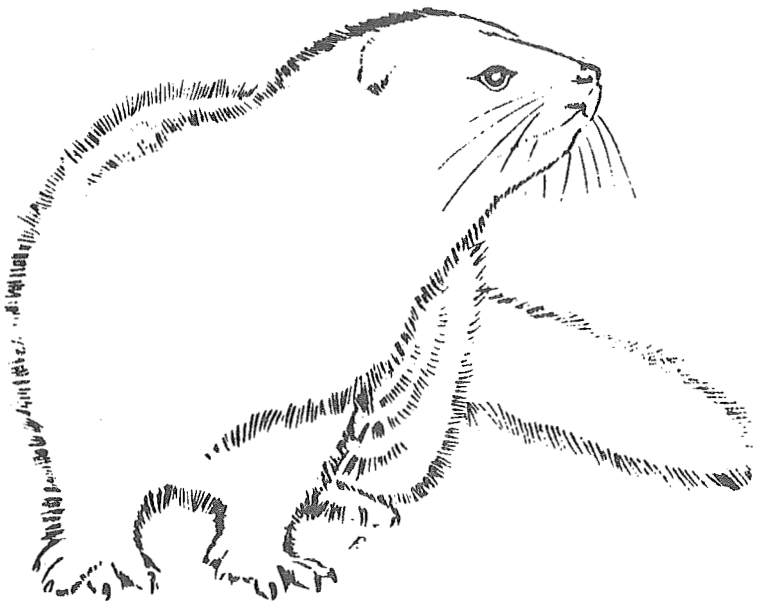
SCIENTIFUR

No. 4, November 1977.

Contents.



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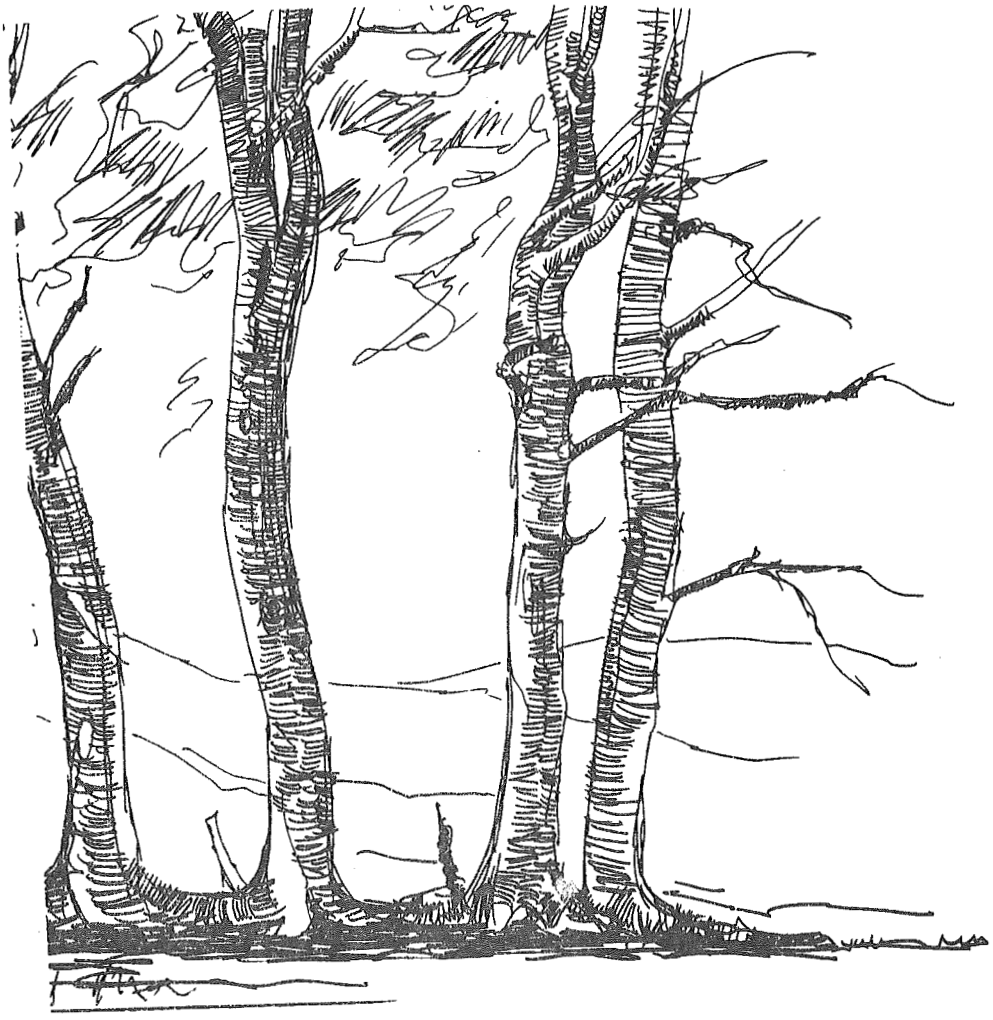
7. COMMUNICATION.



NOTES.

SCIENTIFUR

No. 4, November 1977.

It is customary, at the end of the year, to look back and evaluate if one can be satisfied with the results of one's efforts throughout the year and we at SCIENTIFUR are no exception. Of course it is the number of subscribers and contributors in 1978 which will tell us exactly how successful 1977 was, but anyway we would like to give our version now.

The first two issues consisted largely of material which we had on our shelves. The necessity for using this material made us feel very insecure about the future at this point. However Issue no.3 consisted of 3 original reports and abstracts which had, almost all, been submitted. Many of them were ready to print. This was very heartening, and this development has continued, as can be seen from the present issue which is based exclusively on submitted material. Most of this material was, further, set up according to the guide lines given on the back cover.

The entire SCIENTIFUR "family" - subscribers, contributors and us have therefore every reason to thank each other for the past year and to have high hopes for the coming year, both with regard to contributions and new "family members".

We have not received any information on current events, but we can report on a very successful scientific meeting in Norway on

various problems in the fur production branch.

The program for this meeting was published in SCIENTIFUR no. 2 (pp 42-43). Two papers from this meeting are published in this issue of SCIENTIFUR, and we hope to receive abstracts of some of the other papers to future issue of SCIENTIFUR.

We can also inform that the Board of Scandinavian Association of Agricultural Scientists, Division of Fur Bearing Animals has decided to invite the next World Scientific Congress on Fur Animal Production to Denmark in 1979 or 1980. More news on this congress will come later. At the same time there will be opportunity to come forward with suggestions as to what topics should be treated at this congress.

At the moment work is being carried out on a revision of the "First Revised Edition 1968, of Nutrient Requirement of Mink & Foxes" from the National Academy of Sciences, USA.

Our friend Hugh F. Travis is chairman of the subcommittee on Furbearer Nutrition which is responsible for the revision.

For the first time the Nordic lands are represented on this subcommittee in that the writer has been invited to take part in this revision work.

It is planned that this work should be finished by the spring of 1978, so it is almost the last minute to come forward with useful information which can be of interest for the revision work. But, it is possible that material published in the next issue of SCIENTIFUR can be used, or else direct contact can be made to Hugh Travis.

On a more tedious note, we must inform you that immediately after this issue of SCIENTIFUR has come out, we will take the liberty of sending out accounts for subscriptions for 1978,

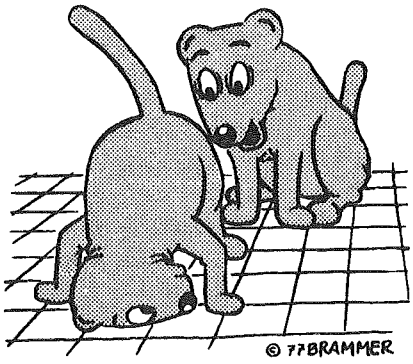
if we have not already been asked to do so.

We hope that this sum will be paid to us in good time before we send out Vol. 2 issue 1 in January 1978.

We who are most closely involved with SCIENTIFUR would like to take this opportunity to thank both subscribers and contributors for then support in 1977, and to wish a Merry Christmas and Happy New Year to all who read these lines.

With kind regards

The editor



What are you studying?
- The background for the
New NRC-norms.

* MORPHOLOGICAL PROPERTIES OF THE BONES OF THE POSTERIOR EXTREMITIES AND THE TRUNK AND DIFFERENCES BETWEEN THE FOX (VULPES VULPES) AND THE DOG (CANIS FAMILIARIS).

(Morfološke odlike i razlike kostiju zadnjeg ekstermiteta i trupa lisice (Vulpes Vulpes) i psa (Canis Familiaris)).

S. Popović, Institute of Morphology and Physiology,
Faculty of Veterinary Medicine, Beograd, Yugoslavia.

Knowledge of the morphological properites of and differences between the bones of domestic and wild animals is becoming more important both for pathomorphological and clinical investigations and with regard to forensic purposes.

Considering the need for the differentiation of very similar bones in the fox and the dog and the lack of data in the literature (Ellenberger and Baum, 1943, Miller et al., 1969, Romer, 1966, Atanasov, 1958, Martino, 1936), concerning this matter, we have undertaken a comparative examinations of a part of the skeleton of these two animals. Present paper completes the comparative study of fox skeleton (Popović, 1972, 1973).

Comparative morphological investigations of the bones of the posterior extremities and the trunk of the fox and the dog have shown, first of all, that there are great similarities but also some characteristic differences between the two species.

Thus some characteristic differences were found in the vertebrae of the spinal column, which, to a greater or smaller extent, can help us in determinations.

A greater number of marked differences were found in the pelvic bones of the fox which could be significant for the differentia-

tion of these bones from those of the dog.

Some characteristics of the femur of the fox were also noted, which can be of interest for the classification of the bones.

The other bones of the posterior extremitites and trunk of the fox are so similar to those in the dog that it is impossible to differentiate between them, with the exception of the relative size of the bones to some extent

Acta Veterinaria (Beograd), 1976, Vol. 26, no.6, 293-3o2.
1o pictures, 7 references.
Authors introduction and summary.

* VISCERAL MEASUREMENTS IN THE MINK ACCORDING TO SEX AND FEEDING METHOD.

(Mensurations viscérales chez le vison selon le sexe et le mode d'alimentation).

J.-P. Laplace, Laboratoire de Physiologie de la Nutrition,
J. Rougeot, Laboratoire des Pelages,
Toisons et Fourrures, Centra national de Recherches zootechniques, I.N.R.A., 7835o Jouy en Josas, France.

The following viscera were weighed: lungs, heart, spleen, liver, kidneys, mesentery including pancreas, stomach and intestine (wet and dry weights) and the length of the intestine was measured in 59 Dark mink, about 7 months old. The mink belonged to 3 groups: females (A) and males (B) fed with a commercial standard feed in form of mash, and males (C) fed with the same feed in pellet form. Aside the differences correlated with live weight (about 85o g in females and 15oo g in males), there was no significant difference in viscera weight between males (B) and females (A). Higher

mesentery weight and lower liver weight were noted in male mink fed mash (B/C), but liver steatosis often occurred. An increase in tissue weight of the emptied stomach was observed in the mink fed pellets (C).

Ann. Zootech. 1976, 25 (3), 387-396.
4 tables, 2 photos, 6 references.

Authors summary.

* THE EFFECT OF O-O-DIMETHYL-O-(2,4,5-TRICHLOROPHENYL) PHOSPHOROTHIOATE (FENCHLORPHOS) ON CHOLINESTERASES IN THE BLUE FOX (ALOPEX LAGOPUS).

Søli, N.E., R.A. Andersen, J. Utne Skaare, and A. Mikalsen, Norges Veterinærhøgskole, Institutt for Farmakologi og Toksikologi, Ullevålsveien 72, Oslo 1, Norge.

The effect of O-O,dimethyl-O-(2,4,5-trichlorophenyl) phosphorothioate (fenchlorphos) on cholinesterases in the blue fox (Alopex lagopus). Acta vet.scand.1977,18,408-415.- Four blue fox bitches were used in the experiments. Two foxes were given fenchlorphos in the feed, one 100 mg/kg body weight and the other 200 mg/kg daily for 30 days. The maximum inhibition of plasma cholinesterase was 65 and 69%,respectively. The corresponding values of the erythrocyte acetylcholinesterase were 43 and 63%.

For the third bitch given 0.4 mg/kg as a single dose i.v. the effect was only measurable as a small transient decrease of the plasma cholinesterase level.

Eighty % of the plasma cholinesterase of the fourth fox, given 500 mg/kg as a single oral dose, was inhibited on the third day. The erythrocyte acetylcholinesterase activity level only showed a slight decline.This fox vomited during feeding the day after administration.

Symptoms as salivation, tremors, diarrhea, pinpoint pupils and respiratory distress were never seen in any of the foxes.

Successful control of ticks, fleas, lice and mites in dogs has been reported when given fenchlorphos orally. Depending on the kind of attack, the doses differed from 20 to 100 mg/kg body weight daily for a month. The same doses have been administrated every other day or once weekly for longer periods as well.

It was concluded that fenchlorphos administration in the feed in doses recommended to dogs is well tolerated by healthy foxes as far as cholinesterase inhibition is concerned.

