) 6.25, 12.5, and 25 ppm ($\mu\text{g/g}$) technical grade heptachlor prior to and throughout the reproductive period (181 days) to evaluate the effects of heptachlor consumption on reproduction and offspring viability and to assess the extent of placental and mammary transfer of heptachlor epoxide to mink offspring. Feeding

12.5 and 25 ppm resulted in significant reductions in feed consumption and body weights of female mink. Mortality was 0, 8, 67, and 100% for the control, 6.25, 12.5 and 35 ppm groups, respectively. All females in the 25 ppm group died within 88 days. Mink fed the two higher heptachlor diets displayed clinical signs indicative of central nervous system involvement just prior to death. Females were mated with males on the same dietary treatments. Whelping success rates were 67, 83, 27, and 0% for the control, 6.25, 12.5 and 25 ppm groups, respectively. High mortality in the 12.5 and 25 ppm groups accounted for the lack of reproductive success. Gestation length, litter size and birth weight of kits were not significantly affected by adult female consumption of 6.25 ppm heptachlor while kits whelped by females on the 12.5 ppm diet weighed significantly less than control kits at birth. Survival of kits in the 12.5 ppm group from birth to three weeks of age was also adversely affected. At three and six weeks of age, kit body weights in both the 6.25 and 12.5 ppm groups were significantly less than body weights in control kits. Examination of heptachlor epoxide concentrations in newborn and developing kits indicated both placental and mammary transfer of the chemical from the dams to the kits. The Lc50 for the 181-day exposure period for female mink was 10.5 ppm heptachlor and the LOAEL, based on reduced kit growth, was 6.25 ppm.

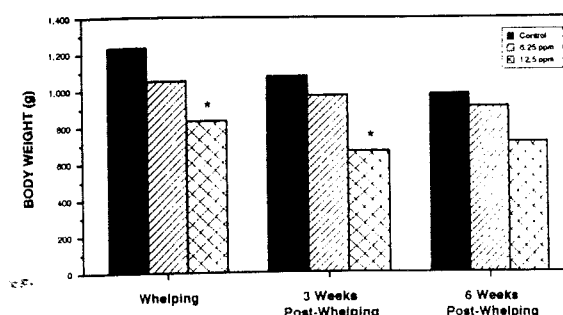


Fig. 3. The effect of dietary heptachlor on adult female mink body weights at whelping and at 3 and 6 weeks post-whelping. No females fed 25 ppm heptachlor whelped. Asterisk indicates significant difference ($p < 0.05$) from control.

Archives of Environmental Contamination and Toxicology, 24, p. 156-164, 1993. 5 tables, 3 figs., 44 refs. Authors' summary.

Chemical analyses and quality analyses - Swedish food control 1992

Eva Aldén

The voluntary chemical and quality control program in Swedish fur farming regarding feed mixtures and feed ingredients has now run for five years. Some minor changes in the rules of the control have been made. The experience so far is that the control has contributed to give us a better and more safe food for fur bearing animals. The main part of the produced feed is included in the control program. In 1992 48 feed kitchens chemically analysed 128 samples of wet feed mixtures and 113 feed ingredients.

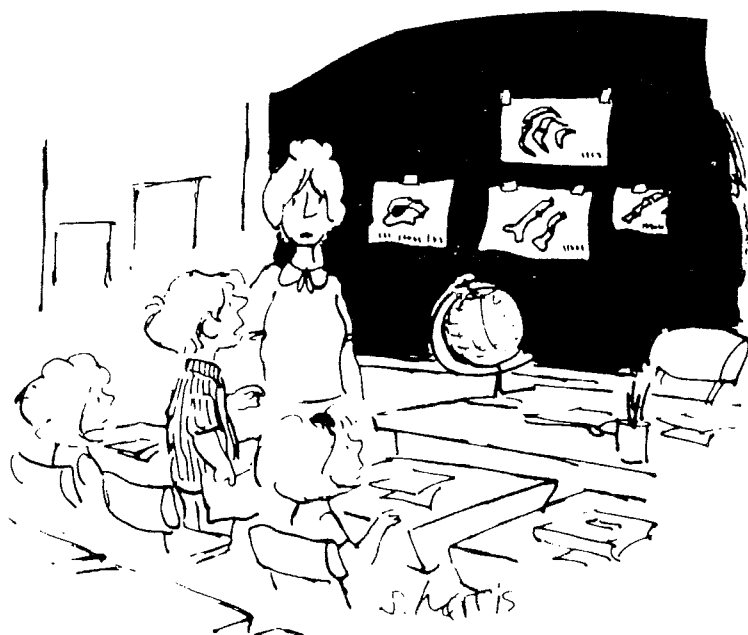
During January - June the average content of dry matter in the feed mixtures was 28% and from July to August 32.7%. From September to December it was 33.5% on average. The first six months the mean ash content was 3% on wet basis and somewhat lower during the rest of the year. The average content of crude protein was 13.2 (January - whelping), 13.6 (whelping - 30th of June), 14.5 (1st of July - 31st of August) and

13.8% (1st of September - 31st of December) respectively. Corresponding values for fat were 5.9, 6.0, 8.9 and 8.9%. Metabolizable energy is calculated from analyzed content of nutrients and for each food mixture calculated digestibility. Calculated mean content of metabolizable energy during the four production periods of the year per kg feed mixture (per kg dry matter) were 4.7 (16.8), 4.7 (6.9), 6.0 (18.3) and 6.1 (18.4) MJ.

Distribution of metabolizable energy on protein, fat and carbohydrates (%) was calculated for the mixtures based on analyzed chemical composition and calculated digestibility coefficients for protein, fat and carbohydrates. During the four production periods the average content of calculated energy, % from protein was 43, 43, 37 and 35. Corresponding values for fat and carbohydrate were 42, 42, 49 and 50, and 15, 14, 14 and 16%, respectively.

As earlier, the fat content in slaughterhouse offal has varied considerably and sometimes been very high.

Stenciled report, 12 pp, 9 tables, 5 refs. In SWED. Author's summary.



"Finding fossilized bones of arctic animals in the tropics indicates either climatic upheaval, continental drift or that paleolithic man had a zoo there."

Significance of zoosocial contacts in controlling endocrine function of testes in silver fox during domestication

L.V. Osadchuk

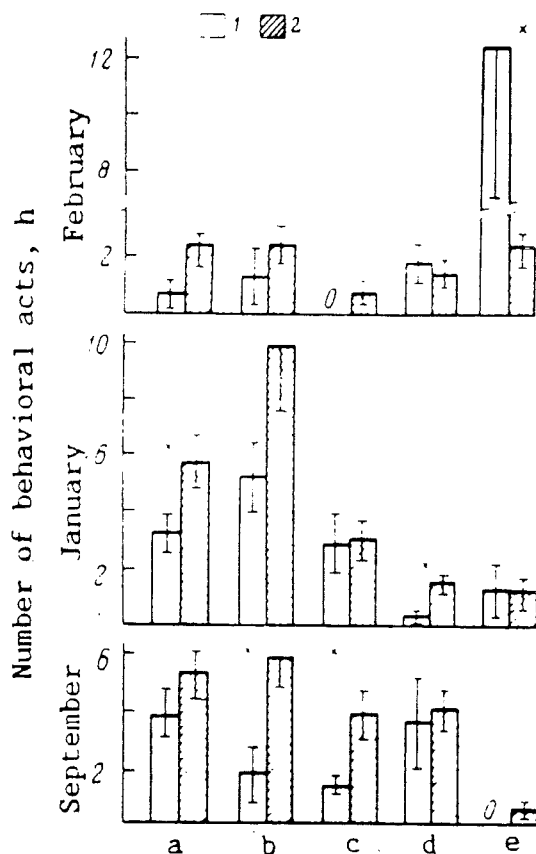


Fig. 1. Zoosocial behavior in male silver foxes in varying stages of the reproductive cycle: 1) state-farm-raised; 2) domesticated; a) "conflict" pose; b) "boxing" pose; c) direct attacks; d) nasogenital contacts; e) matings; *) $p < 0.05$.

This work studied the influence of zoosocial contacts on the hormonal activity of testes and the suprarenal glands in male silver foxes, both those bred and not bred for domestic behavior. Presenting a female to a male during the period of sexual dormancy was shown to induce an increase in the level of cortisol in males from the domesticated population, but did not affect the level of sexual hormones (testosterone and estradiol) in the peripheral blood in animals from both behavioral groups. During the breeding season, presenting a receptive female stimulated secretion of testosterone only in the domesticated males, although the initial level of

testosterone in them dropped during this period compared with the nondomesticated. Analysis of zoosocial behavior of arranged pairs made it possible to establish elevated aggressiveness of domesticated males toward an unreceptive female, and a reduced level of sexual activity toward a receptive female, when compared with undomesticated animals. It is suggested that the domestication process transforms the structure of zoosocial interactions induced by contacts of individuals of the opposite genders, exerting its own effect through a change in the reactivity of hormonal function of the testes.

Biology Bulletin of the Academy of Sciences of the USSR, 18 (1), p. 65-69, 1991. 2 figs., 22 refs. Author's summary.

The effect of sperm number on fertility in blue fox vixens (*Alopex lagopus*) artificially inseminated with frozen silver fox (*Vulpes vulpes*) semen

W. Farstad, J.A. Fougner, C.G. Torres

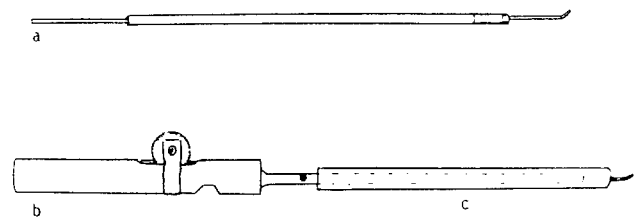


Fig. 1. Disposable equipment for AI in the fox.
 a) Foca sheath (disposable)
 b) Foca pistol
 c) Inserting tube (disposable)

During the breeding seasons of 1989 and 1990, a total of 617 blue fox vixens aged 1 to 6 years (mean \pm SEM, 2.6 ± 0.1) were inseminated with frozen silver fox semen with either 150 million ($n=213$, 1989 + 1990), 100 million ($n=172$, 1990), 75 million ($n=119$, 1989) or 37.5 million ($n=113$, 1989) spermatozoa per insemination. Two intrauterine inseminations, each with an insemination volume of 1.0 ml, were performed at 24-hour intervals on the first and second days after maximum vaginal electrical resistance was measured.

