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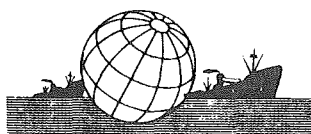
Contents.

1.	CONTENTS	1 - 2
2.	NOTES	3 - 5
3.	<u>MULTIDISCIPLINARY.</u>	
	A COMPARISON OF THE EFFECTS OF REARING MINK SINGLY AND IN PAIRS ON THEIR GROWTH AND REPRODUCTIVE PERFORMANCE. D.M. Shackleton, T.R. Eccles, W.D. Kitts.	6
	LYMPH NODES OF THE THORACIC, ABDOMINAL AND PELVIC WALLS AND VISCERA OF THE MINK. Olivera Jablan-Pantić, Živka Miladinović, D. Drekić.	10
	MICROSTRUCTURE OF DEFECTIVE MINK GUARD HAIR. A.S.H. Wu, J.E. Oldfield, J. Adair.	11
	COMPOSITION AND TREATMENT OF MINK WASTERS. Hugh F. Travis, Jack H. Martin, Thomas E. Pilbeam.	12
	UTILIZATION OF DRIED MINK MANURE AS A PROTEIN SOURCE IN THE DIET OF GROWING PIGS. Matti Näsi.	13
	PLANT NUTRITIONAL MATERIAL IN MINK MANURE. V. Kjellerup, J. Lindhard.	14
4.	<u>REPRODUCTION.</u>	
	EFFECT OF LENGTHENED PHOTOPERIOD AFTER MATING ON LITTER SIZE IN MINK. Bruce D. Murphy.	16
	RESPONSE OF IMMATURE, MATURE NONBREEDING AND MATURE BREEDING FERRET TESTIS TO EXOGENOUS LH STIMULATION. Jennifer Neal, Bruce D. Murphy.	20



SCIENTIFUR  
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Vol. 1, no. 3.  
August 1977.

	PROGESTINS IN MINK GESTATION: THE EFFECTS OF HYPO- PHYSECTOMY. Bruce D. Murphy, William H. Moger.	21
	STEROIDOGENESIS IN OVARIAN COMPARTMENTS OF THE FERRET AT ESTRUS AND PREGNANCY. P. Dimond, G.D. Buchanan, L.W. Belbeck, E.V. YoungLai, B.D. Murphy.	21
5.	<u>NUTRITION.</u>	
	SOYBEAN MEAL VERSUS FISH MEAL AS PROTEIN SOURCE IN MINK DIETS. Anders Skrede.	23
	BLADDER STONES, URINARY CALCULI, URINARY INCONTINENCE AND WET BELLY DISEASE IN MINK. Jeppe Juul Nielsen.	24
	THIAMINDEFICIENCY IN FUR-BEARING ANIMALS CAUSED BY ANTITHIAMINFACTORS IN THE FEED. A. Helgebostad, I.W. Dishington.	38
6.	<u>VETERINARY SCIENCE.</u>	
	FELINE ONCORNAVIRUS - ASSOCIATED CELL MEMBRANE ANTIGEN: EXPRESSION IN TRANSFORMED NONPRODUCER MINK CELLS. A.H. Sliski, M. Essex, C. Meyer, G. Todaro.	40
	MERCURY AND MINK. I. THE USE OF MERCURY CONTAMINATED FISH AS A FOOD FOR RANCH MINK. G. Wobeser, N.O. Nielsen, B. Schiefer.	40
	MERCURY AND MINK. II. EXPERIMENTAL METHYL MERCURY INTOXICATION. G. Wobeser, N.O. Nielsen, B. Schiefer.	41
	MERCURY POISONING IN A WILD MINK. G. Wobeser, M. Swift.	42
	PREVALENCE OF COCCIDIA IN DOMESTIC MINK IN WISCONSIN. William J. Foreyt, A.C. Todd.	43
	ANTICOCCIDIAL ACTIVITY OF EIGHT COMPOUNDS IN DOMESTIC MINK. W.J. Foreyt, A.C. Todd, G.R. Hartsough.	44
7.	<u>COMMUNICATION.</u>	
	NEW LEADER OF FUR ANIMAL RESEARCH AT THE VETERINARY UNIVERSITY OF NORWAY.	45
	MINK DISEASE SERVES AS A MODEL FOR STUDY OF HUMAN MUSCULAR DYSTROPHY.	46





NOTES.  
 SCIENTIFUR  
 No. 3, August 1977.