Acta vet. Scand. 1977, 18, 4o8-415.

Authors abstract.

* MORTALITY OF KITS UNTIL PELTING SEASON ACCORDING TO LITTER SIZE IN MINK.

by A. Udris och A.-B. Oldén, Department of Animal Breeding, Uppsala, Sweden

A study has been made of the connection between kit mortality and litter size. The data was collected from 4 commercial farms and from the fur animal experiment farm at the Agricultural Collage of Sweden. The study rely on 1158 litters from 1-year old standard females, 1354 litters of older standard females, 336 litters of 1-year old pastel females and 354 litters of older pastel females. It occurs, especially in commercial farms that kits are removed from one litter to another to get a better environment. Such litters are excluded from the data.

Litter size is presented including still born kits. Mostly the litters have been counted on the day of birth and sometimes the day after. The mortality has been divided into stillborn and mortality between birth and pelting in November.

The average of the total mortality in this material was 23 %, which seems to be fairly high. A normal value for total mortality is earlier stated to be 15-20 %. The mortality was higher in litters from 1-year old females than from those of older females as expected. The total mortality was 27.0 % and 17.9 % in litters from 1-year old and older females of standard respectively. The corresponding values for pastel were 32 % and 20.5 %, which also shows the higher mortality for pastel than for standard in this material. The percentages for still-born were for standard 1-year old females 8.1 and for older ones 4.5 and for pastels the values were 12.7 and 6.5 for 1-year old and older respectively.

According to litter size the total mortality varied from 15 to 40 %. The highest mortality both before and after birth occured in small and large litters. In litters of 3 - 8 kits the mortality was on about the same level, a little higher than 20 % for 1-year old females and a little lower than 20 % for older ones.

An interesting thing for a commercial farmer is how many kits are alive at pelting at different size of litters. The number to pelt increased with litter size until 8 kits both for young and older females of standard in the experiment farm. In litters larger than 8 the number to pelt remained on the same level. In the commercial farms this level seems to be at 9 kits though less distinct. In pastel the number of kits to pelt increased with litter size until 7 kits for young females and until 11 kits for older females. However it ought to be pointed out that the number of litters larger than 9 were only 13 both for young and older females.

From these results it can be concluded that the average reproduction result of a mink farm depends upon how the litters are distributed according to the size of litters. It also seems clear that a litter size of 7 - 9 kits should be the optimum.

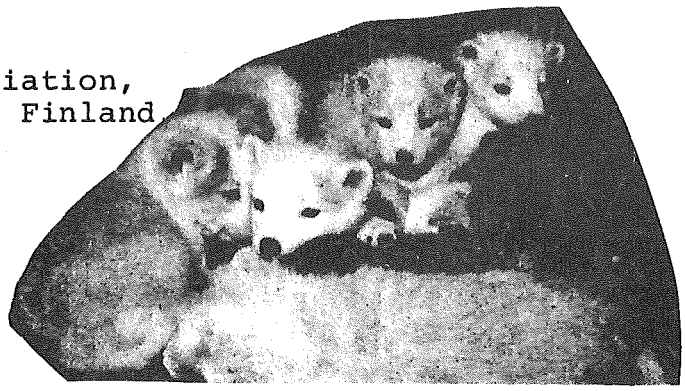
2 Tables, 4 Figures

Våra Pälsdjur 48(1977), 82 - 84 (in Swedish).

Ref. Allan Olausson

*HAEMOGLOBIN CONCENTRATION IN THE BLOOD OF GROWING FOX CUBS.

Lohi, O. Finnish Fur Breeders Association,
Box 14, 00381 Helsinki 38, Finland
Petman, P. - " -
Paavola, S. - " -
Finne, L. - " -



In 1975-76 alltogether 742 blood samples of fox cubs at different ages were tested. The determinations of Hb-value were carried out in farm conditions by Spencer optical Hb-meter (American Optical Co). The animals derived from 10 different farms. No distinction was made between the two sexes.

The mean values and standard deviations in different age groups are given in the following table.

Hb-value (g/100 ml of blood) in blood of bluefox cubs at different age.

Age in weeks	Number of samples	Mean value of age days $\bar{x} \pm$ SD			Hb-value g/100 ml $\bar{x} \pm$ SD		
8	11	54	±	1.63	11.95	±	0.82
9	9	59	±	1,93	12.25	±	0.78
10	9	68	±	1.73	13.15	±	0.77
11	29	74	±	1.70	13.45	±	0.74
12	18	82	±	1.47	13.85	±	1.55
13	31	88	±	1.95	14.62	±	1.44
14	48	95	±	1.62	14.95	±	1.19
15	58	102	±	2.18	15.15	±	1.04
16	79	109	±	1.91	15.18	±	1.02
17	73	117	±	1.99	15.55	±	1.08
18	60	122	±	2.06	16.03	±	0.95
19	90	131	±	2.06	16.04	±	0.88
20	60	136	±	1.60	16.30	±	0.79
21	53	144	±	1.86	16.07	±	0.83
22	26	150	±	2.41	16.60	±	1.04
23	24	157	±	1.26	16.58	±	1.10
24	15	164	±	1.51	16.76	±	0.65
25	19	172	±	1.86	16.77	±	0.84
26	17	178	±	1.89	17.33	±	0.66
27	5	184	±	2.23	17.30	±	0.75
28	8	192	±	1.84	17.50	±	0.80

The least square regression equation between Hb-value and age was computed to be

$y = 14.48 - 0.27x + 0,007x^2 - 0.00006x^3 + 0.0000002x^4$.

Turkistalous/Finsk pälstidskrift 1977, 6, p. 248 - 250.
(Finnish / Swedish)

Author's abstract.

* EFFECTS OF FEEDING INTENSITY ON THE REPRODUCTION OF ONE YEAR OLD FEMALES AT A SWEDISH MINK FARM

By Eva Aldén and Anne-Helene Johansson, Department of Animal Husbandry, Swedish University of Agricultural Sciences, Funbo-Lövsta, S-755 90 Uppsala, Sweden.

The effect of feeding intensity on reproduction, growth and fur quality in mink has been studied for five years. This part of the investigation was carried out on a private mink farm and the intention was to study the effect of rearing intensity on the reproduction results in one year old females. 100 female kits of standard mink were used in the experiment. 50 females were fed as pelting animals (group 1), and accordingly they were very fat by the time of pelting. 50 females (group 2) were fed restrictively from the beginning of September. From pelting all animals were fed restrictively. The feeding intensity was regulated by ration sizes.

The average weights of the females were as follows:

	Nov. 6, 1975	March 3, 1976	May 20, 1976
Group 1	1313 (1020-1680)	953 (780-1130)	1216
Group 2	959 (700-1150)	948 (750-1220)	1144

Of the females in group 1 about 70 % had lost at least 1/3 of their body weight from late autumn to the beginning of March.

Mating and whelping results are given below:

	Group 1	2
Number of females	45[x)]	50
" " mated females	44	50
% mated once	45	34
% mated 2 or 3 times	55	66
Barren females, %	14	6
Live born kits/litter	4.5	5.6
" " " /mated female	3.8	5.2
Number of females who have lost their litter	10	4
Kits/litter, May 20	4,3	5,2

x) 4 sold, 1 dead.

The experiment has been repeated the following year and the results will be presented at the meeting on September 26-28, 1977, in the NJF subsection for furbearing animals.

Published in: Våra Pälsdjur, Vol. 47, No. 10, pp. 252-254, 257-258 (1976).

Authors abstract.

* BODY WEIGHT AND BIRTH RATE OF FEMALE MINK.

by agr. Arvids Udris, Uppsala, Sweden

Calculations have been made of the connection between body weight in November and in March, of weight loss between these two points of time and of the connection between body weight and birth rate of standard females one year old at littering. The data was collected during 1960-1969 at the fur animal experiment farm of the Agricultural Collage of Sweden. The

animals (1022 females) were weighted in the beginning of November and at the end of March just efter the mating period All animals were fed the same diet with normal regulation of the size of portions according to fatness during Dec. - Feb.

The matings started at the 13th of March. A two-mating system was applied with 1 day interval between the matings. Remating was accepted by 60 % of the females.

The mean body weight was 1.23 and 0.88 kg in November and March respectively. The lowest and highest class means of weights in November were 0.75 and 1.95 kg respectively. In March the weights of the corresponding classes were 0.45 and 1.25 kg.

The connection between weight of females in November and in March is shown by a regression coefficient ($b_{y/x} = 0.26$) and a correlation coefficient ($r_{xy} = 0.34^{***}$). It means that the correlation of weight is significant at a level of 0.1 % ($P < 0.001$). The weight loss from November to March is in average 0.35 kg i.e. 28.5 %. The heaviest females decreased 40 % of their weight in November and the lightest females decreased only 5 - 6 % of their weight.

In this material the weight in November had very little influence on the litter size at birth. However it seemed to be an optimum weight in November of 1.2 - 1.5 kg. It was a positive correlation ($r_{xy} = 0.06^{*}$) between body weight late of March and litter size at a low significance level of 5 % ($P \leq 0.05$). The regression coefficient was estimated to $b_{y/x} = 0.90$ i.e. a weight increase of 100 g made the litter size increase with 0.1 kits.

No certain proof was shown between weight in November or March and the frequency of empty females. The mean weights in November and in March of the empty females were the same as the mean of the total.

4 Figures

Våra Pälsdjur 48(1977), 8 - 10 (in Swedish)

Ref. A. Olausson

ASPIRATION BIOPSY OF THE LIVER IN MINK (LUTREOLA VISON).
(Aspirationsbiopsie der Leber bei Nerzen (Lutreola vison).

J. Konrád, J. Hanák, J. Mouka, Tierärztliche Hochschule,
Palackého 1-3, 612 42 Brno, 12, ČSSR.

The authors have developed a technique for carrying out repeated aspiration biopsies on liver from anaesthetized mink. They have given a clinical, pathological-anatomical and histological evaluation. The mink were punctured between the 10^{th} and 11^{th} ribs from the right side. Samples taken were 10 mm long and 1.2 mm thick. Detailed information is given about the aspiration technique. The samples are suitable for histological investigation and are then a valuable diagnostic aid, especially in the study of aleutian disease.

Kleintier Praxis, 21, 41-76, 1976.
6 photos, 12 references.

Ref.: G. Jørgensen

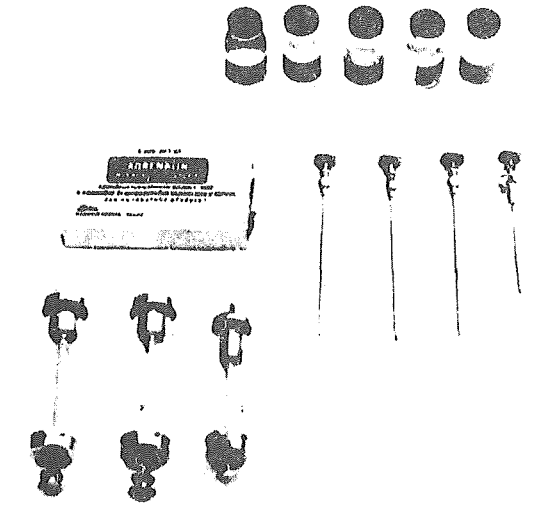


Abb. 1: Ein Satz der Leberbiopsie-Geräte bei Nerzen

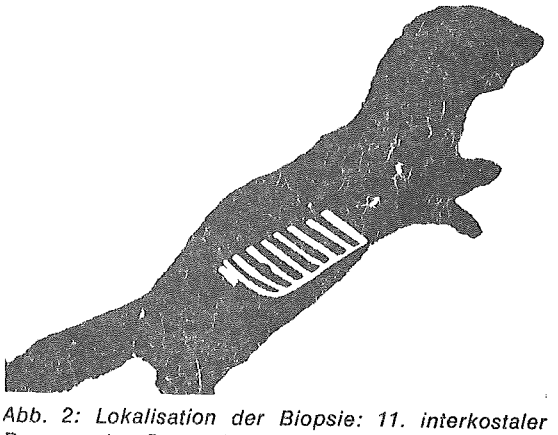


Abb. 2: Lokalisation der Biopsie: 11. interkostaler Raum, rechte Brustseite

* SEMEN VOLUME AND SPERM CONCENTRATION IN THE FERRET (MUSTELA PUTORIUS)

Ann U. Shump, Richard J. Aulerich, and Robert K. Ringer, Poultry Science Department, Michigan State University, East Lansing, Michigan 48824

Semen was obtained from 40 of 62 attempted electro-ejaculations of nine anesthetized male ferrets. The ejaculations were performed using a bi-polar rectal electrode and an electrical stimulus of about 4 V and 0.35 mA applied for approximately 4 seconds and repeated at 10-second intervals. The mean number of stimuli required to obtain an ejaculation was 12.3. The spermatozoa concentration per mm^3 ranged from 0.07×10^6 to 1.98×10^6 with a mean of 0.62×10^6. The mean number of spermatozoa per ejaculate was 16.35×10^6 and the mean volume of semen per ejaculate was 0.026 ml.