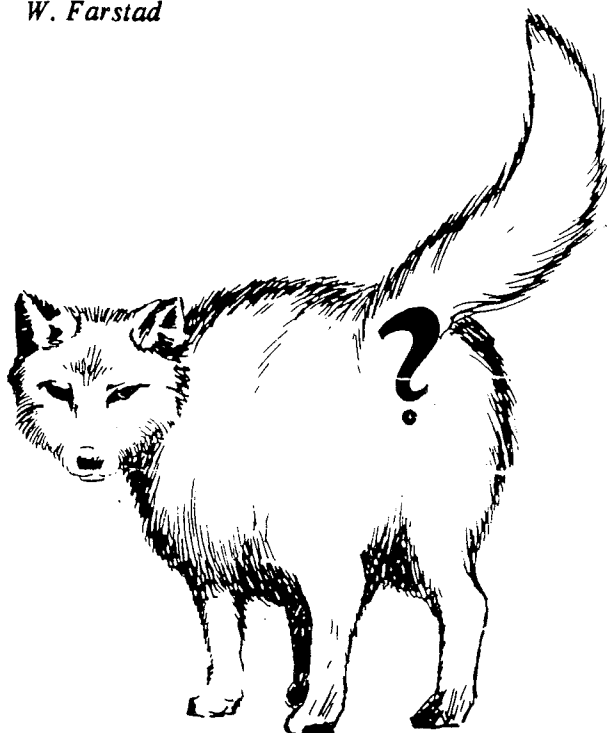
Conception rates were 87% (186 of 213) with 150 million spermatozoa per insemination, 85% (146 of 172) with 100 million, 77% (91 of 119)

with 75 million and 68% (77 of 113) with 37.5 million. The mean numbers of cubs per litter \pm SEM for the four groups were 7.6 ± 0.2 (168 registered litters), 7.5 ± 0.3 (115 litters), 6.4 ± 0.4 (86 litters) and 6.4 ± 0.4 (75 litters). A negative effect on both the conception rate and mean litter size at whelping was observed with decreasing sperm numbers (conception rate percentage: $p = 0.0001$, Chi-square, litter size: $p = 0.02$, Kruskal-Wallis Test). Only the two larger numbers of spermatozoa gave litter sizes comparable to those obtained by artificial insemination (AI) with fresh semen.

Theriogenology 37, p. 699-711, 1992. 2 tables, 1 fig., 24 refs. Authors' abstract.

Trials with frozen semen

W. Farstad



Of 608 blue fox females at 2 farms in Norway, given one uterine insemination of 1 ml frozen silver fox semen containing 150 million spermatozoa, 75% conceived vs. 87% for females given 2 similar inseminations and 82% for females inseminated with fresh semen; litter size averaged 6.0 vs. 7.6 and 7.7. There were significant differences between farms in CR, but not in

litter size at birth. Both CR and litter size were significantly higher for adult females than for females aged 2 yr, and there were significant differences between sires. In a 2nd trial, 104 blue fox females at 2 farms were inseminated with frozen blue fox semen, resulting in a CR of 39% and an av. litter size of 5.4 cubs. There were no significant differences between farms for the traits, but semen stored for 10 yr produced significantly lower CRs and smaller litters than recently frozen semen, and there were significant differences between males.

Norsk Pelsdyrblad, 66 (1), p. 6-7, 1992. In *NORW. CAB-abstract*.

Effects of equine chorionic gonadotropin on reproductive performance in anestrus mink

William B. Wehrenberg, Kenneth J. Kurt, Reinhold J. Hutz

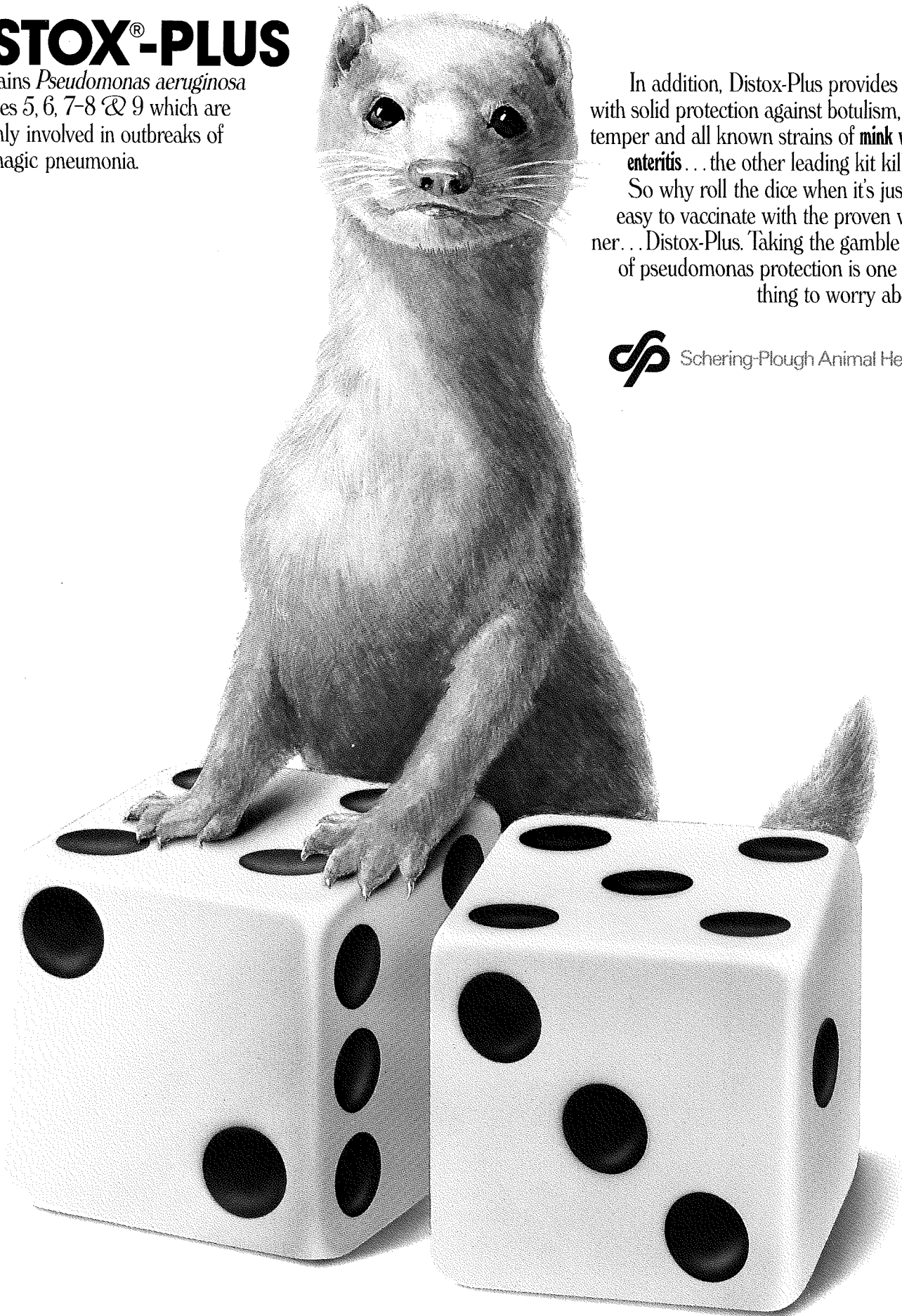
The incidence of anestrus mink during the normal breeding season has been reported to be as high as 5%. We sought to induce estrus in these mink by using various doses of equine chorionic gonadotropin (eCG) and human chorionic gonadotropin (hCG). Seventy-five female mink maintained under standard ranch conditions failed to demonstrate estrus during the annual breeding season in March. These anestrus mink were randomly assigned to treatment groups. Treatments were given on March 16 and again on March 18. On these 2 d. mink were treated with equal doses of saline, 25, 50 or 100 IU of eCG, or 50 IU of eCG on March 16 and 50 IU of eCG + 100 IU of hCG on March 18. Females were paired with males beginning on March 22. None of the salinetreated mink mated. In contrast, reproductive performance of the anestrus mink was significantly improved by treatment with eCG. This included proportion of mink breeding (47 to 100%), proportion given birth (33 to 80%), and average litter size (2.6 to 4.0 kits per whelping female). Reproductive efficiency improved by addition of hCG. These results demonstrate that eCG has a potential application for treating anestrus mink during the breeding season.

Journal of Animal Science, 70 (2), p. 499-502, 1990. 2 tables, 14 refs. Authors' abstract.

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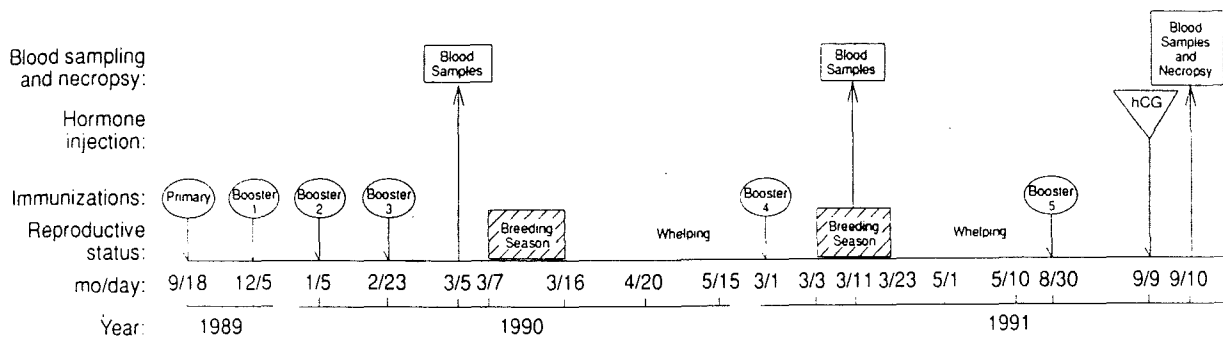
Immunoneutralization of inhibin suppresses reproduction in female mink

J.J. Ireland, T.L. Martin, J.L.H. Ireland, R.J. Aulerich

This study determined whether immunoneutralization of inhibin affected gonadotropin secretion, embryo development, and ovarian function in mink. Adult female mink (n=10) were immunized with bovine inhibin alpha¹⁻³⁶ gly-tyr (bINH, 100 µg) conjugated to human alpha globulins (HAG), or with HAG alone (N=10, controls), mixed with Freund's complete adjuvant. A series of five boosters containing bINH or HAG were then administered during a 2-yr period. Titers of bINH antibodies and serum concentrations of gonadotropins were determined for each breeding season in 1990 and 1991. Each year after whelping, we determined gestation length; sex, number, and weight of live and dead kits per litter at birth; and number and weight of kits per litter 3 wk after whelping. Results were pooled for statistical analysis. Bovine INH antibody titers (percent ¹²⁵I-bINH

bound to serum diluted 1:8000) were 53 ± 3% vs. 2 ± 0.6%, and serum concentrations of FSH were higher (p < 0.05) in bINH-immunized mink compared with controls (144 ± 23 vs. 67 ± 12 ng/ml). However, number (3.8 ± 0.2 vs. 5 ± 0.4) and weight (8 ± 0.3 vs. 9.7 ± 0.4 g) of kits per litter at birth and number of kits per litter alive 3 wk after birth (2.9 ± 0.5 vs. 4.7 ± 0.4) were lower (p < 0.05) in bINH-immunized mothers compared with controls. During the nonbreeding season in 1991, a single injection of hCG (100 IU) was administered to bINH-immunized and control mink; 24 h later blood was sampled, and organ weights were determined. Titers of bINH antibodies (40 ± 4.4 vs. 2 ± 0%), concentrations of FSH (116 ± 22 vs. 48 ± 15 ng/ml), and uterine weights (407 ± 27 vs. 323 ± 26 mg) were greater (p < 0.05) in bINH-immunized mink compared with controls. We conclude that inhibin has a key role in regulation of FSH secretion and may have a physiological role important for embryo development and survival in mink.

Biology of Reproduction 47, p 746-750, 1992. 3 tables, 1 fig., 42 refs. Authors' abstract.



Possibilities of improving the reproductive performance of mink

H. Pingel, H. Hattenhauer

An account is given of some crossbreeding trials with Jet and Standard mink in the former German Democratic Republic. Crossbreeding did not have a significant effect on CR, but crossbred females tended to produce slightly larger litters than purebreds. Crossing of Standard x Jet females with Jet males produced kits with excellent pelt quality. The induction of ovulation resulted in an increase in litter size at birth (5.8

vs. 4.91 for non-induced controls), but did not significantly affect CR or the number of kits weaned.