It has been a pleasure to prepare this issue of SCIENTIFUR. Not only are there several abstracts of worthwhile reports, there are also three original reports on environment, reproduction and nutrition respectively.

It is gratifying that SCIENTIFUR has, to such an extent won recognition as the periodical in which to publish.

My secretary has asked me to thank all the contributors who have sent ready-to-print manuscripts, and I would like to thank all these authors who have sent us sbstracts or original reports on their own initiative.

These contributions which turn up without any activity on our part are definitely our favourites. The less time and effort we have to use to send SCIENTIFUR to press, the cheaper it is and the better SCIENTIFUR's survival chances are.

In the previous issue we were able to report 106 subscribers from 15 different countries. Now we have 116 subscribers from 16 countries, the 16th country being India.

Unfortunately we still cannot put those important fur producing countries, Poland and USSR, on our list of subscribers and contributors. It is my sincere hope that this situation will soon be changed and we can bid a welcome to many of the colleagues we have in these countries.

With the subscription price we have and the limited number of subscribers, it is obvious that SCIENTIFUR will soon be in financial difficulties. Therefore we are enclosing a copy of the introductory issue of SCIENTIFUR with the present issue, and we send with it a prayer that all our subscribers will spread them around to these researchers, institutions and University Libraries, which have not yet learned of SCIENTIFUR's existence.

In the introductory letter (Scientifur Introductory Issue pp 6-7) from NJF (Scandinavian Association of Agricultural Scientists) it was pointed out that SCIENTIFUR's existence was dependent on sufficient subscribers and contributors from as far as possible all fur producing countries.

Thank you for the many letters which go to show that it is not only us who hope that SCIENTIFUR is here to stay.

Bruce Murphy, in his letter, has enquired about several Scandinavian and Russian abstracts - and we do too. Professor Murphy also suggests making a list of "fur scientists" and their field of interest. We hope to be able to take this up later - possibly in connection with the next world congress.

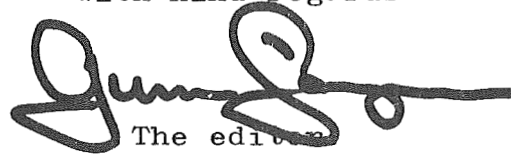
In the "Communication" section we bring an introduction and welcome to the new leader of the veterinarian research farm in Norway, Ordin M. Møller. (Translation from the Norwegian Fur Farming Journal). We think it is important to let each other know who does what and where. If we receive such information we will be very glad to pass it on YOU SEND IT - WE PRINT IT.

In the previous issue I promised to start the ball rolling in the discussion of Metallic and matted fur. This has had to be postponed because of lack of space - but it has not been forgotten.

The next number of SCIENTIFUR comes out just before Christmas, and already the editorial staff is beginning to worry about 1978.

We hope therefore to receive many abstracts and reports soon -  
it would help us to restore our optimism for SCIENTIFUR's future.

With kind regards

The editor



THIS IS OUR SLEEPING PARTNER - NOT YOU .

ORIGINAL PAPER.



A COMPARISON OF THE EFFECTS OF REARING MINK SINGLY AND IN  
PAIRS ON THEIR GROWTH AND REPRODUCTIVE PERFORMANCE

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A major item of the annually increasing costs for the mink rancher is in the maintenance and replacement of housing facilities. The current practice of rearing mink in individual cages, from weaning to killing, requires considerable expenditure and capital investment in both cages and sheds. In an attempt to reduce these expenses a study was designed to investigate the effects of rearing mink in pairs from weaning to pelting on the growth of kits, and upon subsequent reproductive performance of females.

Experimental Design

Four basic rearing treatments were used for each sex to give a total of seven different rearing combinations (Table 1). Litters of Dark/Jet coloured mink were randomly selected from the population at the U.B.C. Fur Animal Unit. To minimise between-treatment variation arising from genetic differences between litters, within-litter comparisons were maximised by dividing each litter into as many treatment types as size and sex composition permitted. Pairings were only between littermates, and a kit and its' dam. Singles and pairs were reared in separate sheds, and no two adjacent pens contained members of the same litter.