Lab. Anim. Sci., Vol. 26, No. 6, 1976, 913-196.
3 photos, 1 table, 5 references.

Authors summary

* HYBRIDS FROM ARCTIC AND SILVER FOX WITH ARTIFICIAL INSEMINATION.

(Hybriden aus Blau- und Silberfuchs durch künstliche Besamung).

Pomytko, V.N., A.V. Vladimirov, E.P. Bautina (1975). Lozarstvo i. Ovostarstvo nauc. Tr. 3, 162-165.

Insemination of a female arctic fox with sperm from a male silver fox gave rise to a hybrid litter of 5 male and 2 female cubs. These hybrid cubs developed more quickly than pure arctic or

silver fox cubs. At 6 months of age the hybrid male cubs had a live weight of 7 kg, the females 5,7 kg. In appearance they resembled silver fox cubs.

Abstract translated from BRÜHL 17, no. 6, 1976.

ORIGINAL PAPER.

* INVESTIGATION OF THE EFFECT OF INCREASING AMOUNTS OF HISTAMINE IN FEED FOR MINK KITS

Johs. Woller, Superfos Blaakilde a/s, DK 2950 Vedbaek,
Sept. 1977.

Resumé: The increasing use of acid preserved raw material in mink feed increases the risk of the formation of histamine in the feed. The effect of histamine on the daily weight gain and health of mink has been investigated in trials, where female kits of the Pearl type were given 15, 118, 203 677 and 847 ppm histamine respectively in the feed. There were 3 kits in each group and the results showed that increasing histamine content gave increasing diarrhoea, just as all the animals apart from the control group, which received 15 ppm histamine in the feed, showed very dilated stomachs.

The daily weight gain fell with increasing histamine concentration and was in the test period 304, 276, 275, 268 and 248 g respectively. With 118 ppm histamine in the feed, the total weight gain was thus reduced by 10% in comparison with the control group and the feed utilization measured in gram total weight gain pr. kg feed was reduced by 7.5%.

Histamine poisoning and the formation of histamine

Histamine poisoning in human beings is a known problem, which has been the object of many investigations. K. Strandberg, R. Mölby and T. Wadstrøm (1973) found that alpha toxin and theta toxin from clostridium perfringens releases histamine from mast cells in rats. The effect of the toxins was stimulated by Ca ++. Zn ++ stimulated only the effect of alpha toxin, while the effect of theta toxin was hindered.

Diarrhoea in human beings caused by rotten fish, was due to synergistic reaction of amines, especially histamine, cadaverine and agmatine. (Yasuha Terada et al. 1974). The classical symptoms of histamine poisoning in human beings are vomiting, diarrhoea, headache, stomachache, heart burn and intense thirst.

C. Iennesteas (1971) states that up to 50 ppm histamine does not show the symptoms, 50 - 100 ppm gives slight poisoning effects, while 100 - 1000 ppm gives clear symptoms. Over 1000 ppm is said to be very toxic.

Histamine is formed by decarboxylation of histidine. The conditions for the occurrence of this process are the presence of free histidine together with bacteria containing histidinedecarboxylase in their enzyme systems. The most important histidine decarboxylating bacteria are clostridium, proteus (especially p. Morganii), salmonella and

escherichia coli (W.J. Edmunds and R.R. Eitenmüller 1975). Lactobacillus has also been mentioned in this connection, but does not seem to play such a big part as was at first thought. The free histidine content in fish varies with the seasons and is different for different types of fish (W.J. Edmunds and R.R. Eitenmüller). Tuna and mackerel have a high histidine content and it is these types of fish that often have given histamine poisoning in human beings.

Ramdom samples of fish silage, poultry pulp and mink feed showed a free amino acid content as shown in table 1.

Table 1. Free amino acid content in some mink feeds

	Lysine	Histidine	Arginine	Lysine	Histidine	Arginine
	mg/kg			g/16 g N		
Fish silage	90	140	61	0.054	0.081	0.037
Poultry pulp	18	6	14	0.008	0.003	0.006
Mink feed	130	47	5	0.068	0.025	0.003

Note that especially fish silage has a high free histidine content. The low pH in fish silage will, however, hinder histidine from being transformed into histamine, because histidine decarboxylation happens only with pH 5.0 - 8.0 with optimum pH 5.0 - 5.5 (Eggert 1939). This agrees with my own investigations, which show that there is no histamine in samples of mink feed, which are preserved with acid, just after the samples are selected. In ordinary mink feed there is from 0-30 ppm histamine just after production, but already after a short storage period the histamine concentration rises very much. Thus a 100 - 120 ppm histamine content is measured after 24 hours storage.

It has not been possible to find investigations showing how fast histamine can be broken down under practical conditions, but C. Ienistea (1971) states that histamine can be destroyed by heating up to 116°C in 90 minutes.

Reaction of mink kits to histamine in the feed

With the object of investigating what effect increasing amounts of histamine in mink kit feed had on feed intake, daily weight gain and health, a test with 15 female kits of the Pearl type was started.

After a week of getting them accustomed to ordinary mink feed, the animals were divided according to the same weight per group, so that there were no siblings in any one group.

The test doses will be seen from table 2

Table 2. Planned amount of histaminedihydrocloride in the feed for each group.

Group I	0 ppm histaminedihydrocloride
Group II	300 ppm histaminedihydrocloride
Group III	600 ppm histaminedihydrocloride
Group IV	1200 ppm histaminedihydrocloride
Group V	2400 ppm histaminedihydrocloride

Histaminedihydrocloride, Sigma nr. H. 7250 was weighed every day and mixed into the amount of feed, which was judged to be necessary to cover feed requirements of the mink. It began with 140 g feed per animal and ended with 190 g feed per animal per day.

The food left over was collected twice weekly and was dried and made into ordinary mink feed with 30% dry matter.

Table 3. Histamine concentration in the test feed

	ppm histamine
Group I	15
Group II	118
Group III	203
Group IV	677
Group V	847

Table 3a. Chemical composition of the basis feed used

Dry matter %		32.0
Digestible crude protein %		13.9
Digestible crude fat %		4.1
Metabolisable energy kcal/100 g		114.0
Gram digestible crude protein pr.100 kcal		12.2
Energy distribution	54.9 % from protein	
	34.4 % from fat	
	10.7 % from carbohydrates	

The animals were weighed once a week and at the end of the test after 34 days, the animals were anaesthetized and blood tests were taken for any serological investigations. After this the animals were killed and samples of liver, small intestine, stomach and kidneys were taken for any histological investigations.

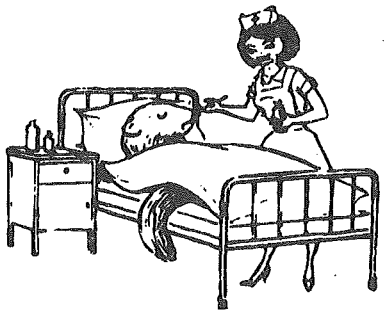
Test Results

At the beginning of the tests vomiting was observed in Group V, but only the first three days. Later the animals got used to the diet. All the groups, apart from the control group, had thin faeces. The higher the histamine concentration the thinner the faeces became, which is shown by table 4.

Table 4. The effect of histamine concentrations on the consistence of faeces

	Average point +)
Group I	0.95
Group II	1.22
Group II	2.44
Group IV	2.60
Group V	2.91

+) Point: 0 = fine, 1 = soft deliquescent, 3=wholly aequeous



HISTIDIN ⟶ HISTAMIN ⟶ MEDICIN

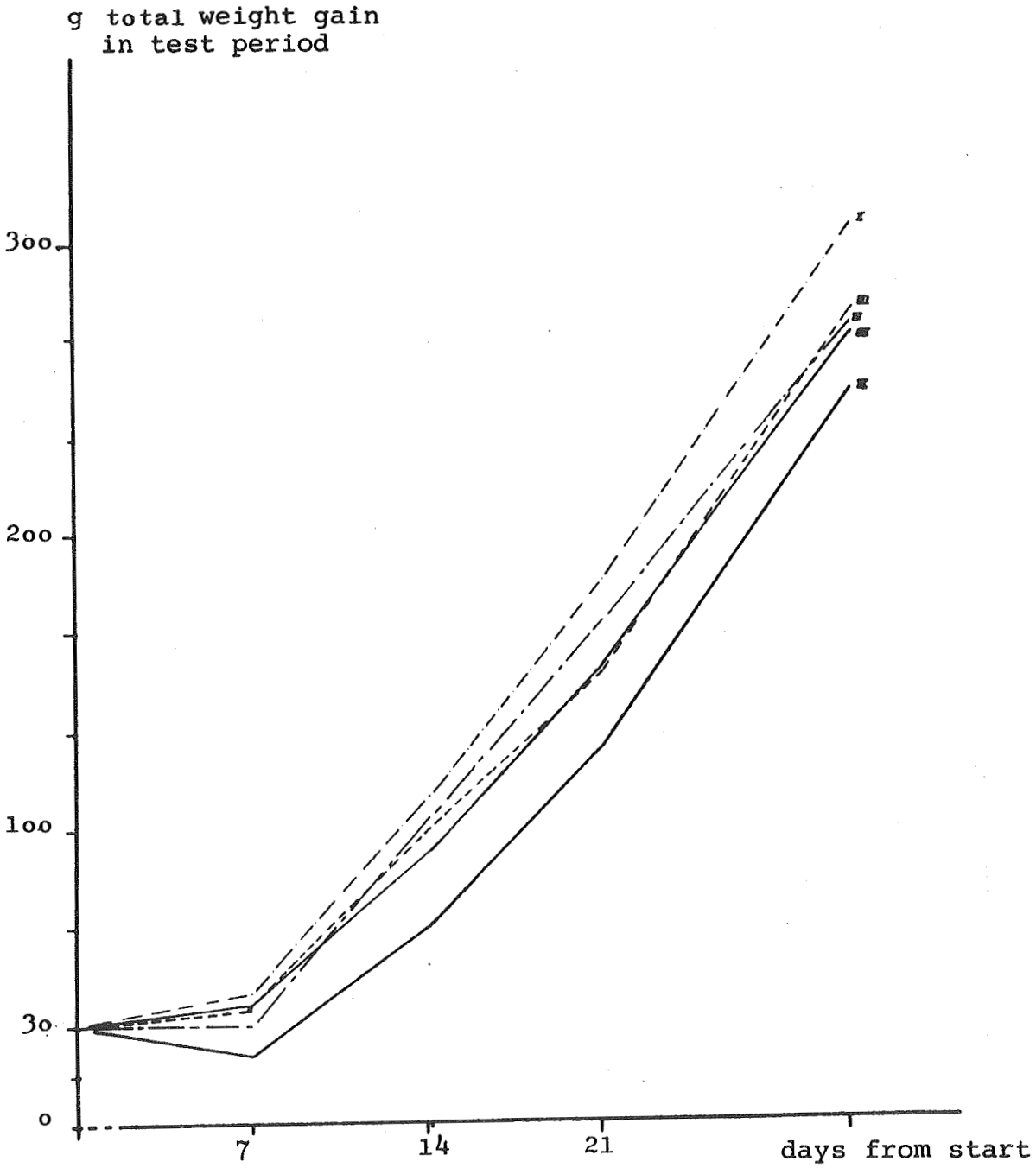


Fig. 1. Each test groups total weight gain during the test period.

Weight gain as well as feed consumption were affected negatively with increasing histamine content in the feed.

This is clear from table 5. and figures 1, 2, 3, and 4.