7 Arbeitstagung über Haltung und Krankheiten der Kaninchen, Pelztier und Heimtiere, 31 Mai bis 1 Juni, 1990, p. 80-86. 6 tables, 1 fig. In GERM. CAB-abstract.

Are fox breeding results satisfactory?

Bente Lyngs

In Denmark, in 1991, the production of cubs per mated female averaged 3.06 for silver foxes and 5.49 for blue foxes vs. 2.92 and 6.01 in 1984. The lack of improvement in cub production over the years is discussed.

Dansk Pelsdyravt, 55 (1), p. 28-29, 1992. 1 table, 8 refs. In DANH. CAB-abstract.

Studies on the period from first mating to parturition in young chinchilla females

J. Nordholm

For an unspecified number of chinchilla females at an experimental farm in Denmark, the mating season was from 17 Dec. to 18 Feb., most matings taking place at the beginning of the season. Age at first parturition ranged from 3.7 to 19.5 months, and 51% of females had produced a litter by 7.5 months of age, 70% by 11.5 months and 80% by 19 months. It is suggested that female fertility in chinchillas may be affected by environmental temp., air humidity, light intensity and the reproductive status of other females. It was concluded that females which have not produced a litter by 11.5 months of age should be pelted.

Vara Pälsdjur, 63 (3), p. 91-92, 1992. 2 refs. In SWED. CAB-abstract.

Information on the recording of fur bearers

Anonymous

For 10394 mink, and 12836 silver fox females and 8835 and 2028 blue fox females mated with blue fox and silver fox males resp., recorded in Norway in 1991, the percentage of infertile females was 8.8, 12.9, 13.7 and 16.9% resp., litter size per mated female 3 wk after parturition averaged 5.2, 3.1, 5.4 and 4.2, and mortality was 9.1, 16.2, 21.3 and 29.6%. Results are compared with those in 1990.

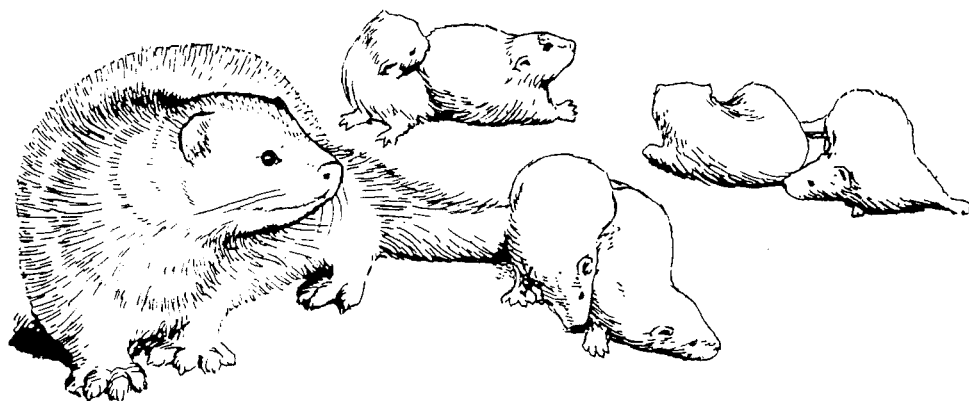
Norsk pelsdyrblad, 65 (9), p. 11-12, 1991. 1 table. In NORW. CAB-abstract.

Breeding results in 1986-91

J. Groot

Of 1,828,892 scanblack, scanbrown, pastel, pearl and other mink females mated in Denmark in 1991, 11.6, 8.1, 9.5, 9.9 and 12.5 % resp., did not produce a litter. Litter size at weaning averaged 4.51, 5.40, 4.90, 4.88 and 4.50 resp., per female mated, and 5.09, 5.88, 5.42, 5.42 and 5.14 per female producing a litter. Of a unspecified number of blue and silver fox females, 18.1 and 14.6% resp. failed to produce a litter, and litter size averaged 6.70 and 3.58 cubs. Data are tabulated by farm size and district.

Dansk Peldyrvavl, 54 (9), p. 386-387, 1991. 11 tables. In DANH. CAB-abstract.



Original Report

The welchiosis (anaerobic enterotoxaemia) pathogenesis in mink.

I. The toxicity of *C.welchii* strains isolated from mink.

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Summary

The authors studied the toxicity of 254 *C.welchii* strains from mink with welchiosis, enteritis and from healthy mink. The strains were isolated from intestinal contents, internal organs and faeces.

During the determination of the toxicity of *C.welchii* type A isolated from the mink with welchiosis, with infectious and non-infectious enteritis and from healthy mink, the following figures were obtained; more than 100 MHD/ml at 66.5%, 48.2% and 20%, respectively; more than MLVD/ml at 83.1%, 54.9% and 8% respectively; more than 50 MLD/ml at 61.9%, 56.7% and 16%, respectively.

The strains isolated from the mink with welchiosis and infectious enteritis were more toxic than the strains of different origin.

Introduction

Among the clostridiosis frequently met with in mink, besides botulism, welchiosis develops either as a nosological entity or as an associative illness (refs. 8, 11). Because of higher and higher implication of *C.welchii* during the last

years - especially of type A - both in animal and human pathology, researches were carried out on the strains of *C.Welchii* isolated from different ecological niches (refs. 5, 6, 8, 10, 12).

The studies of these strains collected from the mink have both an economical and an epidemiological importance. This germ also causes human illnesses.

Materials and methods

Isolation, identification and characterization of the strains. The strains of *C.welchii* were isolated from the internal organs of fresh corpses and also from the faeces of ill and healthy mink. Inoculations were made in liver-broth, incubated at 46°C for 24 hours, and isolation on Zeissler or Willis-Hobbs mediums, incubation under anaerobiosis at 37°C.

The identification of *C.welchii* was made considering the morphological aspects through bacterioscopic examination and of the cultural aspect in turnsole milk, Zeissler, Willis-Hobbs and gelatin mediums.

Typing was made through seroneutralization in mice and the skin test in guinea pigs, the toxin

represented by the centrifugate on Pope medium with glucose and dextrine and in liver-meat broth with glucose, as well.

MHD (minimal haemolytical dosis) was determined through the dissolution of the toxin in 8.5% sodium chloride solutin with 0.2% calcium chloride to which 6% sheep erythrocytes (incubation at 52°C) are added. MLVD (minimal lecithovitellinic dosis) was determined under the same conditions as MHD, but instead of erythrocytes was added lecithovitelline (incubation at 37°C). The MLD (minimal lethal dosis) was estimated through the dissolution of the toxin.

Results and discussion

The results obtained after the MHD tests are represented in table 1a. The test demonstrated that the titre of 300-500 MHD/ml was found in 6.2% of the total strains and 16.6% in welchiosis cases.

Compared with the other species, the haemolytic capacity of the strains is lower. This titre was found in 9.7-18% of the strains isolated from sheep, cattle, fowl and in 19.6-26.5% of strains from the same animal species affected by welchiosis (8, 8a). The maximum titre observed was 1200 MHD/ml for two strains isolated from mink with welchiosis. For the three strains of type D the haemolytic titre was 50 MHD/ml. It was noticed for the strains isolated in France from outbreaks with type A welchiosis that the haemolytic titre was 400-800 MHD/ml, while the ones isolated in Yugoslavia had a titre of only 20 MHD/ml and types B, C and D, 20-40 MHD/ml (6). It is known that *C.welchii* alpha haemolysin, like other bacterial haemolysins, are of the warm-cold type but at 52°C *C.welchii* haemolysin behaves as an ordinary haemolysin (ref. 11).

Table 1a. The toxigenity of *C.welchii* strains

| No | Strain origin | MHD/ml | | | | | | | | | | | | | | |
|----|------------------------------------|-------------------------------|-----|------|------|--------|------|---------|------|---------|------|----------|------|--------|------|-----|
| | | Examined strains | | 4-50 | | 50-100 | | 100-300 | | 300-500 | | 500-1000 | | > 1000 | | |
| | | Type | No | No | % | No | % | No | % | No | % | No | % | No | % | |
| 1 | Mink with welchiosis | A | 18 | 2 | 11.1 | 4 | 22.2 | 4 | 22.2 | 3 | 16.6 | 3 | 16.6 | 2 | 11.1 | |
| 2 | Mink with infectious enteritis | A | 150 | 33 | 22.0 | 47 | 31.3 | 51 | 34.0 | 10 | 6.6 | 4 | 2.6 | 5 | 3.3 | |
| | | NT | 23 | 10 | 47.8 | 7 | 34.7 | 4 | 17.3 | | | | | | | |
| | a) pseudomonas | A | 55 | 9 | 16.3 | 21 | 38.1 | 11 | 20.0 | 7 | 12.7 | 4 | 7.2 | 3 | 5.4 | |
| | | b) other infectious enteritis | A | 95 | 24 | 25.2 | 26 | 27.3 | 40 | 42.1 | 3 | 3.1 | | | 2 | 2.5 |
| | | | NT | 23 | 10 | 43.4 | 7 | 31.8 | 4 | 18.1 | 2 | 9.0 | | | | |
| 3 | Mink with non-infectious enteritis | A | 18 | 7 | 38.8 | 6 | 33.3 | 4 | 22.2 | 1 | 5.5 | | | | | |
| | | D | 3 | 1 | 33.3 | 2 | 66.6 | | | | | | | | | |
| | | NT | 12 | 6 | 50.0 | 4 | 33.3 | 2 | 16.6 | | | | | | | |
| 4 | Healthy mink | A | 25 | 13 | 52.0 | 7 | 28.0 | 3 | 12.0 | 2 | 8.0 | | | | | |
| | | NT | 5 | 2 | 40.0 | 2 | 40.0 | 1 | 20.0 | | | | | | | |
| | Total | | 254 | 74 | 29.1 | 79 | 31.1 | 69 | 27.1 | 16 | 6.2 | 7 | 2.7 | 7 | 2.7 | |

(more)

NT = non-toxigenic strains

By comparing the methods for haemolysin determination on 234 *C.welchii* strains at 52°C and 37°C the following titres were obtained; in 34.1%, 28.2%, 14.5%, 4.2% and 22.2% strains the 52°C titres were twice, 3 times, 4 times, 7 times and 10 times, respectively, higher than the 37°C ones (ref. 8). From the total of 168 examined strains originating from mink with welchiosis and infectius enterites, 13 (7.7%) presented titres over 500 MHD/ml. The MLVD which was determined after the examination of 225 strains (table 1b), showed as in the case of MHD determination and comparatively with the rest of the strains, maximum titres for those strains from mink with welchiosis and infectious enterites. As a result, 38.8% and 19.3% of these strains showed a titre of 100-200 MLVD/ml. This result is the same for 25.5-44.2% strains from

cattle, sheep, fowl and, respectively, for 14.2-16.6% strains from animals with infectius enterites (ref. 8). Compared with the other types of *C.welchii*, type A is also characterized by a high lecithinase activity. The three type D strains showed a titre below 25 MLVD/ml, results being similar with those obtained by us with type D strains isolated from sheep.

Titres of 25 MLVD/ml were obtained from 76.9% sheep and of 100-200 MLVD/ml only from 11.5% sheep (ref. 8). Strains isolated from human beings from outbreaks of food poisoning, gaseous gangrene and septicaemia with type A as well as from other animal species showed titres of 4-128 MLVD/ml (refs. 5, 12). The results obtained after the lethality test of 167 strains, three being type D are represented in table 1c.