TABLE 1: Treatment types and numbers of animals used

<u>Treatment number and description</u>	<u>Initial Sample Size</u>	
	<u>Males</u>	<u>Females</u>
1. Dam with single offspring	28	22
2. Single kit	58	47
3. Paired siblings - opposite sex	40	40
4. Paired siblings - same sex	78	74

Each kit was weighed when litters were divided into treatment groups (21 July, 1975) and again at pelting (10 December, 1975). Ten units from each rearing treatment were randomly selected to be weighed every 14 days throughout the study. Litter sizes of all females were recorded in 1975 and 1976. All mink were fed a similar diet, although pairs received approximately 20% more food to reduce fighting and competition.

### Results

I) Effects of Treatment on Growth: The experimental design was treated as a 2x2x4 factorial (Factor 1: sex - 2 levels; Factor 2: weighing procedure - 2 levels; Factor 3: rearing combination - 4 levels). Final weight was the comparative variable, and initial weight the covariable because initial weights varied between treatments. Analysis of the data used an ANOVA applicable to factorial designs with factor to factor interactions. A probability level of 5% was selected a priori for tests of significance.

Animals weighed only twice were significantly heavier in December than those weighed bimonthly. This difference was the same for all treatments. Animals weighed bimonthly were therefore excluded from further analyses as they made up different proportions of the total animals in each treatment. A comparison of final weights of animals weighed only twice (Table 2) shows that for females treatment had no significant effect upon growth. However, males grew larger reared as pairs than when reared alone.

TABLE 2: Initial and final mean weights of mink kits weighed only twice  
Treatment type

	1	2	3	4
<u>Males</u>				
Initial weight (gms)	1136	1079	1199	1132
Final weight	2106	1838	2103	2124
Number of animals	17	37	27	46
Standard deviation	314.53	241.62	383.18	295.18

Table 2 (continued)

	Treatment type			
	1	2	3	4
<u>Females</u>				
Initial weight	786	737	810	786
Final weight	1122	1139	1118	1150
Number of animals	7	25	25	52
Standard Deviation	124.50	124.03	149.58	181.69

II) Effects of Treatment on Litter-size: Data from adult females (Treatment 1) and from female offspring (primiparous 1976) were analysed separately, because of age differences and also the breeding program progressively removes females giving below-average litters.

a) Litter-size of adult females: An initial analysis of the influence of weighing schedule on litter-size showed no difference, therefore data were combined. Mean litter-sizes in 1976 of the two rearing groups from Treatment 1, and of adult females not used in the rearing experiment showed no significant difference (Table 3). Similarly, mean litter-size of adult females used in Treatment 1 did not differ between 1975 and 1976.

b) Litter-size of primiparous females: The 1976 mean litter-sizes of females born in 1975 and used in the four treatments, and those not used (Table 4) showed no significant difference. However, females raised with male siblings (Treatment 3) had the smallest litter-size.

TABLE 3: Mean litter-sizes born in 1976 to adult females used in Treatment 1 and to adult females not used in study.

	Adult female group		
	Treatment 1 paired with a male kit	Treatment 1 paired with a female kit	Adult females reared singly
Sample Size	21	11	33
Mean Litter-size	5.2	4.1	4.4
Standard Deviation	2.00	3.11	2.51



TABLE 4: Mean litter-sizes born in 1976 to primiparous females used in rearing study and from remainder of ranch.

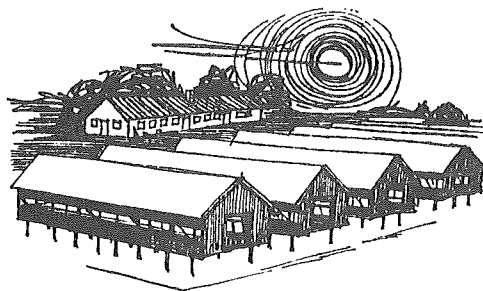
	Treatment Type				
	1	2	3	4	5*
Sample Size	9	12	9	16	42
Mean Litter-size	2.4	3.8	1.1	2.3	3.0
Standard Deviation	2.88	2.55	1.36	2.18	2.44

\* - Primiparous females not used in rearing treatments.

III) Mortality and Fighting: No severe mortality or fighting injuries were recorded. The only signs of stress were those exhibited during the bimonthly weighing period, and were reflected in the weights of these animals.