Table 5. The effect of histamine concentrations on weight gain and feed consumption

Group no	Total weight gain in 34 days	Comparative total weight gain	Feed conversion, g gain/ kg feed	Feed conversion comparative figs.
I	304	100.0	57.0	100.0
II	276	90.6	52.7	92.5
III	275	90.3	52.7	92.5
IV	268	88.0	53.3	93.5
V	248	81.6	50.8	89.1

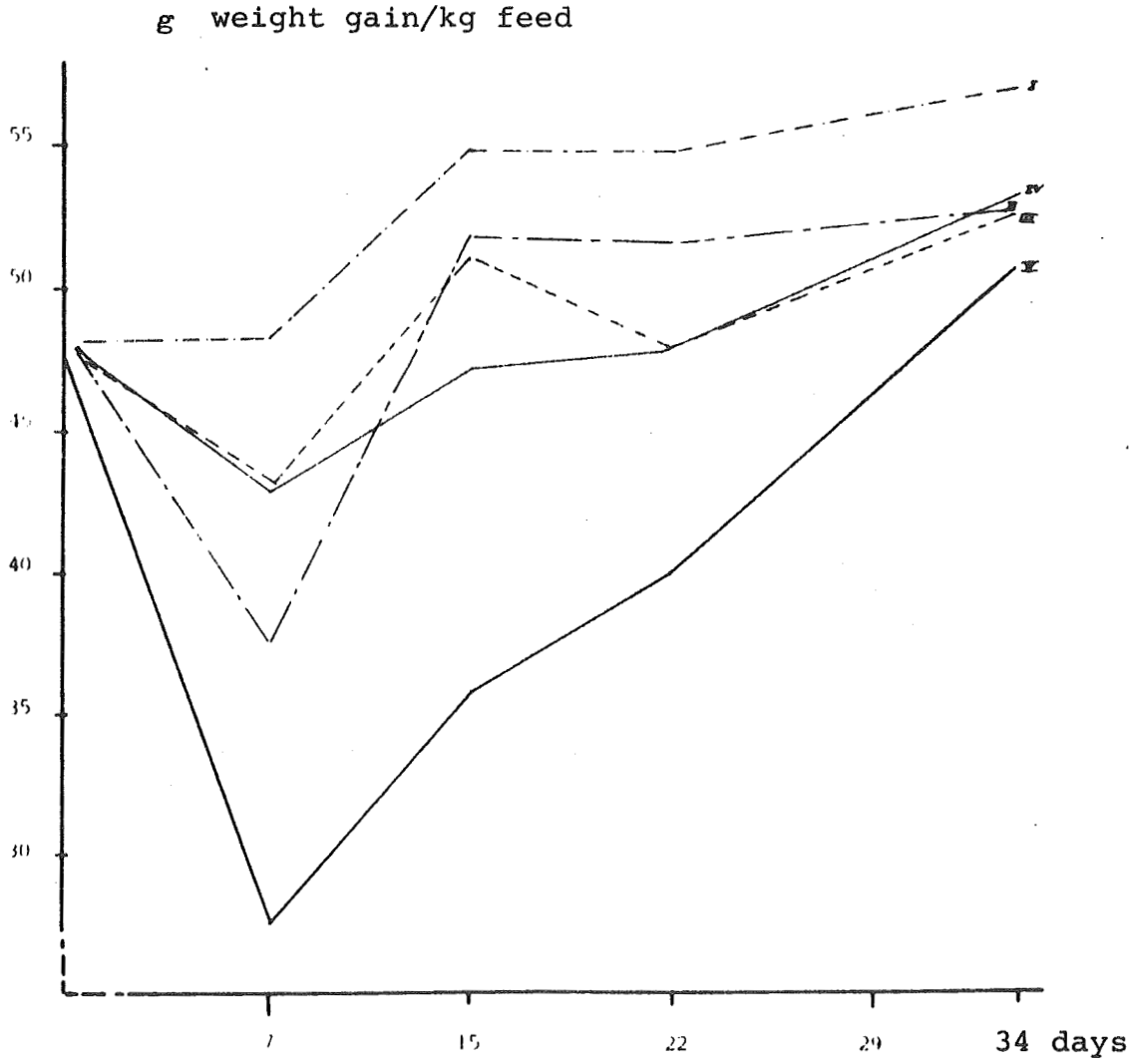


Fig 2. Gram weight gain per kg feed for each test group during the test period

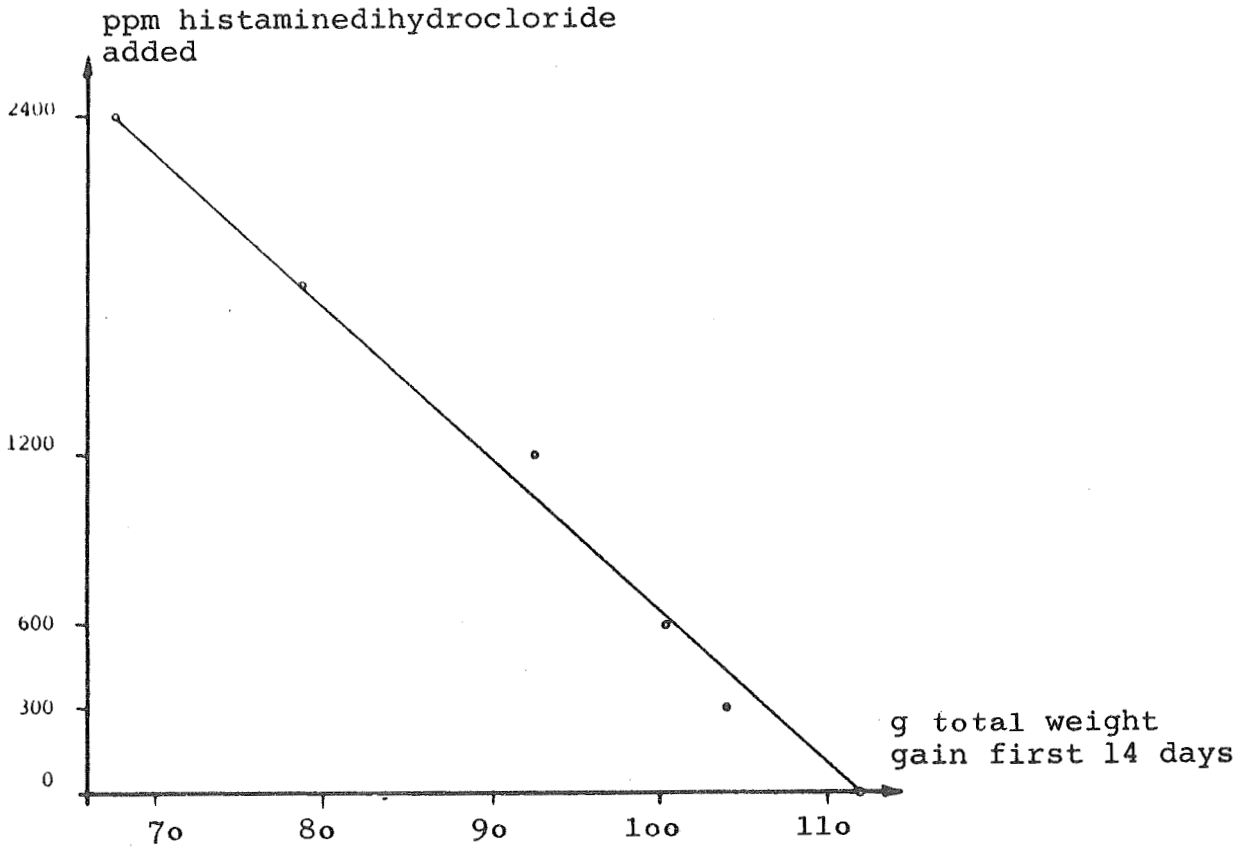


Fig 3. Relation between ppm histaminedihydrocloride in the feed and gram total weight gain in the first 14 days of the test period

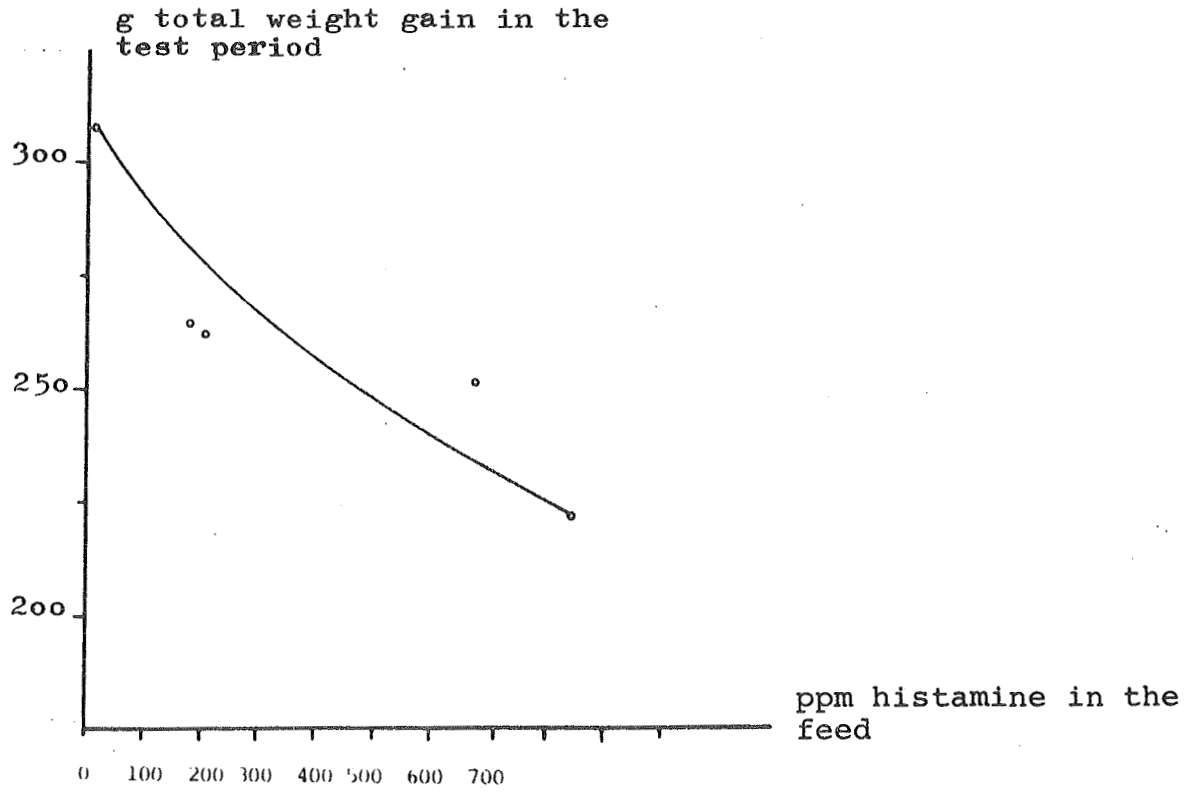


Fig. 4 Relation between ppm histamine in the feed and the total weight gain of the mink kits in the test period.

It is clear that histamine has had a toxic effect on the mink kit and an investigation of the organs showed that even group II with the comparatively low histamine concentration had a very dilated stomach. The abnormal stomach was common to all the groups that were given histamine in the feed, but however it was the only abnormality the pathological investigation, which was done by Mogens Hansen, Vet., DPA, showed.

Conclusion

In ordinary mink feed, the conditions for histamine formation are present. There are bacteria, free histidine and easily converted carbohydrates in sufficient quantities and optimal pH needed for histamine formation. As histamine has a strong negative effect on daily weight gain as well as feed consumption and health of mink, there is no doubt that the concentration of histamine in mink feed should be noted so that the harmful effects can be prevented. The big question is whether histamine poisoning is the cause of the number of cases of thin faeces.

On the face of it there are not many possibilities of guarding against histamine formation, but choice of raw materials, with low histamine content combined with good bacteriological conditions will contribute towards reducing the risks of histamine poisoning under practical conditions.

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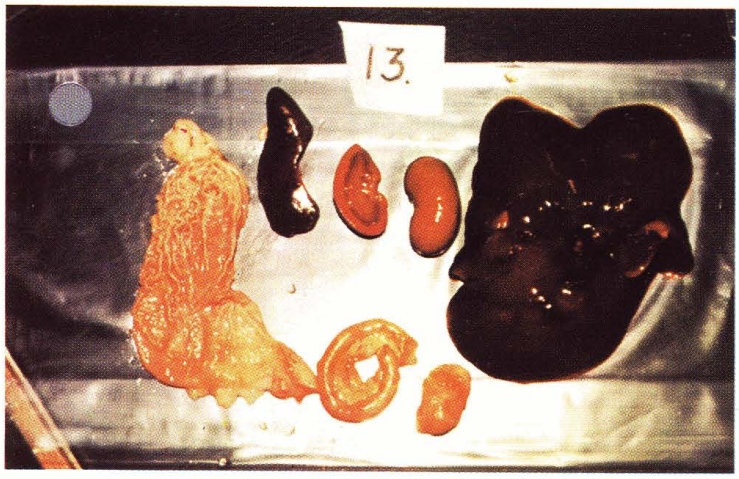

Fig. 5a. Organer fra mink fodret med normalt foder med 15 ppm histamin.

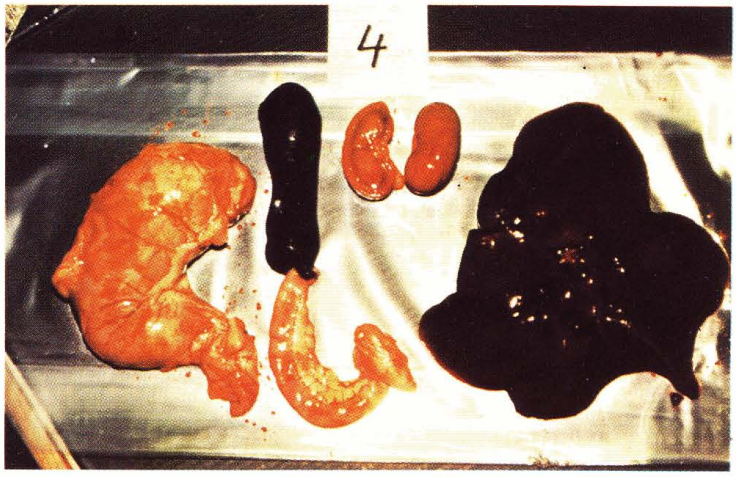

Fig. 5b. Organer fra mink fodret med 847 ppm histamin i foderet.