Table 1b. (ctnd)

| No | MLVD/ml | | | | | | | | | | |
|-------|----------|------|------|-------|------|--------|------|---------|------|---------|-----|
| | Examined | 4-20 | | 20-50 | | 50-100 | | 100-200 | | 200-350 | |
| | strains | No | % | No | % | No | % | No | % | No | % |
| 1 | 18 | 2 | 11.1 | 1 | 5.5 | 7 | 38.8 | 7 | 38.8 | 1 | 5.5 |
| 2 | 145 | 26 | 17.9 | 31 | 21.3 | 60 | 41.3 | 28 | 19.3 | | |
| | 22 | 12 | 54.5 | 6 | 27.2 | 4 | 18.1 | | | | |
| | 51 | 8 | 15.6 | 9 | 17.6 | 21 | 41.1 | 13 | 25.4 | | |
| | 94 | 18 | 19.7 | 22 | 24.1 | 39 | 41.4 | 15 | 16.4 | | |
| | 22 | 12 | 54.5 | 6 | 27.2 | 4 | 18.2 | | | | |
| 3 | 17 | 8 | 47.0 | 8 | 47.0 | 1 | 5.8 | | | | |
| | 3 | 3 | 10.0 | | | | | | | | |
| | 12 | 8 | 66.6 | 4 | 33.3 | | | | | | |
| 4 | 25 | 13 | 52.0 | 10 | 40.0 | 2 | 8.0 | | | | |
| | 5 | 3 | 60.0 | 2 | 40.0 | | | | | | |
| Total | 247 | 75 | 30.3 | 62 | 25.1 | 74 | 29.9 | 35 | 14.1 | 1 | 0.1 |

(more)



Table 1c. (ctnd)

| No | MLD/ml | | | | | | | | |
|---------------|---------------|------|------|-------|------|--------|------|---------|------|
| | Exa- mined | 4-10 | | 10-50 | | 50-100 | | 100-120 | |
| | strains | No | % | No | % | No | % | No | % |
| 1 | 21 | 3 | 14.2 | 5 | 23.8 | 13 | 61.9 | | |
| 2 a) b) | 91 | 9 | 9.8 | 26 | 28.5 | 53 | 58.2 | 3 | 3.2 |
| | | | | | | | | | |
| | 33 | 5 | 16.6 | 6 | 20.0 | 19 | 63.3 | 3 | 9.9 |
| | 58 | 4 | 6.8 | 20 | 34.4 | 34 | 58.6 | | |
| 3 | 27 | 9 | 33.3 | 7 | 25.9 | 11 | 40.7 | | |
| | 3 | | | | | | | 3 | 10.0 |
| | | | | | | | | | |
| 4 | 25 | 14 | 56.0 | 7 | 28.0 | 4 | 16.0 | | |
| | | | | | | | | | |
| Total | 167 | 35 | 20.9 | 45 | 26.9 | 81 | 48.5 | 6 | 3.5 |

As with the other parameters of toxicity when determining MLD, strains from mink with welchiosis and infectious enteritis showed again higher titres compared with the other strains. A titre of 50-100 MLVD/ml was noticed with 61.9% and 58.2%, respectively, of strains, as for strains from mink with non-infectious enteritis and from healthy ones the percentage was only of 40.7% and 16%, respectively. This titre is specific for 30%, 0% and 24.3% of strains isolated from blue foxes with welchiosis, non-infectious enteritis and from rabbits with non-infectious enteritis (ref. 10). In calves, piglets, poultry and sheep with welchiosis the 50-100 MLVD/ml titre was found in 11.4-58% of strains, and 28.2-33% of strains in the case of calves and piglets with infectious enteritis (refs. 8-8e).

From the 112 strains from mink with welchiosis and infectious enteritis 106 (94.6%) caused haemoglobinuric and 98 (87.5%) epistaxis; from the rest of 55 strains 49 (89%) and 47 (85.4%), respectively, similar percentages with those obtained by us with the other species were found

(ref. 8). For *C. welchii* type A a lower lethality is characteristic. Strains of this type isolated both by us and from other welchiosis outbreaks as well as other disease cases in humans and animals, showed a low lethality below 100 MLD/ml, compared to the other types, where an up to 11000 MLD/ml was obtained (6). Non toxigenic strains showed in comparison with type A lower values for the parameters under study.

So, a titre of over 100 MLd/ml was obtained only with 7 (17.5%) of 40 tested strains and the one of over 50MLVD/ml with 4 (10.2%) of 39 strains.

These results support the idea that the majority or almost the total of the non-toxigenic strains are in fact type A strains (refs. 3, 7) which contain alpha toxin but low level titres determined through lecithovitellinic test. Only some of the strains still have high levels of the haemolytic activity (ref. 3). It is known that after a while some of the strains lose partially or totally their capacity to produce lethal toxins, except the alpha toxin. This phenomenon can also take place

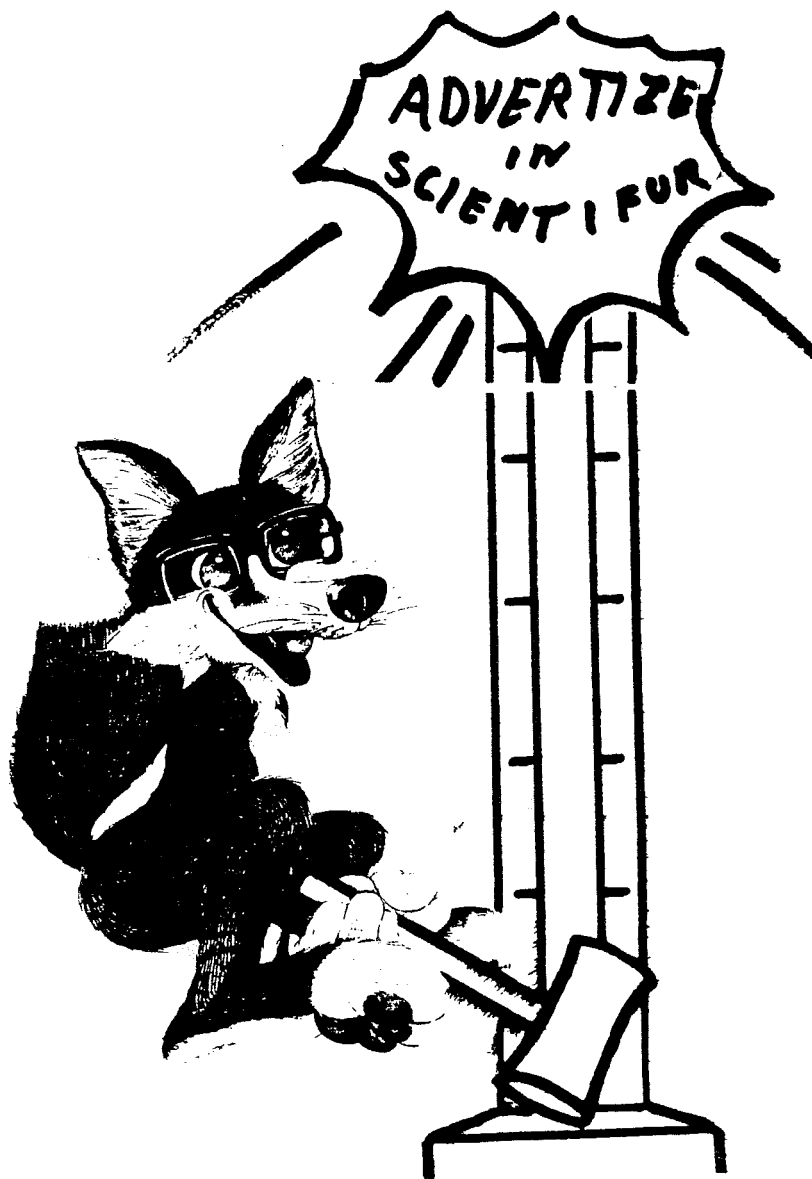
in nature which explains the ubiquitary presence of A type and of the others as "parasites" (ref. 2).

References

1. Bittner, J., Radu, I., Sefer, C.P., breazu, H. 1963. Microbiologia, 8, p. 243.
2. Cato, E.P., George, W.L. 1986. Genus clostridium. In: Sneath, P.H.a., Nicholas, S.N., Sharpe, M.E., Holt, J.G. Bergey's Manual of Systematic Bacteriology, vol. 2, Baltimore-London-Los Angeles-Sydney, Williams & Wilkins.
3. Ferrando, R., Cottureau, Ph. 1967. Rec. Med. Vet., 143, p. 1268.
4. Hatheway, C.L. 1990. clin. Microbiol. Rev., 3, p. 77.
5. Köhler, B., Külbach, S., Meine, H. 1974. Mh. Vet. Med., 29, p. 385.
6. Moraillon, P., Yalcin, N. 1967. Bull. Off. int. Epiz., 67, p. 1328.
7. Niilo, L., Avery, R.J. 1963. Can.Vet.J., 4, p. 31.
8. Secasiu, V., Teza. Doctorat, Fac. med. Vet. Bucuresti, 1979; a) Rev. Crest. Anim. 1984, 34, 38; b) Proceed. Symp. Cluj-Napoca "Ameliorarea, tehnologia si patologia rumegatoarelor", p. 145-151, 1986; c) Sci. session Inst. Pasteur (Bucuresti) 27.IV.1987; d) Ibid. 21.Iv.1988; e) Ibid.25.X.1990.
9. Secasiu, V., Pastirnac, N., Xabava, R. 1984. Scientifur, Vol. 8, p. 143.
10. Secasiu, V., Pastirnac, N., Zabava, R., Draghici, E. 1991. Sci. session Inst. Pasteur (Bucuresti) 7.XI.
11. Sterne, M., Batty, I. 1975. Pathogenic clostridia. Butterworth, London - Boston.
12. Tudor, V., Bittner, J., Armasu, J., Dogaru, D., Ardeleanu, J. 1973. Microbiologia, 18, p. 125.



"You don't seem to understand. Prescott. We're not trying to cure diseases occurring *only* in guinea pigs."



Production of murine monoclonal antibodies against membrane glycoproteins on the surface of lymphoid and myeloid cells of furbearing animals

Merete Press Christiansen

New doctor in the family. We congratulate Merete Press Christiansen with the thesis and the degree and wish her all the best in the future.

The aim of this study was to produce murine monoclonal antibodies against membrane glycoproteins on the cell surface of lymphoid and myeloid cells of pelt animals. Monoclonal antibodies of this type would be useful in studies of the immune system of mink. Monoclonal antibodies could also be used as reagents for blood typing of foxes.

For the production of the monoclonal antibodies mice were immunized in the peritoneal cavity with either mink white blood cells or fox red blood cells. Fusion of spleen cells and myeloma cells was performed using polyethylene glycol as fusing agent. Screening of hybridoma supernatant for antibodies against fox red blood cells was carried out by agglutination test or by testing for hemolytic activity. These screening tests revealed many hybridomas secreting antibodies against fox red blood cells, but none of the antibodies were specific for blood group alloantigens.

In screening of hybridomas for antibodies against mink leucocytes, hybridomas secreting immunoglobulin were first selected in an ELISA test developed for this purpose. Between 30% and 61% of the hybridomas were found to be immunoglobulin secretors after a fusion. Selected hybridomas were tested for anti-mink leucocyte antibody activity by flow cytometry analysis. Of the immunoglobulin secreting hybridomas, 20 to 65 % showed positive reactivity. From two fusions, a total of 103 hybridoma secreting antibodies against mink leucocytes were obtained. Of these, 8 hybridoma were chosen for cloning by the limiting dilution method. Among these 8, individual hybridoma were identified which secreted antibodies against neutrophils and monocytes, or against a subpopulation of lymphocytes, monocytes and neutro-

phils, as well as monoclonal antibodies with panleucocyte reactivity. Determination of immunoglobulin class/subclass was performed by double immunodiffusion (Ouchterlony test). The monoclonal antibodies' isotypes were IgM, IgG₁ and IgG_{2b}.