### Conclusions

1. Weighing animals every fourteen days was sufficient to reduce growth rates of mink compared to weighing only twice in 112 days.
2. The effects of rearing mink in pairs instead of singly appeared to have no adverse effect upon the growth of kits from weaning to pelting, in fact males reared singly grow significantly less than those reared in pairs.
3. The rearing treatments used had no effect upon the litter size of adult or primiparous females.
4. No severe mortality or fighting resulted from rearing as pairs.
5. Further interpretation of these results is required, particularly with respect to the economic considerations.



LYMPH NODES OF THE THORACIC, ABDOMINAL AND PELVIC WALLS AND  
VISCERA OF THE MINK.



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The localization of the lymph nodes of the thoracic, abdominal and pelvic viscera in the mink is presented in this paper, it represents a completion of and a contribution to knowledge of the morphology of the above organs, which might be significant in the diagnosis of diseases such as - infective enteritis, aleutic disease, antrax, salmonellosis, streptococcal infections, necrotic pleuritis, tuberculosis etc. (Lapčević et al., 1970).

Due to the lack of data on the morphology of the mink, we have compared our data on the lymphatic system of the mink with those found for other domestic carnivores, particularly the dog (Freeman, 1942; Ellenberger et al. 1943; Bradley, 1948; Sisson et al. 1962; Prier et al. 1962; Miller et al. 1969).

Carcases of healthy Canadian minks (a total of 17) of both sexes, which had been sacrificed in order to obtain the fur, were examined. Apart from natural preparations, we also used preparations in which the blood vessels of the thoracic, abdominal and pelvic cavities were previously injected with fixative, in order to localize the lymph nodes next to the large blood vessels of the above cavities. The fixative, which was minium diluted in gelatin, was injected through the aorta.

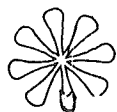
The lymph nodes of the walls and organs of the thoracic, abdominal and pelvic cavity of the mink were classified, according to their topographic position, as in other domestic carnivores. Some lymph nodes were found in the mink which do not exist in the dog (middle and caudal mediastinal lymph nodes, subiliac lymph node), moreover some nodes which occur in the dog were not observed in mink (bronchopulmonary lymph nodes). The form, size and topographic

positions of the parietal and visceral lymph nodes are described in this paper. The visceral lymph nodes were studied on previously injected preparations, due to their localization along the large blood vessels, namely v. portae and the abdominal aorta and their branches.

Acta Veterinaria (Beograd), 1976, Vol. 26, no.2, 81-93.

12 photos, 16 References.

Authors introduction and summary.



#### MICROSTRUCTURE OF DEFECTIVE MINK GUARD HAIR.

A.S.H. Wu, J.E. Oldfield, J. Adair, Oregon State University,  
Corvallis 97331, USA.

Guard hairs from normal mink and from normal and defective areas of mink pelts with "singe" or "red hip" abnormalities were studied with the scanning electron microscope (SEM).

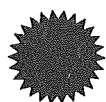
The surface or cuticle of normal guard hair consists of scales overlapping each other. These cuticle cells show regional variation in shape and size in a single fiber and display several distinct patterns. The region near the tip of guard hairs from areas of pelts with "red hip" defect is often split and appears to be devoid of cuticle cells. A high incidence of split tips has also been observed in hairs with the "singe" abnormality, but has not been seen in normal mink hair. The cross sections of normal guard hairs are mostly oval, while those of the hairs from the "singe" regions of the pelt are frequently angular in profile. The partial lack of cuticle cells and the angular cross sectional view of the hair with "singe" defect may be partly responsible for an alteration of light reflection from the defective hair surface and give the undesirable characteristic areas of metallic sheen in the affected mink pelts.

(Key Words: Mink, Guard Hair, "Singe", "Red hip", SEM.)

Journ. of Anim. Science, Vol. 44, no.3, 1977, 462-466.

14 photos, 14 references.

Authors summary.



#### COMPOSITION AND TREATMENT OF MINK WASTES

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Thomas E. Pilbeam, Department of Animal Science, Cornell University.

The composition and volume of mink wastes were studied over a two-year period. Volatile solids (VS) were 77.2%, chemical oxygen demand (COD) 84.6% and total Kjeldahl nitrogen (TKN) was 12.8%, expressed as the percentage of total solids. These values are similar but somewhat higher than those for the waste of laying hens. For management purposes the concept of a "mink unit" was developed, which allowed comparisons with wastes from other farm animals (1 female + .2 male for 12 months and 4 kits for 7 months).