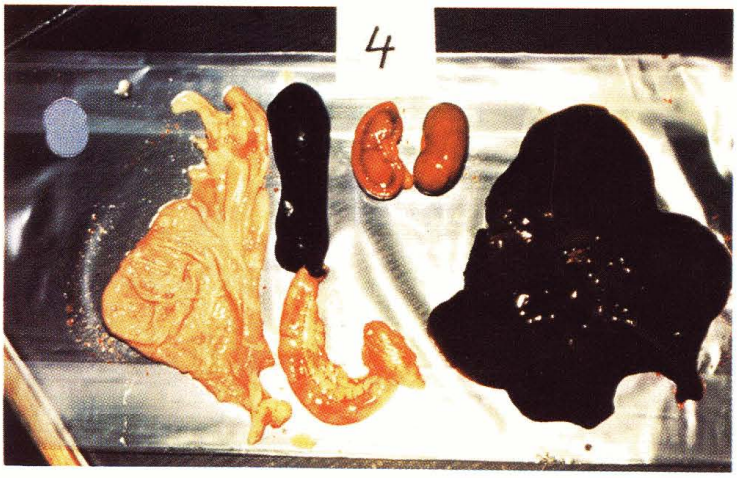

Fig. 5c. Organer fra samme mink som fig. 5b, men med opskåret mavesæk.

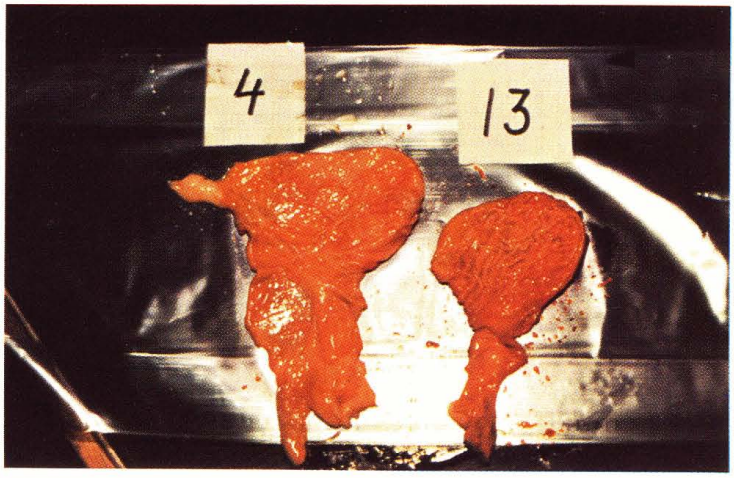

Fig. 5d. Mavesæk fra mink fodret med 847 ppm histamin (4) og med 15 ppm histamin (13).

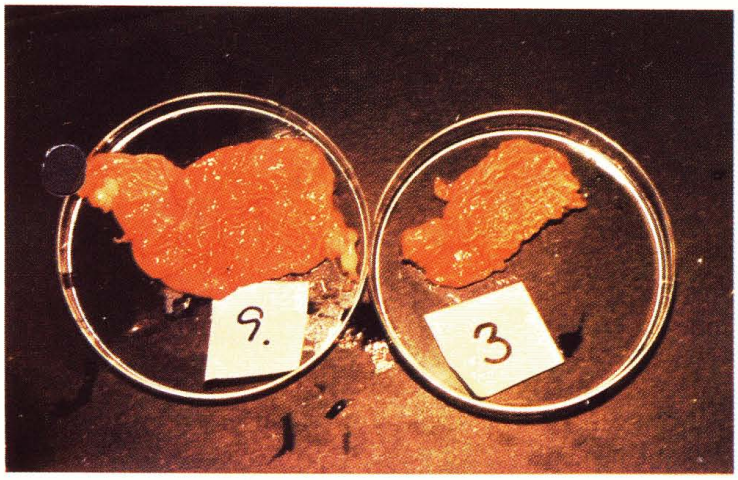

Fig. 5e. Mavesæk fra mink fodret med 847 ppm histamin (9) og med

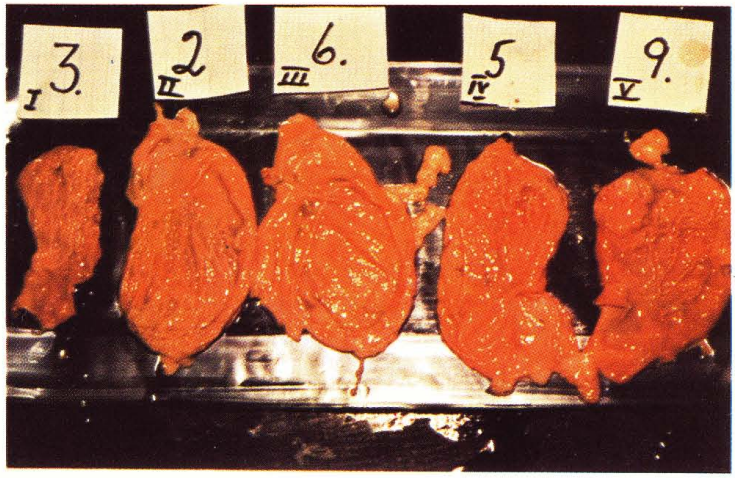

Fig. 5f. Mavesæk fra mink fodret med stigende mængde histamin i fode-

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Fig. 5 a. Organs of mink fed with control diet containing 15 ppm histamine.

Fig. 5 b. Organs from mink fed with 847 ppm histamine in the diet.

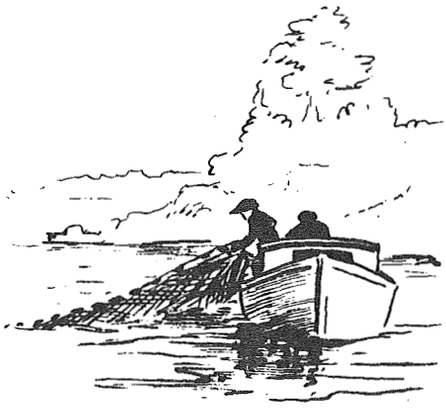

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Fig. 5 c. Organs from the same mink as fig. 5 b, but with stomach cut open.

Fig. 5 d. Stomach of mink fed with 847 ppm histamine (4) with 15 ppm histamine (13).

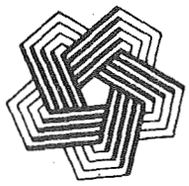

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Fig. 5 e. Stomach from mink fed diets containing 847 ppm histamine (9) and 15 ppm histamine (3).

Fig. 5 f. Stomach from mink fed with increasing amounts of histamine in the feed. I 15 ppm, II 118 ppm. III 2o3 ppm. IV 677 ppm. V 847 ppm.

ORIGINAL PAPER.

* CONTENT OF DIFFERENT CARBOHYDRATE FRACTIONS RELATED TO THE DIGESTIBILITY OF CARBOHYDRATES IN DIETS FOR MINK.

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Introduction.

Previous investigations have shown that the digestibility of carbohydrate for mink varies much more than e.g. for pigs. This is demonstrated in Table 1 where the digestibility of carbohydrate in some commonly used feedstuffs is given for pigs and mink, respectively. From the table it can be seen that mink are inferior to pigs with regard to their ability to digest carbohydrates. Furthermore there is no correlation between digestibility coefficients determined on pigs and mink.

Table 1. Digestibility of carbohydrate in some feedstuffs for pigs and mink, respectively.

Feedstuff	Digestibility of carbohydrate in %: pigs[1)]	mink
Barley	87	50
Oats	74	47
Wheat	92	43
Maize	93	37
Wheat bran	74	30
Grass green meal	56	33
Sugar beet waste, dried	85	25
Soy bean meal	94	27

1) The digestibility of carbohydrates in pigs was calculated on the basis of digestibility of the NFE fraction and crude fiber from data published by Langborg Hansen et al. (1976) and Jørgensen et al. (1977).

The difference between mink and other monogastric species in their ability to digest carbohydrates is probably due to the difference in rate of passage of the feed through the digestive tract. The rate of passage in mink is 4-5 hours measured as time from intake of feed to excretion of about 95% of the undigested feed (Enggaard Hansen 1977). Another reason could be that mink, being a carnivore, is unable to produce some of the enzymes essential for the digestion of carbohydrates in necessary amounts.

The present work was carried out to investigate the possibility of developing a method for evaluation of the digestibility of carbohydrates for mink on the basis of chemical analyses.

Material and methods.

The investigation comprised feedsamples and results from 81 digestibility experiments with mink. The experiments were carried out according to Glem Hansen & Jørgensen (1972). The material was selected from a large number of experiments to be representative for the carbohydrate containing feedstuffs commonly used for mink. The feedsamples were analysed for dry matter, ash, crude protein, crude fat and α-linked glucose in connection with the original experiments. In addition a modified analysis for α-linked glucose (carried out as described below) was carried out on these feedsamples which had been stored with a view to later analyses.

Determination of dry matter, ash, crude protein, and crude fat (Stoldt's method) was carried out according to Weidner & Jakobsen (1962). The method used to determine the content of α-linked glucose is described by Mac Rae & Armstrong (1968) and Gaillard & van't Klooster (1973). The modified method for determination of α-linked glucose is simply an exclusion of the autoclaving of the feed sample prior to the colourimetric determination.

The digestibility of carbohydrate in raw and cooked grain has

in experiments with mink, shown a difference which can not be explained by the content of ∝-linked glucose determined after autoclaving. The reason for this could be, as already mentioned, that the mink are unable to produce the enzymes essential for decomposition of the starch in sufficient amounts. The enzyme used for decomposition of starch during the analysis for ∝-linked glucose, amyloglucosidase, can only decompose cooked starch. Therefore, the analytical method was modified to investigate the relationship between the content of ∝-linked glucose determined without a previous autoclaving and the digestibility of carbohydrate for mink.

Results and discussion.

The correlation between ∝-linked glucose determined according to the original method and the digestibility of the carbohydrates seems to be good when the carbohydrate containing feedstuffs have not been cooked or heat treated in any other way before use. The difference in digestibility between raw and cooked grain can not be explained by this method. However, this difference could in a preliminary investigation be explained by the content of ∝-linked glucose determined according to the modified method described above. This can be seen from Table 2.

Table 2. The content of ∝-linked glucose determined with and without previous autoclaving and the digestibility of the carbohydrate in mink.

	∝- linked glucose		
	with autoclaving	without autoclaving	% digestible carbohydrate
Raw wheat	63.2	39.6	39
Cooked wheat	63.4	62.8	7o

The correlationcoefficient between % digestible carbohydrate and ∝- linked glucose determined both with and without previous autoclaving, was found to be o.87 in each case. This means that 76% of the variation in digestibility can be explained by the

content of α-linked glucose. However, it was clear that it was not the same samples which were responsible for the remaining 24% of the variation in both regression analyses. Therefore, a multiple regression analysis was carried out according to Draper & Smith (1966) with digested carbohydrate as the dependent variable and α-linked glucose without previous autoclaving and α-linked glucose with autoclaving minus the amount of α-linked glucose without autoclaving as independent variables. The resulting regression equation explains 89% of the variation in digestibility of carbohydrates.

By taking the rest fraction of the carbohydrates calculated as the difference (dry matter - (ash + crude protein + crude fat + α-linked glucose determined by the original method) into the regression analysis as a third independent variable, 92% of the variation in digestibility can be explained by the following regression equation:

$$y = 0.98\ x_1 + 0.46\ x_2 + 0.20\ x_3 - 3.37$$
$$F = 720^{\star\star\star} \qquad 123^{\star\star\star} \qquad 26^{\star\star\star}$$
$$R^2 = 0.92\ ;\quad n = 81$$

where y = the calculated amount of digestible carbohydrate,
x_1 = g α-linked glucose determined without autoclaving,
x_2 = g α-linked glucose determined with autoclaving minus α-linked glucose without autoclaving,
x_3 = g remaining carbohydrate,
F = points of distribution according to Draper & Smith (1966),
R^2 = the multiple correlation coefficient.

The relation between the amount of carbohydrate digested and the values calculated according to the equation shown above is illustrated graphically in Fig. 1.

The F-values show that each of the regression coefficients is determined with a high degree of significance ($P<0.001$). The regressioncoefficients also show a significant difference in digestibility of the three fractions of carbohydrates, namely, 98%, 46%, and 20%, respectively.