Immuniseret mus

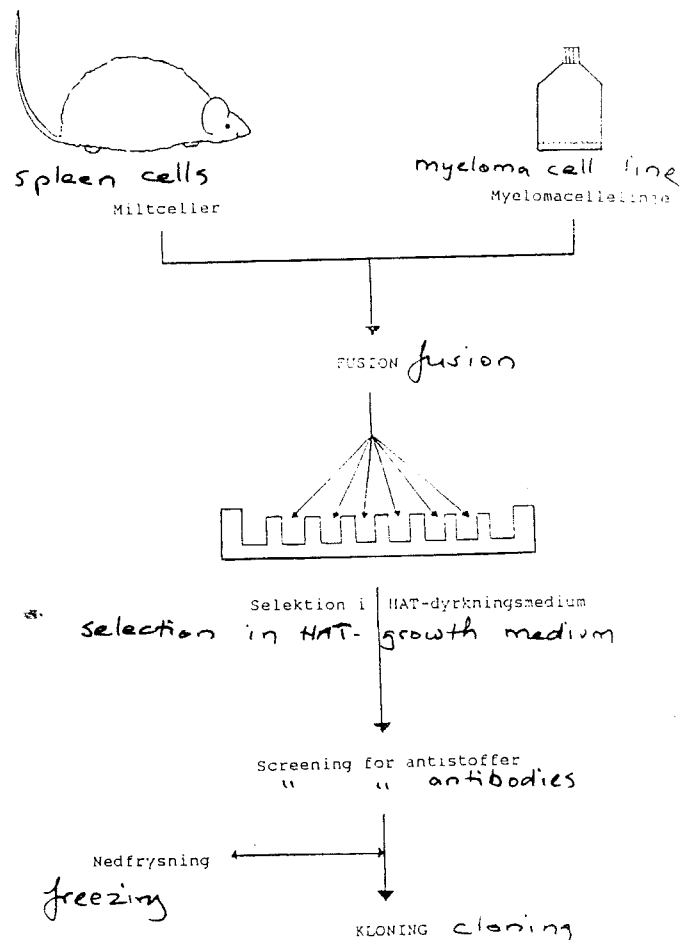


Fig. 2.1. Schematic overview of production of monoclonal antibodies.

Molecular weights of the antigen recognised by monoclonal antibodies were determined by solid-phase precipitation, followed by polyacrylamide gel electrophoresis and autoradiography. One monoclonal antibody with panleucocytic reactivity precipitated three polypeptides with molecular weights of 110 kDa, 82 kDa and 60 kDa. Another monoclonal antibody, also with panleucocytic reactivity, precipitated two polypeptides with molecular weights of 140 kDa and 14 kDa. A third monoclonal antibody, reacting with neutrophils and monocytes, precipitated a 88 kDa polypeptide. The last monoclonal antibody, reacting with subpopulations of neutrophils, monocytes and lymphocytes, precipitated 105 kDa polypeptide. A comparison of the unknown antigens with human cell surface molecules recognized by anti-CD antibodies failed to establish their identity.

Eleven of the produced monoclonal antibodies were tested for cross reactivity with dog leucocyte. One monoclonal antibody showed the same panleucocyte reactivity with dog leucocyte as it did with mink leucocytes. Three other monoclonal antibodies also showed positive reactivity, but with another reactivity as seen with mink leucocyte. None of these were positive for dog lymphocytes.

Royal Vet.- and Agric. Univ., Copenhagen, 1990, pp 152. In DANH, Su. ENGL.

Plasmocytosis of mink. Epizootical serological survey of the disease in Greece

I.A. Dimitriadis, P. Oikonomidis, E. Souliou, A. Sfairopoulos, N. Banurah

A small scale serological survey was done on plasmocytosis in mink in Greece. Sera of mink of two herds were examined by counter immunoelectrophoresis. The 70 sera of the first herd were found to be negative. From 72 sera of the second herd (in West Macedonia) 25 (36%) were found positive for plasmocytosis. It is more than sure that mink of other areas in Greece are also infected with plasmocytosis virus and, therefore, we suggest a systematic serological survey of the disease in the whole mink population in Greece.

Bulletin of the Hellenic Veterinary Medical Society, 42 (2), p. 109-114, 1991. 2 tables, 6 figs., 22 refs. In GREEK, Su. ENGL. Authors' abstract.

Nucleotide sequence analysis of Aleutian mink Disease parvovirus shows that multiple virus types are present in infected mink

Elisabeth Gottschalck, Søren Alexandersen, Anders Cohn, Lene A. Poulsen, Marshall E. Bloom, Bent Aasted

Different isolates of Aleutian mink disease parvovirus (ADV) were cloned and nucleotide sequenced. Analysis of individual clones from two in vivo-derived isolates of high virulence indicated that more than one type of ADV DNA were present in each of these isolates. Analysis of several clones from two preparations of a cell culture-adapted isolate of low virulence showed the presence of only one type of ADV DNA. We also describe the nucleotide sequence from map units 44 to 88 of a new type of ADV DNA. The new type of ADV DNA is compared with the previously published ADV sequences, to which it shows 95% homology. These findings indicate that ADV, a single-stranded DNA virus, has a considerable degree of variability and that several virus types can be present simultaneously in an infected animal.

Journal of Virology, Vol. 65, No. 8, p. 4378-4386, 1991. 3 tables, 5 figs., 48 refs. Authors' summary.

Gene regulation in Aleutian mink disease parvovirus

Torben Storgaard, Jesper Christensen, Bent Aasted, Søren Alexandersen

We are currently investigating the regulation of transcription for Aleutian mink disease parvovirus (ADV). ADV causes two different disease complexes in mink. Neonatal mink kits unprotected by maternal antibodies develop an acute pneumonia after infection with ADV. In contrast, adult mink infected with ADV develop a chronic immune complex-mediated condition known as classical Aleutian disease. A detailed transcription map of the ADV-G strain in cell culture has been published by Alexandersen et al. (1988). It shows that from the very short genome of approximately 4800 nucleotides five different mRNA's are transcribed from two different promoters.

To investigate further the viral regulation of transcription we have produced 5' and 3' dele-

tion in the promoter at map unit 3 (P3) and in the promoter at map unit 36 (P36). The obtained sequences were placed in front of the reporter gene chloramphenicol acetyl transferase (CAT). By measuring the level of CAT expression in transient transfection assay we have obtained a relative value for the promoter strength and identified important regions for gene regulation. We found both ADV promoters to be very weak in this system compared to SV40 promoter confirming computer analysis of the promoter and enhancer sequences. We are currently investigating the functions of the non-structural proteins in ADV. All three non-structural proteins have been cloned for transient transfection to study their influence on the two viral promoters. We found the P36, but not the P3 promoter, to be transactivated by the largest non-structural protein (NS-1). The level and mechanism of transactivation for the non-structural proteins will be discussed and compared to other parvoviruses. The potential role of the weak promoters for the special pathogenesis of ADV will be discussed.

2. Congress of the European Society for Veterinary Virology, Uppsala (Sweden), 23-26 September 1991. Only abstract recieved.

Expression and characterisation of Aleutian disease virus encoded protein in a baculovirus vektor system

Jesper Christensen, Torben Storgaard, Søren Alexandersen, Bent Aasted

A detailed transcription map of Aleutian mink disease parvovirus (ADV) showed the existence of five different mRNA's. Each RNA transcript had potential translation initiation sites within open reading frames, suggesting translation. Four of the RNA's were transcribed from the region of the genome known to code for non-structural protein (NS) and one RNA from the left side of the genome code for the two structural proteins (VP1 and 2). Recombinant Baculovirus containing the gene for VP1 and VP2 both in genomic and cDNA form were produced. The structural proteins produced had identical molecular weights, when compared to the corresponding proteins from ADV infection in CRFK cells by Western Blotting. Both Baculovirus constructs formed particles indistinguishable to wild type virus as judged by electron microscopy.

Furthermore, recombinant baculovirus from the three putative non-structural proteins has been produced. A biochemical and functional analysis of structural and non-structural are in progress and results will be presented.

2. Congress of the European Society for Veterinary Virology, Uppsala (Sweden), 23-26 September 1991. Only abstract recieved.

Coronavirus infection in mink (*Mustela vison*). Serological evidence of infection with a coronavirus related to transmissible gastroenteritis virus and porcine epidemic diarrhea virus

P. Have, V. Moving, V. Svansson, Å. Uttenthal, B. Bloch

Antibodies to a transmissible gastroenteritis virus (TGEV)-related coronavirus have been demonstrated in mink sera by indirect immunofluorescence, immunoperoxidase test and immunoblotting. This is the first serological evidence of a specific coronavirus infection in mink. The putative mink coronavirus (MCV) seems to be widespread in the Danish mink population with a prevalence approaching 100% (108 of 111 positive sera in indirect immunofluorescence using TGEV). The prevalence of MVC infection seems to have been constant at least since 1981. Analysis by immunoblotting has shown that MCV is closely related to TGEV by the spike (S), matrix (M) and nucleoprotein (N) polypeptides. Furthermore, antibodies to MCV also cross-reacted with N and M polypeptides of porcine epidemic diarrhea virus (PEDV). Thus, mink coronavirus may occupy an intermediate position between the TGEV-group of coronaviruses and PEDV. MCV antibodies did not neutralize TGEV, porcine respiratory coronavirus, canine coronavirus, feline infectious peritonitis virus or feline enteric coronavirus. Coronavirus-like particles have been observed by EM in stool samples from mink and MCV may therefore be associated with syndromes of acute enteritis in preweaning mink.

2. Congress of the European Society for Veterinary Virology, Uppsala (Sweden), 23-26 September 1991. Only abstract recieved.

Pathogenesis and epidemiology of the spongiform encephalopathies

Richard H. Kimberlin

Infectious agents in the scrapie family only multiply in certain non-dividing cell populations of the lymphoreticular system (LRS) and of the nervous system (NS). This creates a hierarchy of tissues according to the maximum infectivity titres, and makes it possible to deduce which rendered sheep tissues in cattle feed were responsible for the outbreak of bovine spongiform encephalopathy (BBE) in the U.K., and which bovine tissues used in food or pharmaceuticals might be a risk to man.

The LRS seems to play two different roles in these neurological diseases. First, tissues such as Peyer's patches, visceral lymph nodes and spleen are early sites of agent multiplication from which neuroinvasion can occur via peripheral nerves that connect with the thoracic spinal cord. Secondly, the LRS may also provide an extraneural reservoir of infection which may be relevant to the natural spread of scrapie in sheep. Infectivity titres in the LRS of mink with transmissible mink encephalopathy (TME) are much lower than in scrapie. This may explain why TME is a dead-end disease. SSE resembles TME in being caused by infection with a scrapie-like agent in feed. Could SSE also be a dead-end disease?

2. Congress of the European Society for Veterinary Virology, Uppsala (Sweden), 23-26 September 1991. Only abstract received.

Serum immunoglobulins in polar foxes infected naturally with distemper virus

W. Deptula, B. Tokarz

The dynamics of IGM, IgG, IgA was assessed and a total amount of immunoglobulins expressed in turbidometric units (ZST) in diseased and foxes suspected to be ill, and in healthy animals. In the first period of distemper (1-10 days) was found an increase of IgM and from 4-7 day a

decrease of IgG, IgA and total amounts of immunoglobulins. Before death (day 13) the level of immunoglobulins decreased by 50-400%.