An oxidation ditch system of waste stabilization was developed similar to that used for poultry (1). The system was satisfactory technically and removed approximately 90% of the TKN and COD. The system is not economically practical at current stocking rates, but could be used if more intensive systems of production are developed or if more stringent laws are introduced concerning the disposal of mink wastes.

The problems of pollution from mink wastes were discussed (2, 3). Pollution from point sources (a concentrated source of pollution that can be readily identified) should be minimal with proper drainage and sheds that protect waste from rainfall. Problems on nonpoint-pollution (dissipated run-off, such as crop land run-off) should also be relatively easy to overcome if guidelines for waste disposal for other farm animals are used based on the amount of nitrogen present in the waste.

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Authors abstract.

UTILIZATION OF DRIED MINK MANURE AS A PROTEIN SOURCE IN THE DIET  
OF GROWING PIGS



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The use of dehydrated mink manure as a protein source for growing pigs was studied by substituting 7.5 % and 15 % (w/w) of the complete feed for manure and corresponding amount of barley. The manure used had a poor feed value as compared to the values obtained earlier in digestibility tests in minks. The crude protein content was 21.3 %. The addition of mink manure to the feed did not adversely affect the feed consumption nor were any effects on the health of the pigs observed. The differences in daily gain and feed efficiency recorded between the experimental groups were not statistically significant. The number of experimental animals was small, and a large variation occurred within the groups. The addition of mink manure to the diet resulted in lower weight gain, apparently due to a lower energy supply. The groups given mink manure received less feed units than the controls. No harmful effects of the manure feeding on carcass quality was observed and organoleptic tests revealed no changes in the smell or taste of the meat. No changes were found in the digestive tracts, livers or kidneys of the pigs.

Report from The Second Congress of International Society for  
Animal Hygiene, Zagreb 1976, 370-374.

3 tables, 1 fig. and 3 references.

Authors abstract.



PLANT NUTRITIONAL MATERIAL IN MINK MANURE.  
(Minkgødnings indhold af plantenæringsstoffer.)

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6600 Vejen, Denmark.

Samples of mink manure from 14 mink farms were analysed at Askov.

Of these samples, 14 had been stored from 6 months to 3 years, and 5 were of fresh manure, which had not been in contact with earth or litter. The results are shown in Table 1.

Table 1. Composition of mink manure.

	Askov 1976			
	stored manure		fresh manure	
	mean	var.	mean	var.
	Content % in manure			
Dry matter	36,0	28.8-43.9	20.8	20.4-23.3
Sand	14.5	3.7-25.8	0.3	0.1-0.4
Sandfree dry matter	21.5	17.0-28.2	20.5	17.4-23.1
Total-N	0.94	0.61-1.42	1.14	1.00-1.30
NH <sub>3</sub> N	0.36	0.05-0.81	0.42	0.38-0.49
P	1.58	0.67-3.09	1.00	0.70-1.23
K	0.28	0.17-0.49	0.15	0.12-0.17
Na	0.18	0.11-0.30	0.16	0.12-0.19
Ca	2.79	0.97-5.70	1.68	1.18-2.13
Mg	0.14	0.09-0.20	0.10	0.08-0.12
	Content, ppm in manure			
Cu	14	6-24	6	4-23
Mn	99	42-186	31	23-28
Zn	500	254-863	182	106-303
Ni			0.8	0.5-1.0
Cr			0.5	0.3-0.9
Cd			0.1	0.0-0.1
Pb			1.3	0.7-1.6
Co			0.4	0.2-1.2

According to "Dansk Pelsdyrav1" (Danish Fur Breeders Periodical) 1975 p 145, there were produced 3.2 mill.mink skins in Denmark in the period 1974/75. According to our calculations this should represent 70,000 tons manure or an average of 22 tons manure per farm per year.

Therefore, with the use of 2-3 tons manure per hectare, an average farm would have to have about 10 hectares available to be able to utilize this manure to the full.

Statens Planteavlsvorsøg, 1333. Meddelelse,  
79. årgang, 17. marts 1977.

2 Tables.

Ref. G. Jørgensen



ORIGINAL PAPER.



EFFECT OF LENGTHENED PHOTOPERIOD  
AFTER MATING ON LITTER SIZE IN MINK

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Introduction

The presence of an obligate period of embryo quiescence in mink was described as early as 1940 by Hansson. His further studies (1947) indicated that this delay period coincided with recurring estrous cycles in the female. Johansson & Venge (1951) have presented evidence suggesting that survival was inversely related to the interval for which the embryo remained in the quiescent state.