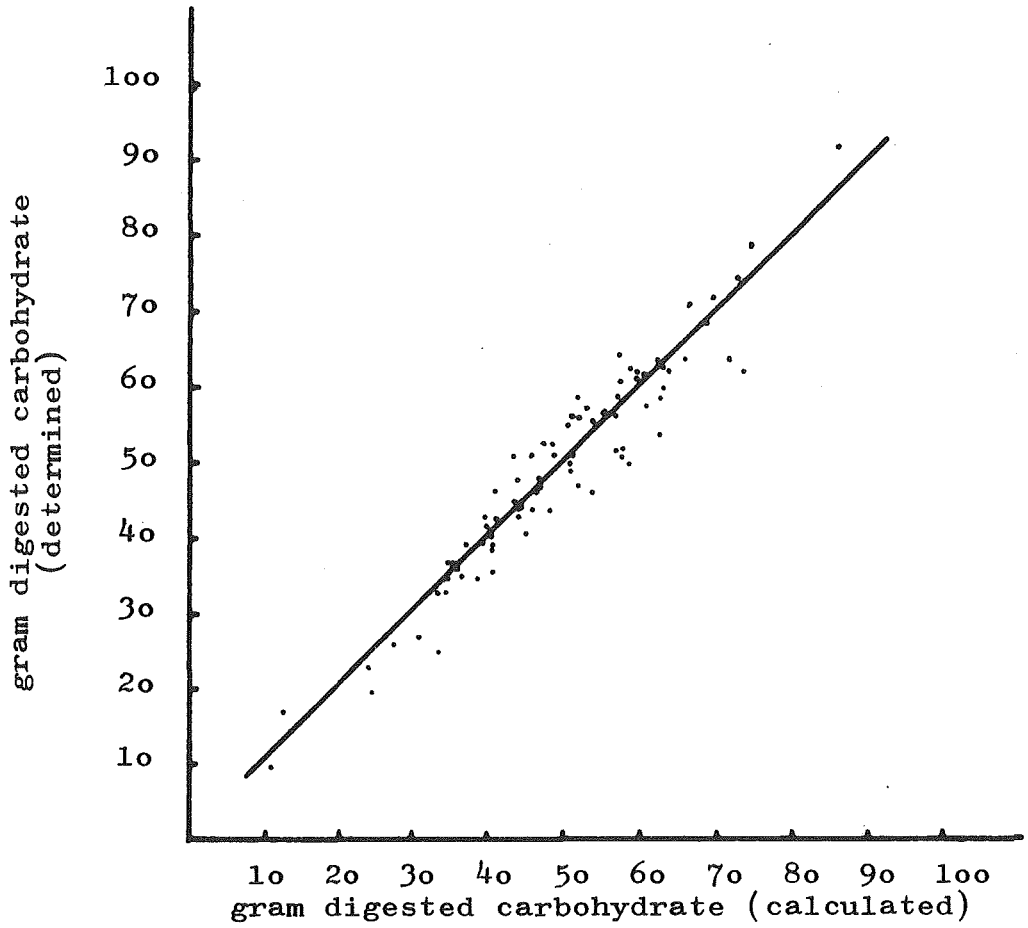

Fig. 1. The relationships between the digested amounts of carbohydrate experimental determined and the values calculated according to the equation shown above.

It can be concluded that the digestibility of carbohydrate in mink can be calculated with reasonable accuracy on the basis of two analyses of feed samples, namely determination of α-linked glucose with and without a previous autoclaving of the feedstuff.

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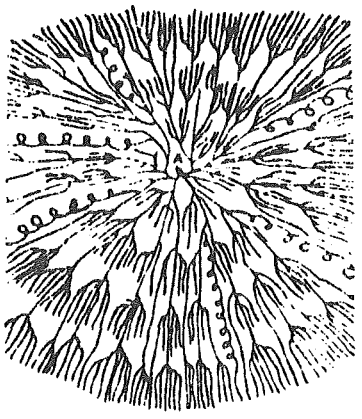
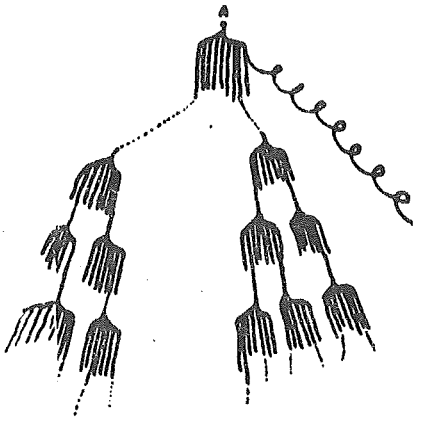


An ultra-macromolecular model starch granule.
Letter A represents a reducing the primer. (NIKUNI, 1969)



A model of a part of raw starch starch).
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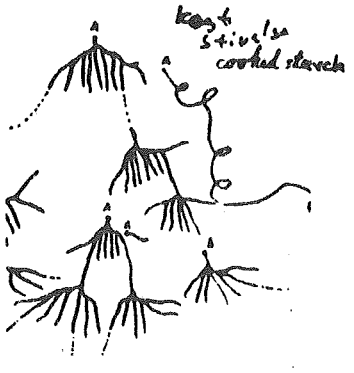

* FEED pH AND ACID-BASE BALANCE OF MINKS.

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The Royal Veterinary and Agricultural University,
and The Department of Fur-Bearing Animals, The
National Institute of Animal Science, Trollesminde,
Hilleroed, Denmark.

Poulsen & Jørgensen (1976) and Jørgensen et al. (1976) demonstrated that by giving mink acid feed the metabolic acid-base balance of the animals could be changes in acidotic direction, and the reproduction capacity and welfare of the animals were adversely affected. However, the results of those acid-base examinations were based on single analyses of heart blood from anaesthetized animals.

In order to obtain a more reliable basis for evaluation of the influence of the pH of feed on the acid-base balance of mink, an investigation was carried out involving examination of the acid-base balance of mink at different acid-base loads in identical animals.

Material and Methods.

The investigation comprised 37 adult mink males of standard type. The minks were during six feeding periods divided into two groups. The two groups of minks were fed the same basic feed but of varying degrees of acidity of protein level (table 1). In period I both groups of minks were fed a neutral farm feed. In period II sulphuric acid preserved silage were added to the farmfeed. In period III this feed were neutralized by the addition of different quantities of sodium hydroxide, after which, in period IV, the animals were again given a neutral farmfeed. Analyses of blood were performed during the last week of each feeding period. The net renal acid excretion

Table 1. Experimental plan for two groups of mink during 6 experimental feeding periods.

	Feeding periods of the year and feeding period numbers (Roman).											
	1o/12-3o/1 I		9/2-3/3 II		4/3-24/3 III		25/3-3o/4 IV		1/5-26/5 V		27/5-12/6 VI	
Groups	1.	2.	1.	2.	1.	2.	1.	2.	1.	2.	1.	2.
No. of animals	17	18	18	19	18	18	18	17	18	17	17	18
pH of feed	6.7	6.6	4.8	5.5	5.8	6.2	6.4	6.4	4.8	4.9	6.4	6.4
Characteristics of feeding difference between periods and groups.	farmfeed with different levels of protein.		feeding different amounts of sulphuric acid preserved silage.		same as in period II but neutralised to different levels of pH using NaOH.		neutral feed.		same as in period IV but acidified with acetic (gr.1) and formic acid (gr. 2).		neutral feed.	
BE mmol/l	-1.6	-2.7	-6.1	-4.o	-2.3	-2.6	-2.o	-1.4	-3.2	-4.1		

was measured during the periods III, V - VI. Acid-base status of the animals were examined by use of anaerobically drawn arterialized capillary blood from the claw.

Results and discussion.

The values for the metabolic acid-base parameter (table I) base excess (BE), vary proportionally with the pH values of the feed except when organic, physiological acids has been used (period V). Only in period II were found an almost significant difference between the two groups of animals. This statistical difference between the groups are probably more due to the low pH level than to a pH difference between the groups.

Neutralization with NaOH (period III) of the feed used in period II produces significant changes in the acid-base data with the occurrence of values within the normal range. However, the values found in period III are slightly more acidic than the values found by feeding normal farm feed (period IV). This difference might be due to the formation of a laxative salt (sodium sulphate) at the neutralization of the sulphuric containing feed. The faeces will become looser and probably cause an increased rate of passage through the intestinal tract. This will contribute to a low BE value.

The renal acid excretion increases in the animals given the most acidic feed, with the exception of the animals given acetic acid preserved silage.

The body weight of the animals were diminishing during the whole experiment. The animals refused to some extent to eat the neutralized feed offered. However, the mating season may have had some influence.

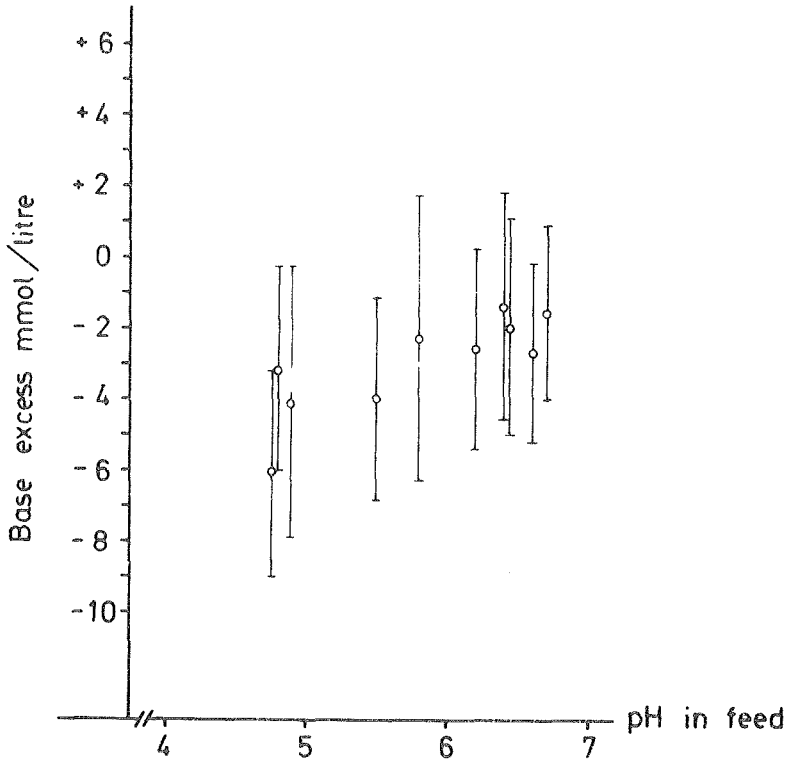

Fig. 1. The relationship between pH in the feed and the Base excess value of the animals indicated by the mean values ± standard deviations.

Conclusion.

On reduction of the pH value of the feed to below a certain limit, the metabolic acid-base balance of the animals is changes in acidotic direction, and the renal excretion of acids increases. On neutralization of an acid feed, the metabolic acid-base balance may remain normal, but this neutralization of the acid feed may have a negative influence on the welfare of the animals.

Further details will be published in The influence of the pH of feed on the acid-base balance of mink by J.S.D. Poulsen & G. Jørgensen, Nordisk Veterinær Medicin, 1977, vol. 29, no. 11, 488-497.

* COOKED FISH SILAGE IN COMBINATION WITH FISHMEAL OR MICRONIZED SOYBEAN MEAL AS MINK FOOD

by Anne-Helene Johansson, Eva Aldén and Karl Gunnar Söderdahl, Department of Animal Husbandry, Swedish University of Agricultural Sciences, Funbo-Lövsta, S-755 90 Uppsala, Sweden.

Mink kits of pastel-type were fed rations containing 15 % (July-August) and 20 % (September-pelting) cooked fish silage in combination with 4 % fishmeal or 4 % micronized soybean meal. Effects of the diets on growth and pelt quality were estimated. Minks fed rations with soybean meal were due to lower energy supplement somewhat lighter than the other groups. Results from digestibility trials with the experimental rations indicate a normal protein and fat digestibility. As expected, carbohydrate digestibility was lower for the soybean meal group.

When the pelt quality was estimated it was found that the soybean meal group had longer guard hairs, the guard hairs covered better and the fullness of the woolhairs was better than for other groups. The good results for the two last characters could to some extent be explained by somewhat shorter skins in this group.

Measurements of food wastage and laboratory experiments on food consistency indicate a positive effect on the food consistency of the soybean meal.

Published in: Våra Pälsdjur, Vol. 48, No. 4, pp. 119-120, 123-125 (1977).

* IS IT POSSIBLE TO SOLVE THE CONSISTENCY PROBLEMS IN FOOD MIXTURES FOR MINK CONTAINING ACID-PRESERVED INGREDIENTS?

by Anne-Helene Johansson and Eva Aldén, Department of Animal Husbandry, Swedish University of Agricultural Sciences, Funbo-Lövsta, S-755 90 Uppsala, Sweden.

Use of acid preserved silage in mink food can give problems with the consistency of the food mixture. Therefore the following experiments concerning food consistency were carried out:

1. Water-absorbing ability of Swedish betfor (Swedish betfor = = 50 % sugar-beet pulp + 50 % molasses).

2. Ability of different feedstuffs to take up and hold released liquid.

3. Hydrolysis studied in food mixtures containing silage. Released liquid was collected in graduated glass.

4. Swedish "betfor" as minkfood. Palatability, dietic effects and food wastes.

Results:

Experiment No. 1. To 10 g samples of betfor, ground betfor and Greek beet pulp was put water once, 2, 3, 4, 5, 5.5 and 6 times the sample weight respectively. The water-absorbing ability was estimated after 1, 2 and 24 hours respectively. The results are given in Table 1.