Medycyna Weterynaryjna, 47 (5), p. 204-207, 1991. 3 tables, 15 refs. In POLH, Su. ENGL. Authors' summary.

Alimentary intoxication of chinchillas caused by Clostridium perfringens enterotoxin

M. Nowakowska, J. Matras, M. Bartoszcze, S. Palec

Poisonings on the chinchilla farm, caused by *Cl. perfringens* enterotoxin, was described. Diagnosis was settled by the discovery of the enterotoxin in the samples of feedstuffs and intestines of dead animals and by isolation of seven strains of *Cl. perfringens*. The enterotoxin was discovered by the indirect ELISA and counter immunoelectrophoresis using anti-enterotoxin globulins. Enterotoxins produced by the isolated strains caused erythema in guinea pigs.

Medycyna Weterynaryjna, 47 (4), p. 156-157, 1991. 1 table, 14 refs. In POLH, Su. ENGL. Authors' summary.

Staphylococcal adenitis in ranch mink in Ontario

D. Bruce Hunter, John G. Prescott

Staphylococcus intermedius was identified as the cause of an outbreak of acute adenitis of the cervical apocrine glands of neonatal mink, and the cause of vaginitis and mastitis in adults. The disease occurred with greater frequencies in mutation mink with Chediak-Higashi syndrome than in pastel and dark color phases.

Canadian Veterinary Journal, 32 (6), p. 354-356, 1991. 2 tables, 3 figs., 14 refs. Authors' abstract.

Escherichia coli diarrhea: E. coli enteritis in mink

C. Hyldgaard-Jensen

This feed-related disorder in growing mink, its symptoms and multifactorial origin are examined. Conditions previously diagnosed as thin or small mink syndrome or arrested growth due to phosphorus deficiency or an excessively acid diet have been grouped together as *Escherichia coli* diarrhea.

Dansk pelsdyravt, 54 (5), p. 191-192, 1991. 1 fig. In DANH. CAB-abstract.

An outbreak of Aujeszky's Disease in mink

M. Nabeya, H. Ogino, D. Nakabayasi, T. Watanabe, Z. Murayama, S. Ishii, N. Hosino

In December 1989, eight adult mink died suddenly on a 232-head mink farm in Niigata Prefecture. Six animals were necropsied, but no characteristic gross lesions were observed in any of them. Histopathologically, necrotic foci with intranuclear inclusion bodies in the degenerated nerve cells and neuroglial cells were found in the medulla oblongata of all cases. Neuronophagia, microgliosis and intranuclear inclusion bodies in nerve cells were observed in the trigeminal ganglia of two cases. In these same cases, intranuclear inclusion bodies were observed in the epithelial cells of the tonsil. Suid herpes virus 1 (Aujeszky's disease virus: ADV) antigen was identified in lesions of the medulla oblongata, trigeminal ganglia and tonsil by an immunoperoxidase technique. Viral agents were isolated from the brain. These isolates were identified as ADV by a neutralization test and an immunofluorescence technique. Cleavage patterns of DNA of the isolates by *Bam*HI were similar to those of the Yamagata S-81 strain of ADV. A serologic survey on serum samples collected from the feeder swine of fattening farms in the same area using an enzyme-linked immunosorbent assay showed that none of them had ADV antibodies.

The affected mink received rations containing swine offal derived from the Kanto area where AD is widespread, suggesting that the offal is the source of the infection.

Journal of the Japan Veterinary Medical Association, 44 (6), p. 587-590, 1991. 2 tables, 3 figs., 11 refs. In JAPN, Su. ENGL. Authors' summary.

Pancreatic duct hyperplasia in a Raccoon (*Procyon lotor*) caused by *Atriotaeenia procyonis*

Daniel E. Snyder, Amir N. Hamir, Cathleen A. Hanlon, Charles E. Rupprecht

A raccoon (*Procyon lotor*) livetrapped in Philadelphia, Pennsylvania was healthily infected with the tapeworm *Atriotaeenia procyonis*. Histopathologic examination of the duodenum revealed this tapeworm attached to the mucosa; the mucosa was mildly hyperplastic without a significant inflammatory infiltrate. This tapeworm was seen also within the proximal pancreatic duct and histopathologic lesion associated with its presence consisted of marked hyperplasia of mucosal cells, causing the formation of an extensive papillary projection into the duct lumen. Inflammatory cellular reaction was minimal, consisting primarily of lymphocytes, and was seen in the mucosa and submucosa of the duct. The presence of *A. procyonis* in the pancreas of this raccoon is considered to be an aberrant location for this parasite and has not been reported previously.

Journal of Wildlife Diseases, 27 (2), p. 334-336, 1991. 3 figs., 4 refs. Authors' abstract.

Prevalence of *Toxoplasma gondii* infection in Raccoons

J.P. Dubey, A.N. Hamir, C.A. Hanlon, C.E. Rupprecht

Serum samples from 427 raccoons (93 from Pennsylvania, 45 from New Jersey, 72 from South Carolina, 68 from Virginia, 30 from Iowa,

and 119 from Ohio) were evaluated for *Toxoplasma gondii* antibodies in dilutions of 1:25, 1:50, and 1:500. The distribution of *T. gondii* antibody titers was < 1:25 for 212 raccoons (49.6%), 1:25 for 34 raccoons (7.9%), 1:50 for 117 raccoons (27.4%) and \geq 1:500 for 64 raccoons (14.9%). Tissue cysts were seen in the liver, and tachyzoites were in the brain of a raccoon with abnormal neurologic signs and concurrent infection with canine distemper virus. Organisms in the liver were stained with anti-*T. gondii* serum, and the raccoon had a *T. gondii* titer of 1:160 in the agglutination test.

Reports on Wildlife and Laboratory Animals, Vol. 200, No. 4, p. 534-536, 1992. 1 table, 1 fig., 11 refs. Authors' summary.

Detection of mink and canine parvovirus infections with photobiotinylated DNA probe

Zhao Yongjun

The hind III C fragment of the replicative form (RF) DNA of mink enteritis virus (MEV) was cloned into the plasmid vector pBR 322, and designated as pBM. By dot hybridization, 36 mink and 12 dog fecal specimens before virus inoculation were detected with a positive rate of 36.1% and 33.3%. 98 fecal specimens from MEV-infected mink and 71 fecal specimens from canine parvovirus-infected dogs were examined with a positive rate of 90.8% and 91.5%, respectively. The results showed that the positive rate of the specimens detected with pBM probe was apparently higher than that of the standard hemagglutination test. For comparison with pBM probe detection, a part of the mink and dog fecal specimens were examined with electron microscopy and virus isolation.

Bulletin of Veterinary College of PLA (China), Vol. 11 (3), p. 201-203, 1991. 2 tables, 8 refs. In CHIN, Su. ENGL. Author's abstract.

Lipid composition of pulmonary surfactant in breeding foxes with cardiopulmonary insufficiency

K. Kostro, A. Ledwozyw

The lipid composition of the pulmonary surfactant of breeding foxes was examined. The surfactant isolated from healthy polar and common foxes did not show significant strain differences in lipid composition. On the other hand, in the surfactant isolated from the lung of common foxes that died with the symptoms of cardiopulmonary insufficiency, the quantity of phosphatidylcholine and phosphatidylglycerol was lower and that of sphingomyelin and lysophosphoglycerides was higher than in the surfactants prepared from healthy animals. Moreover, in the phosphatidylcholine and phosphatidylglycerol fractions of the surfactant isolated from the diseased animals, the level of palmitic acid was significantly lower.

Acta Veterinaria Hungarica 39 (1-2), P. 67-75, 1991. 4 tables, 27 refs. Authors' abstract.

Unspecific humoral immunity in polar blue foxes naturally infected with distemper virus

W. Deptula, B. Tokarz

Dynamics and activity of myeloperoxidase and serum lysozyme, globulins, total protein in the polar blue foxes infected naturally with the distemper virus (CDV) were examined. Two step examinations were done. In the first step, the value and activity of the above-mentioned parameters of unspecific humoral immunity were registered twice in 24 sick and 22 healthy foxes during sickness and just before death. In the second step, the examinations were performed on 10 healthy and 12 sick foxes at days 1, 4, 7, 10 and 13 of the disease e.g. from the appearance of the first clinical signs up to the death of the examined animals.

Clinical observations, anatomopathological and virological (direct immunofluorescence test using a conjugate prepared by the Biowet Nitra, Czechoslovakia) tests were performed simultaneously with immunological tests. A complex evaluation of the breeding systems on 5 farms at the first step and on 3 farms at the second step of the studies was also done. It was found that the natural infection of foxes with CDV increases the activity of myeloperoxidase and blood serum lysozyme and decreased the level of serum globulins.

Medycyna Weterynaryjna, 48 (3), p. 125-127, 1992. 2 tables, 8 refs. In *POLH, Su. ENGL. Authors' summary*.

Polyglucosan bodies in the central nervous system of a fox

S. Kamiya, Y. Suzuki, M. Daigo

Polyglucosan bodies (PGB) in the central nervous system of an old male fox, *Vulpes vulpes japonica*, without neurological signs were examined by light and electron microscopy, lectin histochemistry and immunohistochemistry. Fox PGB were round, slightly-basophilic and PAS-positive structures. Most of the bodies were situated free in the neurophil. Electron microscopically, fox PGB were composed mainly of branching filaments and electron-dense material. Lectin histochemistry revealed that fox PGB contained mannose and galactose in addition to glucose. Fox PGB were immunoreactive for monoclonal antibodies raised against human polyglucosan. These findings indicate that fox PGB are similar to feline ones.

Jornal of Comparative Pathology, Vo. 105 (4), p. 467-470, 1991. 6 figs., 11 refs. *Authors' summary*.

Immobilization of wild carnivores with a mixture of ketamine and xylazine

J. Servin, C. Huxley

A mixture of two drugs: ketamine hydrochloride (KHCl), a sedative which produces dissociative anesthesia, and xilazine hydrochloride (XHCl), a non-narcotic myorelaxing sedative, was used to immobilize wild carnivore mammals under field conditions. Four mexican wolves (*Canis lupus baileyi*), twelve coyotes (*Canis latrans*),

four gray foxes (*Urocyon cinereoargenteus*), three skunks (*Mephitis macroura*) and two raccoons (*Procyon lotor*) were intramuscularly injected. Data was grouped in three size categories to be compared: small carnivores, weighing 1 kg to 6.6 kg, received averaged dosages of 36.1 mg/kg of KHCl and 6.5 mg/kg of XHCl. Medium size carnivores, (coyotes) weighing 7.5 to 16 kg, received average dosages of 4.7 mg/kg of KHCl and 1.6 mg/kg of XHCl. Large carnivores (wolves), weighing 23 kg to 28 kg, received an average dosage of 4.2 mg/kg of KHCl and 2.3 mg/kg of XHCl. Dosages used kept the animals immobilized enough time to be handled. Standard measurements like weight and sex were registered. An attachment of a radio-collar was also performed. Vomiting, bleeding, cardiac arrhythmia, breathing stop or deaths were not observed while the animals were under this treatment. This study reveals that the mixture KHCl-XHCl is recommended to wildlife managers as it is an accesible and safe method for both animal and its capturer. The variables drug effect and management time were analized with the linear regression model. Some animals have been monitored since capture for a year and show no physical deficiencies.

Veterinaria Mexico, 23 (2), p. 135-139, 1992. 2 tables, 16 refs. In *SPAN, Su. ENGL. Authors' summary*.