A reduction in preimplantation delay can be induced by supplementation of the natural photoperiod (Pearson & Enders, 1944; Holcomb *et al.*, 1962; Murphy & James, 1974). The converse appears also to be true, subjecting mink to shorter than natural photoperiod or no light increases the length of the delay phase of gestation (Kirk, 1962) or in some cases appears to obviate implantation (Murphy & James, 1974).

The present experiment was designed to test whether supplementation of photoperiod after mating, operating presumably by shortening the preimplantation delay phase of gestation, would increase embryo survival manifest as increased yield of kits per female mink.

Materials and Methods

Experiments were initiated on the Montgomery Fur Ranch, Wetaskiwin, Alberta, on March 20, 1977. Individual 100 watt incandescent bulbs sus-



pended at approximately 2 M intervals 1.5 M above the mink cages was used. Two hours of light were added to the natural photoperiod of 13 h light and 11 h dark (assuming 30 minutes of light before and after sunset) at that latitude on March 20. Animals were therefore subjected to a constant photoperiod of 15 h light, 11 h dark until April 7 at which time the natural photoperiod became exceeded the supplemented photoperiod. Two sheds were lit, one containing Dark females mated to Dark males and a second containing Pearl females mated to Royal Pastel males. Controls consisted of one unlit shed of Darks and one of Pearl females mated to Royal Pastel males. Most females had been according to the usual Montgomery procedure: 2 matings on consecutive days allowed by a single mating 6, 7 or 8 days later. As could be expected, some could not be mated according to the above procedure and these received either one or two matings. It was presumed that the latter are randomly distributed throughout the sample. Number of kits per female was determined by Montgomery Ranch personnel observing the nest box on the day following the first sound of young.

#### Results and Discussion

The mean litter size, range and standard error of the mean for treated and untreated females are presented in Table 1. Females that produced and subsequently lost litters are not included.

TABLE 1

Shed	Treatment	Mink	N	Mean Kits/ $\bar{x} \pm SE$	Range	% producing litters	Mean Kits/ $\bar{x} \pm SE$ Producing litters
12	2h light supplement	Dark ♀	137	3.48 $\pm$ 0.3	0-8	82%	4.23 $\pm$ 0.17
13	2h light supplement	Pearl ♀ Pastel ♂	72	4.61 $\pm$ 0.22	0-9	96%	4.84 $\pm$ 0.20
16	Control	Dark	136	4.02 $\pm$ 0.20	0-9	86%	4.63 $\pm$ 0.17
18	Control	Pearl ♀ Pastel ♂	79	4.87 $\pm$ 0.22	0-8	95%	5.24 $\pm$ 0.16

Statistical analysis by Student's t procedure indicated that there were no significant differences between either treatment group and its control. This was the case whether the number of kits per bred female or the number of kits per female producing litters were considered. Since females of both strains were mated more than once with an interval between matings it is impossible to accurately determine the length of preimplantation delay to which the embryos were subjected. No trend toward earlier parturition was noted in either of the treated sheds when compared to the control sheds. These results indicate that supplementation of light after mating has no effect on litter size, thereby suggesting that the light did not enhance embryo survival. In dark females there appears to have been a trend toward reduction in the number of litters produced (86 to 82%). The sizes of litters in both treatments are similar.

Supplementation of the natural photoperiod will accelerate gestation in other species of mustelids with obligate delayed implantation including the sable (Belyaev et al., 1951) and the spotted skunk (Mead, 1971). In the sable it appears that this shortening of gestation reduce the number of barren females from 23% in controls to 11.08% in the light supplemented group. Holcomb et al. (1962) reported that mink females (Dark) mated twice and exposed to 82 minutes per day of extra light after mating had larger mean litter size than unlighted Dark females (5.2 vs 3.8). This difference however was not statistically significant.

The results of the present experiment are different from those observed by other investigators i.e. that addition of light after mating will enhance mean litter sizes in mustelids. Our previous work indicates that extra light will shorten gestation in mink and the present experiment suggests that this may not affect embryo survival. Further experimentation is necessary to clarify this issue.

## Acknowledgements

The author thanks Mr. J.W. Montgomery and personnel of the Montgomery Fur Ranch, Wetaskiwin, Alberta for their kind assistance. This study was funded by Alberta Agricultural Research Trust Grant #55-28250 and the Canada Mink Breeders.