Table 1. Water-absorbing ability of betfor, ground betfor and Greek beet pulp.

Feedstuff	Water-absorbing ability (x sample weight) after	
	2 h	24 h
Betfor	3	4
Ground betfor	4	5
Greek beet pulp	5.5	6

Experiment No. 2. A food mixture consisting of 27 % cooked Danish fish-silage, 13 % cod offal, 20 % herring, 13 % slaughter-house offal, 13 % chicken offal and 13 % commercial cereals was

prepared. Of this mixture 50 % was homogenized and samples were prepared of 90 % food mixture, 2 % experimental feedstuff and 8 % water. For every experimental feedstuff one sample was homogenized and one was not. As experimental feedstuffs were used betfor, ground betfor, Greek beet pulp, potatoe-mash powder, blood-meal, feather-meal, uncooked ground cereals (50 % wheat, 25 % barley and 25 % oats), wheat brans, fishmeal and micronized soybean meal.

The amount of free liquid was estimated in the samples after 4.5, 8, 20 and 48 hours respectively.

The results indicate that addition of 2 % beet pulp to a food mixture containing more than 20 % silage is enough to absorb nearly all released liquid up to 48 jours after preparation. Also 2 % betfor and 2 % micronized soybean meal showed good water-absorbing ability.

Experiment No. 3. Released liquid from silage containing food mixtures was collected in graduated glass. Addition of 2 % betfor or 2 % Greek beet pulp improved the water-holding ability of the food mixtures.

Experiment No. 4. Betfor as a water-absorbing agent in food mixtures was tried according to palatability, dietic effects and food wastes. Four groups of 5 male and 5 female mink kits of pastel-type were fed rations containing 0, 2, 4 and 8 % betfor respectively. The animals were weighed once a week. Animals given a ration with 8 % betfor lost weight rapidly probably due to low feeding intensity and food lost through the netting. Food wastage was measured and food waste increased with increasing betfor percentage. It was also clear that the animals to some extent had sorted out betfor. No differences in dietic effects could be seen when animals given betfor were compared to animals on non-betfor rations.

Published in: Våra Pälsdjur, Vol. 47, No. 11, pp. 279, 281-283 (1976).

* THE RESULTS OF MINERAL SUPPLEMENTATION IN THE FEEDING OF MINK.

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Jaakko Mäkelä, Helve´s Research Farm, Pb 14, 00381 Helsinki 38 Finland.

The effect of mineral supplements on the fertility, growth and skin quality of mink was tested in three years´experiments. The total number of animals amounted approximately to 3 600. The control groups received a supplement of 50 ppm Fe in dry matter and the other groups in addition to Fe different combinations of other essential minerals: NaCl (0,12-0,14 % Na), Mg (0,05 %), Cu (5,0-5,5 ppm), Zn (50-56 ppm), Mn (33-35 ppm), Co (0,8 ppm), J (0,45 ppm) and Se (0,05 ppm), all amounts given in dry matter of feed.

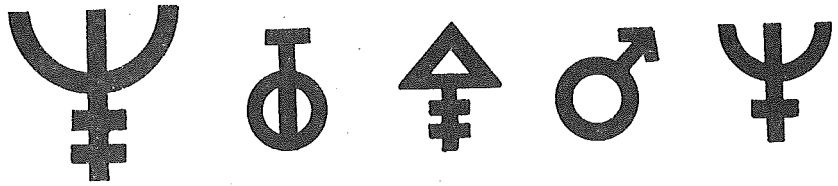
The results varied between years and totally the mineral supplements had no remarkable and uniform effect on those parameters mentioned.

This result is, however, not surprising because minkfeed generally contains plenty of all minerals as the feed analyses reveal. The concentrations of minerals in the basal feed were according to the analysis: Ca 3,2-3,9 %, P 1,1-1,7 %, Mg 0,17-0,26 %, Na 0,32-0,68 %, K 0,70-1,30 %, Fe lo2-509 ppm, Zn 57-94 ppm, Mn 30-45 ppm, Cu 7,8-11,5 ppm, Co 0,19-0,74 ppm, J 2,4-6,4 ppm and Se 0,05-0,42 ppm in dry matter.

Taking into consideration some results received in experiments with breeding females and the concentration of minerals during that season it is, according to the writers´ opinion, possible, that some microminerals like Zn and Mn can be limiting factors for the best possible fertility in certain conditions. The high level of macro-minerals (Ca, P, Mg) in minkfeed can increase the need for micro-minerals (antagonism) allthough their concentration as such should be adequate.

Agricultural Research Centre, Department of Animal Husbandry.
Bull. N:o 10. 1977. (Finnish)

Author´s abstract.



* THE FEEDING EXPERIMENT WITH SPRAT (Clupea sprattus)

Tuomo Kiiskinen, Agricultural Research Centre, Department of Animal Husbandry, 01300 Vantaa 30, Finland

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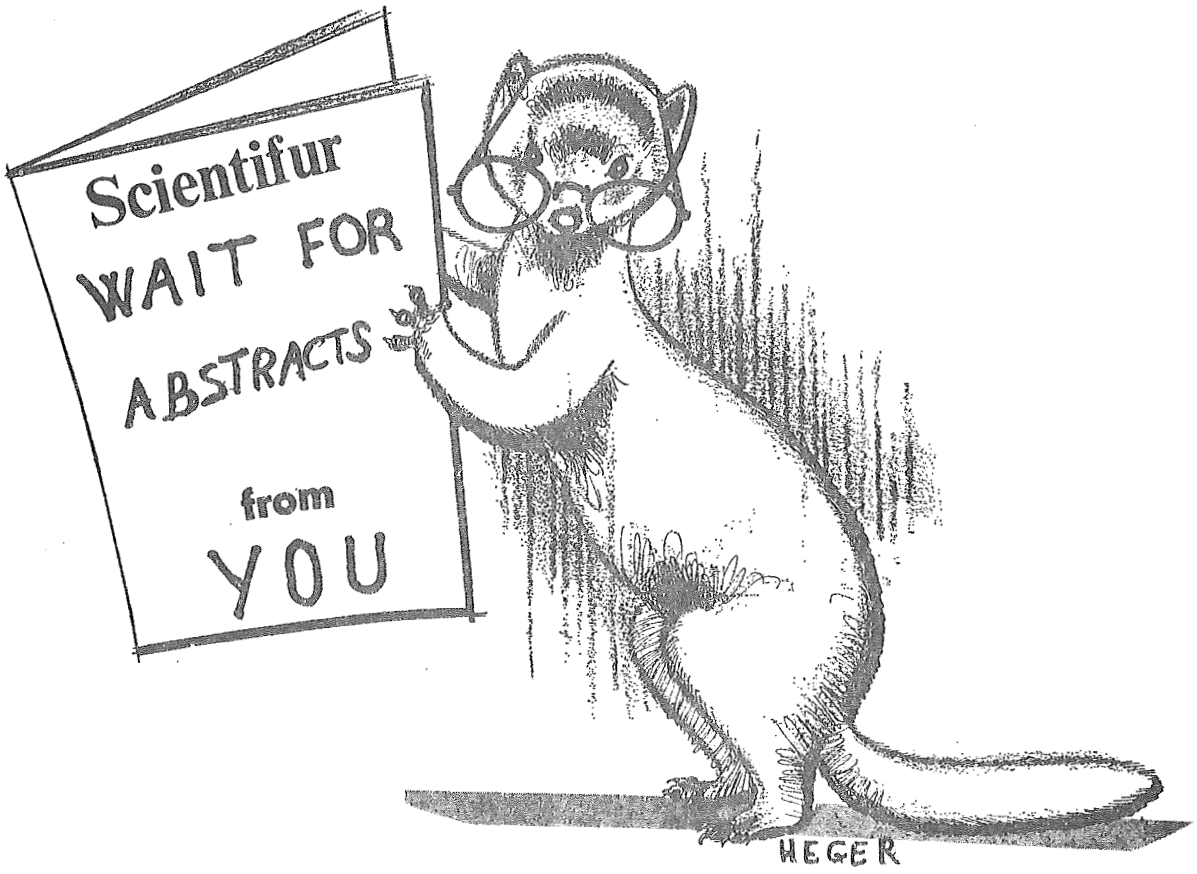
Sprat (Clupea sprattus, vassbuk in Swedish) is a near relative to herring and baltic herring and it often appears in great amounts among trawled baltic herring. Sprat is well suited to the facturing of canned fish and is cought a lot for this purpose by Russian trawlboats. It is quite rich in fat. The fat content arises in the winter (Nowember-February) to 12-14 % decreasing after spawning to 3-5 %. The sprat is mentioned to be a thiaminase fish. In Finland Qvist and Mäkelä (1960) carried out an experiment, in which they could use sprat 27,2 % (23.8-30.9) and 18,7 % (1.10-30.11) in the minkfeed without any harm. Sprat replaced the same amount of baltic herring in the control feed. Cooking and skip-a-day feeding didn`t improve the results.

In 1976 the writers arranged a feeding experiment by replacing the baltic herring (15 %) of the control feed with sprat. The experiment started in the beginning of July (6.7) and went on to the pelting-time. There were 80 standard kits per group (40 ♂♂, 40 ♀♀). According to the analysis, the sprat contained 16 % crude protein (49,8 % in dry matter) and 13,5 % fat (42,0 % in dm). The chemical analyses of the experimental feeds were very near each other and there were no notiseable differences in the peroxides of the feeds.

The differences in growth and skin quality between the groups were negligible. The average weight gain of the males was 1366 g (183 %) in the control group and 1391 g (195 %) in the sprat group. The corresponding figures for females were 577 g (102 %) and 538 g (101 %) respectively. As the mortality in the sprat group was higher than in the control group (8,0/1,3%) the writers will continue the research in order to examine the thiaminase activity of the sprat.

Turkistalous/Finsk Pälstidskrift 1977, 5, p. 210-212
(Finnish, Swedish)

Author`s abstract



* FELINE PANLEUKOPAENIA VIRUS AND MINK ENTERITIS VIRUS. A SEROLOGICAL STUDY

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The serological relationship of Danish feline panleukopaenia virus and mink enteritis virus and strains from Great Britain, USA, Germany and Canada was examined in neutralization tests using a direct immunofluorescence technique. Vaccine strains of the virus were used representing virus strains from the different countries. It was found that all Danish feline panleukopaenia virus strains and the mink enteritis strain belong to the same serotype and further that they are of similar antigenicity as feline panleukopaenia virus strains and mink enteritis strains isolated in other countries.

The neutralization test can be used as an aid in the clinical differential diagnosis to other diseases of cat and mink.The use of the test for this purpose, though, is limited by the fact that three days are required to obtain a result and futher that repeated examination of possible increases in titre is nesessary.However, the neutralization test can be used in epidemiological investigations of feline panleukopaenia and mink enteritis for instance in search for subclinical disease.

2 Tables, 2 Figs. , 13 references.

The complete report published in Acta vet. scand. 1977. 18, 1-9.

* ADAPTATION OF THE ORBITAL SINUS BLEEDING TECHNIQUE TO THE CHINCHILLA (CHINCHILLA LANIGER)

Karen M. Brookhyser, Department of Zoology, Michigan State University, East Lansing, Michigan 48824

Richard J. Aulerich, Department of Poultry Science, Michigan State University, East Lansing, Michigan 48824

Archie J. Vomachka, Department of Zoology, Michigan State University, East Lansing, Michigan 48824

The orbital sinus bleeding technique was used to obtain 1-3 ml samples of venous blood from chinchillas (Chinchilla laniger) within 1 minute. By monitoring food intake and body weight, this technique was shown to have no detrimental effects on the general health of the animals, but serial samples taken twice weekly over a period of 2 months did induce some degree of hemorrhage or occasional corneal opacity in some animals.

Lab. Anim. Sci., Vol. 27, No. 2, 1977, 251-254.
2 photos, 8 references

Authors summary.

* CURRENT STATUS OF PCB TOXICITY TO MINK, AND EFFECT ON THEIR REPRODUCTION

Richard J. Aulerich and Robert K. Ringer, Poultry Science Department, Michigan State University, East Lansing, Michigan 48824

Experiments were conducted from 1968 to 1974 to investigate reproductive complications and mortality in mink fed Great Lakes coho salmon and to ascertain the effects of polychlorinated biphenyls (PCB's) on this fur bearer. The results of mink feeding trials indicated that coho salmon, as such, were not responsible for the loss of reproduction in the adult, or the kit morality. Mink diets that contained other species of Great Lakes fish caused similar reproductive complications, but to a lesser degree.

Rancidity, mercury poisoning and chlorinated hydrocarbon pesticide contamination of the fish were all discounted as being responsible for the problem. The clinical signs and lesions noted in mink that died while

receiving diets that contained Lake Michigan coho salmon were very similar to those observed in mink fed on rations that contained supplemental PCB's. These included anorexia, bloody stools, fatty liver, kidney degeneration, and hemorrhagic gastric ulcers. Analyses of tissues from mink that died when fed 30% Lake Michigan coho salmon or 30 ppm supplemental PCB diets showed similar PCB residues.