Reproductive failure in mink and ferrets after intravenous or oral inoculation of *Campylobacter jejuni*

Judith A. Bell, Dean D. Manning

Four pregnant mink and seven pregnant ferrets, including five with previous exposure and specific antibody, were injected intravenously with 10^8 - 10^{10} colony-forming units of *Campylobacter jejuni*. All 11 pregnancies failed 1-16 days after injection, with results ranging from fetal resorption to expulsion of dead or premature living kits. In every case, uterine contents (placenta, uterine fluid and/or kits) were culture-positive for *C. jejuni*. Three pregnant mink and nine pregnant ferrets, including four with previous exposure and antibody, were fed 10^9 - 10^{11} *C. jejuni*. Two of the mink aborted; kits of all three were culture-positive, but those of one female survived. Seven of the nine ferrets aborted, with two having culture-positive uterine contents. None of 28 uninfected ferret control

pregnancies ended in abortion. The most prominent histological feature observed was severe placentitis, which appears to be a more likely cause of *Campylobacter*-induced abortion than direct pathogenic effects on infected kits. These results suggest that infection of mink or ferrets with *C. jejuni* during pregnancy poses a serious risk of reproductive failure, even for previously exposed females.

Canadian Journal of Veterinary Research, 54 (4), p. 432-437, 1990. 2 tables, 1 fig. In ENGL. Su. FREN. Authors' abstract.

Fatty liver in mink

Eva Aldén

Fatty liver syndrome in mink is described. Recommendations to prevent the disease include feeding raw meat of good chemical and hygienic quality, preventing rancidity in feeds, dietary choline chloride 200-400 mg/kg feed adapted to requirements, or addition of choline chloride 800 mg/kg feed when necessary.

Vara Pälssdjur, 62 (6), p. 170-171, 1991. 5 refs. In SWED. CAB-abstract.

3-5 week diarrhea in mink kits - some reflections

T. Mejerland

In Sweden in 1991, 65% of the 83 respondents to questionnaires on diarrhea in mink kits had had the problem. The risk factor identified was the fat content of the feed; a high level of fat in the diet during lactation resulted in milk that was high in fat and appeared to predispose sucking kits to this form of diarrhea. Faeces sampling from affected kits did not give conclusive results but did indicate the range of antibiotics in use and made drug resistance studies possible. The higher incidence of the condition in large litters and in the litters of young mink was attributed to the lower immunoglobulin levels of the kits in these categories.

Vara pälsdjur, 63 (3), p. 87, 1992. In SWED. CAB-abstract.

Comparison of feline parvovirus subspecific strains using monoclonal antibodies against a feline panleukopenia virus

Masami Mochizuki, Shin-ichiro Konishi, Masayuki Ajiki, Takao Akaboshi

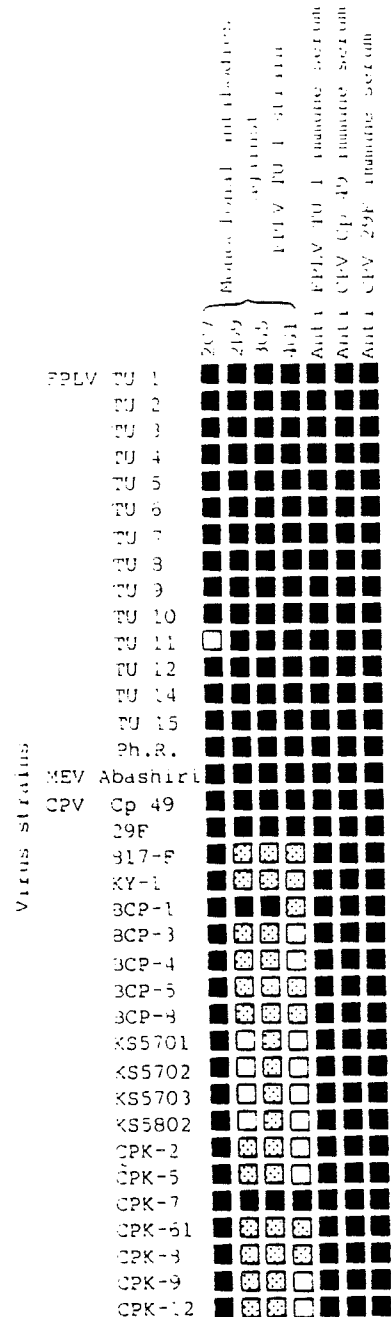


Fig. 1. The diagram of hemagglutination-inhibition titers of monoclonal antibodies and polyclonal immune sera against feline parvoviruses presented in Table 1.

- : $\pm 4 \times$ the titer with the homologous virus.
- ▣: $< 1/4$ but $\geq 1/20$ the titer with the homologous virus.
- : $< 1/20$ the titer with the homologous virus.

Four monoclonal antibodies (mAb) against a feline panleukopenia virus (FPLV) TU 1 strain, one of the host range variants of feline parvovirus (FPV), were produced and applied for antigenic analysis of FPLV, canine parvovirus (CPV) and mink enteritis virus (MEV). All mAbs were considered to be directed at epitopes on the virus capsid surface because they neutralized the infectivity and inhibited the hemagglutination (HA) of the homologous virus as well as other FPV strains. They were of the mouse IgG1 type.

High antigenic homogeneity among FPLV strains was confirmed by HA-inhibition (HI) test with the mAbs and polyclonal immune sera against FPLV or CPV. But the TU 11 strain of FPLV was antigenically distinguished from the remaining 14 FPLV strains by both the HI test and the micro-neutralization test with one of the mAbs produced. MEV Abashiri strain was found to be antigenically indistinguishable from FPLV. Most of the CPV strains isolated after 1981 were considered to be antigenically different from earlier CPV isolates when some mAbs were applied in the serological tests, confirming the replacement of CPV by an antigenic variant in Japan. However, antigenically different CPVs were detected at the end of 1984 from unrelated epizootics occurred a month apart in the same area.

Jpn. J. Vet. Sci. 51 (2), p. 264-272, 1989. 2 tables, 1 fig., 34 refs. Authors' summary.

Experimental infection of domestic ferrets (*Mustela putorius furo*) and siberian polecats (*Mustela eversmanni*) with *Yersinia pestis*

E.S. Williams, E.T. Thorne, T.J. Wuan, S.L. Anderson

Eight domestic ferrets (*Mustela putorius furo*) and two Siberian polecats (*M. eversmanni*) were inoculated subcutaneously with 12 to 1.2×10^7 *Yersinia pestis* originally isolated during an epizootic of plague in white-tailed prairie dogs (*Cynomys leucurus*) near Meeteetse, Park County, Wyoming (USA) in 1985. None of the ferrets or polecats developed clinical signs of disease which suggested that black-footed ferrets (*M. nigripes*), a congener, also would be resistant to plague. All animals receiving $\geq 1.2 \times 10^3$ organisms produced serum antibodies detected by

the passive hemagglutination test with titers peaking at 1:1,024 and remaining positive until at least 219 days postinoculation. Sera collected from 12 free-ranging black-footed ferrets near Meeteetse in 1984 and 1985 were negative for antibodies against *Y. pestis*. Prevalence of antibodies against *Y. pestis* was high in other carnivores collected from the same area in 1986.

Journal of Wildlife Diseases, 27 (3), p. 41-4 1991. 1 fig., 32 refs. Authors' abstract.

Effectiveness of Foxverm in ascariasis combating of foxes

S. Paciejewski, J. Gorski, J. Staskiewicz, A. Kaprowicz

The examinations were performed on the state farm of foxes at Zalesie near Elk. Dehelminthisation was carried out on 4200 adult and 24500 young foxes within two years. On the basis of necropsy and coproscopic examinations it was found that the animals were infested only with *Toxocara canis*. Extensiveness of the invasion ranged from 19 to 54 per cent. It was associated with the age of animals and zoohygienic conditions. The effectiveness of Foxverm administered in the rate of 10-15 mg/kg body weight (active substance) was 94 and 98% respectively. Besides, it was found that the first dehelminthisation should be done in young foxes aged 2-3 weeks with a simultaneous dehelminthisation of their mothers. The results of dehelminthisation were much more effective when strict sanitary measures were introduced.

Medycyna Weterynaryjna, 47 (4), p. 158-160, 1991. 3 tables, 7 refs. In POLH, Su. ENGL. Authors' summary.

Monovalent and combined inactivated (killed) vaccines in the prophylaxis of trichophytosis of breeding foxes

J. Wawrzekiewicz, K. Wawrzekiewicz, Z. Sadzi-kiwski

The purpose of the work was to elaborate an inactivated vaccine against trichophytosis (ringworm) of breeding foxes and assess its protective value under experimental conditions. The studies were carried out on three groups of foxes

which were immunized at the age of 1, 3 and 6 months. There were used two vaccines i.e. a monovalent vaccine prepared of the *Trichophyton verrucosum* strain No 43 and a combined one containing the strains of *T. verrucosum* No 43 and *T. mentagrophytes* var. *granulosum* No 58. The animals were vaccinated twice intramuscularly at intervals of 10-14 days using from 1 to 2 ml of the preparations depending upon the age of animals. The protective value of the vaccines was assayed by means of challenge employing the suspension of virulent strains of *T. verrucosum* and *T. mentagrophytes*. It was found that: 1) Foxes from 1 to 6 months old were sensitive to artificial infection with virulent strains of *T. mentagrophytes* and *T. verrucosum*; 2) After infection the signs of clinical trichophytosis appeared at the site of infection at day 10 and disappeared after 4-6 weeks depending upon the age of animals and intensiveness of changes; 3) The combined vaccine and also a monovalent vaccine (prepared from the *T. Verrucosum* strain) elicited a high degree of protection against virulent strains of *T. mentagrophytes* and *T. verrucosum*; 4) The inactivated vaccines could be applied at the end of the 4th week of young foxes which acquired in this way a high degree of protection in the period of their highest sensitivity to ringworm.

Medycyna Weterynaryjna, 47 (7), p. 317-320, 1991. 4 tables, 23 refs. In *POLH, Su. ENGL. Authors' summary*.

Coypus (Myocastor coypus) as a new host of Cryptosporidium parvum

I. Pavlasek, B. Kazakiewicz

C. Parvum is reported for the first time from coypu. The protozoan was found in 1989 on 2 farms near Poznan, Poland. On one farm it was present in 5 of 8 coypu aged 14-21 days but a second litter of 8 aged 14 days was not infected; on the second farm all forty 28-day-old and 35-day-old animals were infected. None suffered diarrhea. The mean size of the oocysts was 5.0 x 4.75 microm. 4-day-old mice were successfully infected with oocysts from the coypu but two 7-day old chicks were not infected. In a further

experiment, coypu were infected with *C. parvum* oocysts from lambs, confirming the identity of the parasite.

Folia Parasitologica, 38 (1), p. 90, 1991. CAB-abstract.

Use of Ivermectin against several nematodes in naturally infected raccoons (*Procyon lotor*)

Richard E. Hill Jr., Jeff J. Zimmermann, Johan H. Greve, George W. Beran

The anthelmintic effectiveness of various dosages of Ivermectin administered i.m. was compared in three groups of raccoons (*Procyon lotor*) naturally infected with nematode parasites. Qualitative fecal examinations were performed before treatment and periodically after treatment using a sucrose flotation technique. Ivermectin was effective against *Placoconus lotoris*, *Capillaria putorii*, and *Physaloptera* sp. at all doses (200-2,000 µg/kg body weight) and against *C. plica* at higher doses (≥ 600 µg/kg body weight). Ivermectin was incompletely effective against *Baylisascaris procyonis* and *C. procyonis* at a dose of 2,000 µg/kg body weight.