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RESPONSE OF IMMATURE, MATURE NONBREEDING AND MATURE BREEDING FERRET  
TESTIS TO EXOGENOUS LH STIMULATION



Jennifer Neal, Bruce D. Murphy,

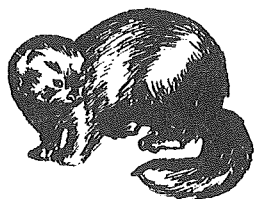
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Mature male ferrets undergo an annual period of sexual inactivity during which they resemble immature ferrets in their low plasma testosterone levels ( $< 0.2-5$  ng/ml) and reduced testis and epididymal size. Plasma testosterone concentrations in immature, mature nonbreeding and mature breeding male ferrets were compared after stimulation with LH administered by intramuscular injection at doses of 10 and 100 ug/kg body weight. The mature breeding animals showed a variable response depending on their plasma testosterone concentrations prior to injection. Animals with high preinjection levels of testosterone (25-30 ng/ml) showed little response suggesting that their testes were already being maximally stimulated. The mature nonbreeding animals responded to both the low and high dose of LH with elevated plasma concentrations of testosterone consistent with those found in sexually active males (15-27 ng/ml). The higher dose of LH produced a higher and more sustained response than the lower. The immature ferret testes showed a small transitory response to both 10 and 100 ug of LH but their plasma testosterone concentrations did not approach those found in sexually active ferrets. The results indicate that increase in responsiveness of the ferret testis to LH may be an important factor in puberty, while variation in level of LH secretion may be responsible for annual recrudescence of mature males.

Biology of Reproduction, 1977, Vol. 16, 244-248.

2 figs., 1 tables, 24 references.

Authors abstract.



PROGESTINS IN MINK GESTATION: THE EFFECTS OF HYPOPHYSECTOMY



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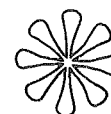
This paper describes the results of two experiments performed in Pearl variety mink: assay of progesterone and  $20\alpha$ -hydroxypreg-4-ene-3 one ( $20\alpha$ -ol) from samples taken weekly during gestation and the effects of hypophysectomy during the first week of pregnancy. Progesterone was low ( $< 8$  ng/ml) until approximately five days prior to implantation when it increased and remained elevated ( $\approx 30$  ng/ml) through the early portion of postimplantation pregnancy. A subsequent decline was observed toward parturition. Mean concentrations of  $20\alpha$ -ol were relatively constant through gestation with a trend toward a greater proportion of progestin represented as  $20\alpha$ -ol during the preimplantation delay. Hypophysectomy prevented implantation, reduced progesterone levels and increased the concentration of  $20\alpha$ -ol relative to progesterone in plasma. These data suggest that prolactin (PRL) is a component of the lutetrophic complex in mink. Further, the corpus luteum of delay requires hypophyseal support for normal function.

Endocrine Research Communications, 1977, Vol. 4, No. 1, 45-60.

3 figs., 2 tables, 14 references.

Authors abstract.

STEROIDOGENESIS IN OVARIAN COMPARTMENTS OF THE FERRET AT ESTRUS  
AND PREGNANCY.



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In a continuing comparative study of ovarian steroidogenesis in induced ovulators we found that cat follicles secrete significant amounts of testosterone and

estradiol-17 $\beta$  (1). Estradiol-17 $\beta$  secretion was greater than in rabbit follicles (2) and was not stimulated by ovine LH whereas testosterone was. The present study extends our investigation to the ferret which has previously been examined for implantation (3).

Six estrous ferrets were used in these studies. Ovaries were removed under anaesthesia and follicles dissected out. Single intact follicles, 2-4 mm in diameter, were incubated in 0.2 or 1 ml of minimum essential medium (Earle's salts) containing 5% normal rabbit serum for 2 h before incubation for 24 h in medium alone, or with 5  $\mu$ g/ml ovine luteinizing hormone (NIH-LH-S17). In 4 animals only one ovary was removed, the animal was then mated and the other ovary removed 12-14 days later. Follicles and corpora lutea were incubated separately. Comparable amounts of interstitial tissue were also incubated. Following incubations, tissues were fixed for histological study.

Radioimmunoassay of steroids was carried out on the media as previously described (2). Results shown in the table, are expressed in terms of progesterone, testosterone, androstenedione and estradiol-17 $\beta$  per tissue compartment. Differences were analysed using Student's t test for paired samples with LH treated tissues and for unpaired samples to determine variations between different tissues.