PCB toxicity experiments revealed that mink are very sensitive to these compounds and that the lethal dose varied inversely with the chlorine content of the PCB's although only Aroclor 1254 exerted a detrimental effect on reproduction when fed at a low level (2 ppm) for 8 months. The reproductive failure encountered in feeding mink Lake Michigan coho salmon and Aroclor 1254 was shown to be of a non-permanent nature.

Arch. Environm. Contam. Toxicol., Vol. 6, 1977, 279-292.
13 tables, 44 references

Authors abstract

* PHENYLMERCURIC ACETATE INTOXICATION IN MINK.

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C.G. van Lieshout, Head of the Department of Toxicology and Analytic Chemistry, Central Veterinary Institute, P.o.box 6007, Rotterdam, the Netherlands.

Mink died following phenylmercuric acetate (PMA) intoxication. The mink, all standards, were fed a diet that later proved to be contaminated with PMA with a mean mercury content of 27 ppm. This diet was fed to mink one year and older 11 days and to mink younger than one year 13 days.

A total of 116 mink died including 40 % of the males older than one year (n = 23), 31 % of the females older than one year (n = 89), 1 % of the males younger than one year (n = 4). There were no deaths among the females younger than one year. The age-related phenomenon with regard to mortality could not be explained.

Clinical symptoms started with a progressive loss of appetite and a decrease in activity. The surviving mink appeared to recover within three weeks after change the normal food.

The most important pathologic changes were observed in the kidneys. Tubulonephrosis, primarily localized in the proximal convoluted tubules, was most severe in mink dying 2-3 weeks after the beginning of feeding of the contaminated diet. Lesions in the central nervous system were not observed. Thus, the effects of arylmercurial compounds such as PMA, differed strikingly in mink as they do in other animals and man, with those of alkylmercurial compounds.

Some surviving mink were sacrified with intervals of 3, 5, 21 and 50 weeks to study the course of the histopathological changes and the residual mercury retention.

Blood urea nitrogen levels, increased up to six times, and proteinuria were observed up to 5 weeks after exposure to PMA. Tubulonephrosis, less severe than in mink died spontaneously, was found up to 5 weeks after exposure to PMA.
Mercury residues in brain, liver, kidney and skeletal muscles were analyzed. From the data of the mercury residues, measured up to 50 weeks after exposure to PMA, the residue regression,

the coefficient of regression and the half-times of disappearance of mercury were calculated. Twenty-one weeks after exposure mercury residues had declined to normal levels.
The half-time of disappearance of mercury was 10 days in skeletal muscle, 22 days in kidney, 27 days in brain and 36 days in liver.

Reproductivety of the surviving mink and fur quality were not affected by PMA-intoxication.

The results of the analyses of the residual mercury levels in tissues, the histopathological findings, the clinical follow-up of the surviving mink and their normal reproductivity indicate the reversibility of PMA-intoxication.

2 figures, 1 table and 34 references.

The complete report was published in:
Tijdschrift voor Diergeneeskunde 102, 495-503, 1977.

* OBSERVATIONS ON WET BELLY DISEASE IN MALE MINK.
(Beobachtungen zur Bauchnässe der Nerzrüden)
H. Zimmermann, Bezirksinst.f.Veterinärwesen, DDR 22 Greifswald.
Garten und Kleintierzucht 14 (1975), no. 2o, 1o.

Wet belly disease is seen mainly in male mink in the autumn or early winter. The value of the skins of mink affected is considerably reduced. When discussing the cause of this disease, there are several factors which must be taken into account, among them, genetic factors, feeding and care of the animals, and bacterial influences. Investigations have shown that it has been possible to cure 52% of cases of wet belly in males by putting them in cages by themselves, instead of in pairs which is the usual practice.
Abstract translated from BRÜHL, 17, no.6, 1976.

* INFECTION OF THE BRAIN AND BRAIN MEMBRANES IN FOXES DUE TO SALMONELLOSE.

(Entzündung der Hirnhäute und des Gehirns im Verlaufe der Salmonellose der Füchse).

Kaszubkiewicz, Cz., J.A. Madej. (1974).
Med. weter. 3o (1974), 598.

Salmonellose attacks carnivorous fur bearers, especially silver and polar foxes, and, in rare cases, mink. In the material examined (from a fox farm), it was found that the affected animals showed crooked posture with tilling back of the head, compulsive movements and upward bending of the vertebral column. These symptoms could be traced to infection processes in the central nervous system. Bacteriologically, salmonella of the types S. dublin and S. enteridis were shown to be present.

Abstract translated from BRÜHL, 17, no.6, 1976.

* HYDROXYPROLINE AND WET BELLY IN MINK

Dear Sir:

I would like to comment on certain aspects of the paper by Dr. J. Juul Nielsen, entitled "Bladder stones, urinary calculi, urinary incontinence and wet belly disease in mink", which appeared in your August 1977 issue. In this paper, Dr. Juul Nielsen advances the hypothesis that the wet belly disorder in mink is caused by high levels of hydroxyproline in the diet. Data derived from my recent publication "Soybean meal versus fish meal as protein source in mink diets" (Acta Agric. Scand. 1977, 27:145-155) were presented in support of this hypothesis. Though I appreciate Dr. Juul Nielsen's interest in my published results, I cannot accept his contention of a hydroxyproline/wet belly relationship predicated on this study. In contrast, we have good evidence to suggest that hydroxyproline scarcely plays a central role among factors responsible for the wet belly syndrome.

It should be recognized that the data presented by Dr. Juul Nielsen in his Table 4 and Graph 1 have reference to diets designed for quite different purposes. Furthermore, the range of hydroxyproline intake was fairly narrow and none of the diets contained particularly high levels of hydroxyproline. I have compiled the results from 26 dietary treatments at our station in 1974, where hydroxyproline analysis and subjective wet belly grading were available. The results, which include the data cited by Dr. Juul Nielsen, are presented in Fig. 1. Similarly, data from 12 experimental diets used in 1975 are shown in Fig. 2. In the same way as Dr. Juul Nielsen, I have calculated the intake of hydroxyproline in the basis of feed consumption recorded as the male/female average, while the presented wet belly data deal with males. Thus, the amounts of hydroxyproline actually consumed by the male mink were somewhat larger than those reported. I regard this imprecision to be of minor importance.

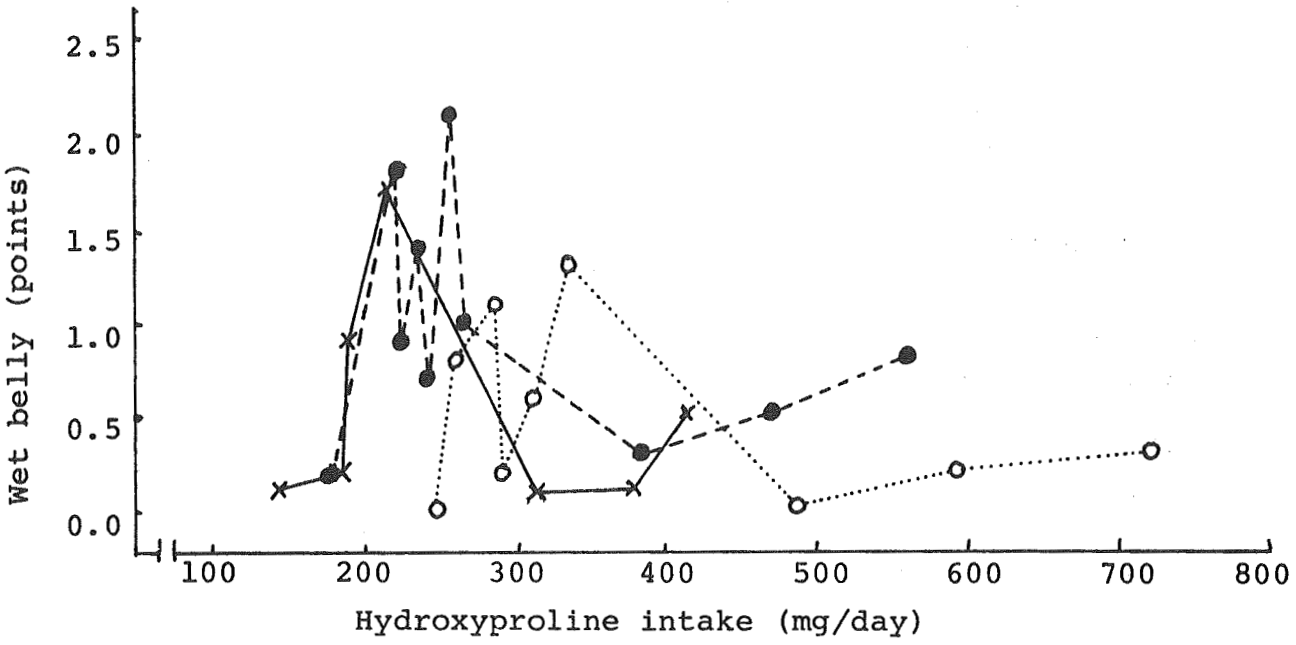

Fig. 1. Wet belly occurrence in male mink (1974) related to intake of hydroxyproline at the protein concentration: ca. 23(×——×), ca. 28(●---●) and ca. 33(○·····○) percent of metabolizable energy from protein.

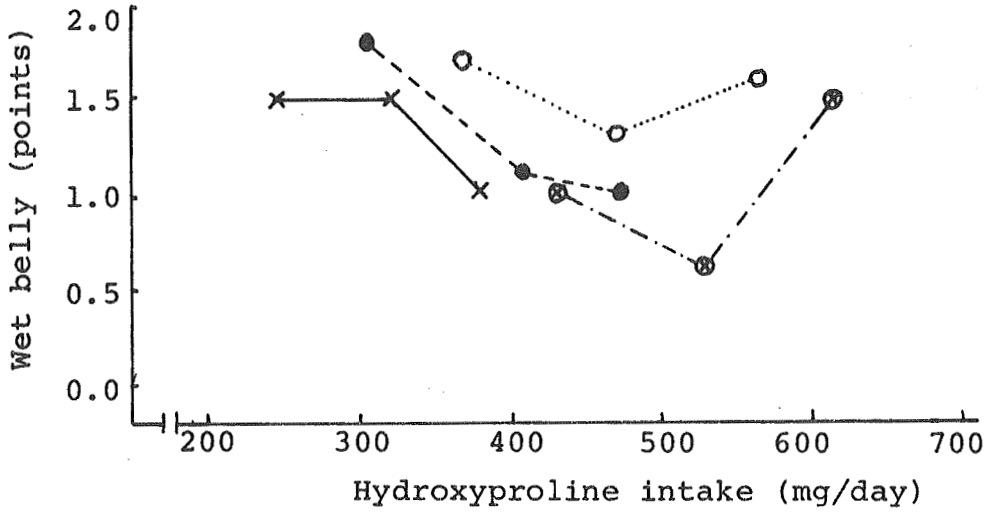

Fig. 2. Wet belly occurrence in male mink (1975) related to intake of hydroxyproline at the protein concentrations: ca. 25(×——×), ca. 29(●---●), ca. 33(○·····○) and ca. 38(⊗-·-·-⊗) percent of metabolizable energy from protein.

In my judgement, the results shown in Figs. 1 and 2 would indicate that no relationship can be established between hydroxyproline intake and incidence of wet belly. I therefore regard the apparent relationship, shown by Dr. Juul Nielsen, as purely coincidental. Thus, the statement that the concentration of hydroxyproline should not exceed 0.8 g hydroxyproline/100 g protein is unsupported by results from our department.

It also appears that Figs. 1 and 2 fail to confirm the postulate of Dr. Juul Nielsen that the protein level influences the occurrence of wet belly. This may be surprising, since a low level of protein was accompanied by a high level of fat. However, the range in protein concentrations was not very wide and the results should not be considered as conclusive evidence.

Turning to our study referred to by Dr. Juul Nielsen, this dealt with a comparison of fish meal produced from blue whiting with solvent extracted soybean meal as sources of protein in mink diets during the period from July 10 to pelting time in early December. The main results of the experiment were that replacement of fish meal with soybean meal caused considerable reduction in body growth, nitrogen retention and feed utilization. However, soybean meal was found to lower the incidence and severity of wet belly as compared with fish meal. I suggested that this may indicate factors causing wet belly in fish meal rather than a preventive effect of soybean meal. The fish meal was not stabilized with antioxidants and the lipid fraction could possibly have been a wet belly inducing agent. I further pointed out that feed restriction has been shown to prevent wet belly in mink. Considering the poor growth of animals fed appreciable quantities of soybean meal, the physiological effects of these diets may have been similar to those of feed restriction.

In all fairness to Dr. Juul Nielsen, the wet belly disorder is complex and numerous dietary variables may be involved besides environmental and genetic factors. A further clarification of the causative factors

is certainly needed, and we should welcome ideas for experimental testing. Hopefully, this will advance our knowledge rather than add to the confusion surrounding this important problem.

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What is HYDROXYPROLIN ?
- I don't know; maybe
something from Norway ?