Journal of Zoo and Wildlife Medicine, 22 (4), p. 417-420, 1991. 1 table, 10 refs. Authors' abstract.

Prophylactic and therapeutic use of a vaccine against trichophytosis in a large herd of silver foxes and arctic foxes

A. Rybníkář, J. Chumela, V. Vrzal, F. Krys, H. Janouskovicová

The report describes the incidence of trichophytosis in a large herd of silver foxes and arctic foxes in Czechoslovakia. Out of 4800 animals in the herd 25 silver foxes and 25 arctic foxes were clinically affected. The causative agent was identified as *Trichophyton mentagrophytes*. Prophylactic and therapeutic use of an experimental vaccine, prepared from a live *T. mentagrophytes* culture, was successful: trichophytosis was brought under control within 2 months of revaccination.

Acta Vet. Brno, 60, p. 285-288, 1991. 6 refs. Authors' abstract.

Toxoplasmosis in ferrets

R.N. Thornton

The author reports that a protozoan identified in an epidemic of congenital Toxoplasma-like disease in ferrets (which was reported by the author in 1986) was subsequently confirmed immunohistochemically as Toxoplasma.

New Zealand Veterinary Journal, 38 (3), p. 123, 1990. 2 refs. CAB-abstract.

Malignant lymphoma in ferrets: Clinical and pathological findings in 19 cases

Susan E. Erdman, Frances M. Moore, Rebecca Rose, J.G. Fox

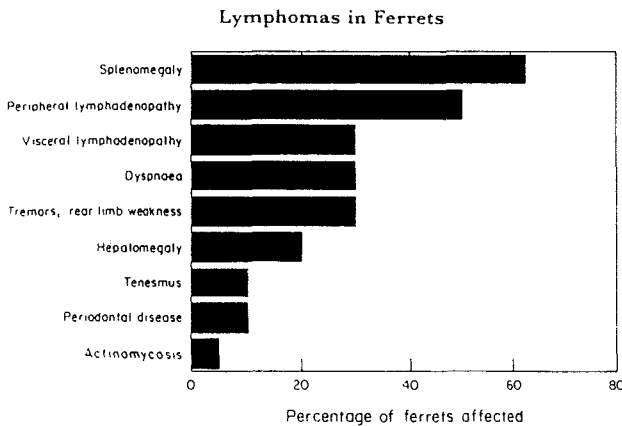


Fig. 1. Clinical findings in 10 ferrets with malignant lymphoma.

The clinical and pathological findings in 19 ferrets (*Mustela putorius furo*) with malignant lymphoma are reviewed. Peripubescent ferrets had rapidly progressive stage IV high grade immunoblastic or small non-cleaved cell lymphoma. Adult ferrets had stage II or IV low grade diffuse small lymphocytic (DSL) lymphoma, stage IV high grade small non-cleaved cell lymphoma, or stage IV high grade immunoblastic polymorphous (IBP) lymphoma. Three ferrets had concurrent IBP and DSL lymphoma involving different organs. The IBP admixture of immuno-

blasts, large atypical lymphocytes, Reed-Sternber-like cells, lymphoblasts and small lymphocytes has been associated with certain retrovirally associated lymphomas and nodal hyperplasias in man, non-human primates and cats. Aleutian disease, a parvovirus-induced lymphoproliferative disease, also involves clinical and histological features similar to certain lymphomas in ferrets. Seven ferrets tested were seronegative for feline leukaemia virus antigen. Only one of eight ferrets was positive for Aleutian parvovirus antibody. The clinical and pathological findings are suggestive of a viral aetiology for certain lymphomas in ferrets.

Journal of Comparative Pathology, Vol. 106 (1), p. 37-47, 1992. 2 tables, 7 figs., 42 refs. Authors' summary.

A histomorphologic and immunohistochemical study of chordoma in twenty ferrets (*Mustela putorius furo*)

D.G. Dunn, R.K. Harris, J.M. Meis, D.E. Sweet

The histomorphologic and immunohistochemical features of chordoma in 20 ferrets were evaluated. The mean age was 3.4 years, and, in the cases for which sex was known, females (n=10) outnumbered males (n=5) two to one. All 20 tumors occurred on the tip of the tail. Nineteen of 20 tumors (95%) were composed of three components, often arranged concentrically with lobules of physaliferous cells at the periphery, trabecular bone in the center, and cartilage in between. The bone often contained marrow and hematopoietic cells. One tumor lacked chondromatous or osseous tissue. Immunohistochemical results were consistent with previous studies of chordoma. All 20 tumors (100%) were positive for keratin and vimentin intermediate filaments; 15 (75%) were positive for S-100 protein; and 17 (85%) were positive for neuron specific enolase. This neoplasm shares morphologic and immunohistochemical features with "classic", as well as chondroid chordoma, of human beings, making it a potential animal model.

Veterinary Pathology, 28 (65), p. 467-473, 1991. 1 table, 8 figs., 27 refs. Authors' abstract.

Pancreatic adenocarcinoma with metastasis in two ferrets

Heidi L. Hoefler, Amiya K. Patnaik, Anne D. Lewis

Exocrine pancreatic adenocarcinoma with carcinomatosis was diagnosed in 2 ferrets. Clinical signs, included abdominal distention and hind limb weakness. Ultrasonography showed moderate ascites in both ferrets, an irregular abdominal mass in 1 ferret, and multiple abdominal masses in the other ferret. The ferrets were killed, and PM examination of 1 ferret showed carcinomatosis without visceral metastasis.

Journal of the American Veterinary Medical Association, 201 (3), p. 466-467, 1992. 11 refs. CAB-abstract.

Intranasal infection of ferrets (*Mustela putorius furo*) with canine parainfluenza virus

Beate Durchfeld, W. baumgärtner, S. Krakowka

Immunocompetent and cyclophosphamide-immunosuppressed ferrets were intranasally infected with canine parainfluenza virus (CPIV) and observed for clinical signs, histopathologic lesions, the immunocytochemical demonstration of CPIV antigen in the respiratory tract and scanning electron microscopic alterations of the tracheal epithelium until 36 days post infection (p.i.). In both groups, clinical signs were minimal, restricted to the upper respiratory tract and consisted of cough elicited by tracheal compression between 3 and 7 days p.i. Microscopically, inflammatory and degenerative lesions were observed in the trachea and less frequently in the nasal cavity; bronchiolitis or interstitial pneumonia was not demonstrated. By immunocytochemistry, CPIV antigen was demonstrated in tracheal epithelial cells, whereas nasal cavity, bronchi, bronchioles and lung were devoid of viral antigen. Ferrets given CPIV alone developed a minimal lymphocytic tracheitis with minimal loss of cilia and CPIV antigen was observed only 4 days p.i. 17 days p.i., normal epithelial organization and ciliary reappearance was re-established. Ferrets treated with cyclophosphamide

and infected with CPIV exhibited mild to moderate histological lesions as above with similar scanning electron microscopic changes until 36 p.i. Tracheal lesions consisted of intraepithelial and submucosal infiltration of lymphocytes and macrophages, focal epithelial hyperplasia and multifocal loss of cilia. In addition, mild and transient neutrophilic infiltration was observed. In immunosuppressed ferrets, viral antigen expression was prominent and demonstrated 4 and 8 days p.i. These data suggest that ferrets are susceptible to aerosol CPIV infection.

J. Vet. Med. Series B, 38 (7), p. 505-512, 1991. 5 figs., 28 refs. Authors' summary.

Eosinophilic gastroenteritis with Splendore-Hoeppli material in the ferret (*Mustela putorius furo*)

J.G. Fox, L.S. Palley, R. Rose

Eosinophilic gastroenteritis, focal or diffuse with eosinophilic infiltrations of the stomach or intestine, has been described in human beings, cats, dogs, and horses. In this paper, we describe infiltration of the gastrointestinal tract with eosinophils accompanied by a circulating eosinophilia in six ferrets (*Mustela putorius furo*). Clinical signs included chronic weight loss, anorexia, and diarrhea. The small intestines from five ferrets had diffuse infiltrates of eosinophils. This resulted in focal or multifocal loss of the muscular tunic in three ferrets. Two of these ferrets also had eosinophilic gastritis. Eosinophilic granulomas with Splendore-Hoeppli material were present in mesenteric lymph nodes in four ferrets. Two ferrets had multiple organ involvement; one had eosinophilic granulomas in the liver, mesentery, and choroid plexus as well as moderate parapancreatic segmental arteritis with infiltration of eosinophils and mural thrombosis. The second ferret had in addition to moderate diffuse gastric and small intestinal eosinophilic mucosal infiltrations, interstitial eosinophilic pulmonary infiltrates. Examination of all tissues failed to reveal an infectious agent.

Vet Pathol, 29, p. 21-26, 1992. 2 tables, 4 figs., 24 refs. Authors' abstract.

Pancreatic adenocarcinoma with osseous metaplasia in a ferret

R.W. Kornegay, J.M. Morris, D. Cho, F. Loza

A poorly differentiated pancreatic adenocarcinoma with regional lymphatic, hepatic, enteric and pulmonary metastases was diagnosed in an adult European ferret (*Mustela putorius furo*). The ferret showed clinical signs including a progressive, marked abdominal enlargement owing to ascites. Microscopic findings included intralesional osseous metaplasia. Exocrine pancreatic neoplasms in ferrets are rarely reported compared with neoplasms with endocrine differentiation.

J. Comp. Path., Vol. 105, p. 117-121, 1991. 5 figs., 7 refs. Authors' summary.

Coccidioidomycosis in three European ferrets

Kathryn A. DuVal-Hudelson

Coccidioidomycosis (*Coccidioides immitis*) is reported in three European ferrets (*Mustela putorius furo*) that were presented with weight loss, lethargy, anorexia, cough, and lameness; one also had draining tracts of the tarsal bones and right carpus. Radiographs showed increased densities in the thoracic cavity. Clinical signs failed to improve with antibiotic treatment. All animals were euthanized or died during treatments.

Journal of Zoo and Wildlife Medicine, 21 (3), p. 353-357, 1990. 3 figs., 10 refs. Author's abstract.

Diseases of furbearing animals 1991

Mogens Hansen

In general, the incidence and severity of diseases recorded in 1991 were lower than in previous years. Distemper was reported on 4 premises and viral enteritis in 71 cases (about half the number for 1990). Tests for plasmacytosis (Aleutian disease) were made on 2.7 million blood samples during the year; 75% of breeding bitches are now on farms classified as plasmacytosis-free (less than or equal to 1 positive reactor/10000 tests). A few cases of mange were reported, an intruding wild animal or dog being suspected of introducing the infection. Outbreaks of an acute intestinal infection (? colibacillosis) associated with feed from a central supplier was responsible for 1-5% of deaths on affected farms. In the first 10 months of the year 4.2% of breeding animals were lost from other causes and in June-October 2.5% of kits died, mostly at birth or before weaning.

Dansk Pelsdyravl, 55 (1), P. 14-15, 17-18, 1992. 2 tables, 2 figs. In DANH. CAB-abstract.

Summer vaccination (of mink)

Mogens Hansen

In Denmark in 1991 most of the 2 million breeding female mink and about half of the 10 million mink kits were vaccinated against mink enteritis, at a total cost of 10 million kr. During the year there were 71 confirmed cases of mink enteritis virus infection and 4 farms were affected by distemper. The criteria used to decide which animals to vaccinate and the time of year of vaccination are outlined.

Dansk Pelsdyravl, 55 (5), p. 213-214, 1992. CAB-abstract.



The Ferret and Ferreting Handbook

James McKay

140 pages, 14 chapters, 39 references. 1989.

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