Luteinizing hormone caused a significant increase only in progesterone secretion by the follicles obtained at estrus or during pregnancy. No other differences were statistically significant due to the large variations observed. When comparisons were made between ovarian compartments, the corpora lutea secreted more progesterone ( $P < 0.001$ ) than follicles or interstitial tissue and follicles produced more testosterone ( $P < 0.05$ ) and estradiol-17 $\beta$  ( $P < 0.025$ ) than corpora lutea or interstitial tissue. Peripheral levels of steroids were undetectable except for progesterone during pregnancy which ranged from 10-25 ng/ml. These results suggest that the follicles are refractive to luteinizing hormone as far as testosterone and estradiol-17 $\beta$  production are concerned but are still responsive in terms of progesterone production and are similar to those found in the rabbit (2).

IRCS Medical Science, 1977, Vol. 5, 56.

1 tables, 3 references.

Authors abstract.



SOYBEAN MEAL VERSUS FISH MEAL AS PROTEIN SOURCE IN MINK DIETS.

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Effects of replacing the fish meal protein in mink diets with solvent extracted soybean meal were investigated. Soybean meal was applied as 1/2 and 1/1 replacement of digestible protein from fish meal, which accounted for 40-44% of total contents of digestible protein. Each combination of protein ingredients was fed at three protein levels: 33, 28 and 23% of metabolizable energy (ME).

Compared with fish meal, soybean meal was found to decrease ration digestibility of dry matter, organic matter, protein and carbohydrate. Coefficients of apparent protein digestibility for fish meal and soybean meal used in feeding experiments were 84.3 and 78.7, respectively. Nitrogen retention values of animals fed soybean meal were significantly lower than those of control animals receiving fish meal.

The high level of soybean meal promoted a substantially reduced body growth regardless sex and protein levels. Growth depression of animals receiving the lower soybean meal level (1/2 replacement of fish meal), was significant for males on the two lowest protein levels, only. Feed utilization data indicated that soybean meal either increased feed wastage or possibly adversely affected the utilization of consumed ME.

The replacement of fish meal with soybean meal reduced the incidence and severity of "wet belly" disease in male mink. Mortality and hemoglobin concentrations were not affected by dietary inclusion of soybean meal. While most fur characteristics were apparently unaffected by treatments, length of the guard fur consistently increased with increasing amounts of soybean meal.

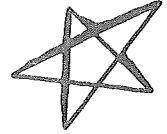
Acta Agric. Scand. 27 (1977), 145-155.

16 tables, 2 figures, 19 references.

Authors summary.

ORIGINAL PAPER.

BLADDER STONES, URINARY CALCULI, URINARY INCONTINENCE  
AND WET BELLY DISEASE IN MINK



A Review with some new Aspects of the causative Factors

by

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1. Introduction
2. Early observations of the causative factors in mink.
  - 2.1. The fat content of the feed
  - 2.2. Ca/P ratio
  - 2.3. Total mineral content of the feed
  - 2.4. Summary
3. Recent observations of the causative factors in mink.
  - 3.1. Large-scale investigation on practical feeding
  - 3.2. Genetic factors
  - 3.3. Nutritional factors
4. Some observations of the causative factors in man.
  - 4.1. Nutritional survey studies
  - 4.2. Investigations on the urinary excretion
  - 4.3. The nutritional source of oxalate in urine
5. Observations of secondary clinical symptoms.
6. How to prevent the symptoms.
  - 6.1. Empirical curative methods
  - 6.2. Theoretical preventive methods
  - 6.3. Practical preventive methods
7. Conclusion.
8. Literature.

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## 1. Introduction.

"The wet belly disease of mink is one of the major problems plaguing the mink industry today." This was written by Leoschke (1959) and is still true in the year 1977. He continues: "Although the disease has been under study for a number of years, very little experimental data are available on this enigmatic malady."

To-day more data are available, but this very important problem still seems to be unsolved (Skrede, 1977 and Pastirnac, 1977).

## 2. Early observations of the causative factors in mink.

### 2.1. The fat content of the feed.

Leoschke (1959) found in an excellent experiment with high and low fat diets, that it was possible to control the occurrence of wet belly by changing the diet from high fat (25% of the dry matter) to low fat (12.5% of the dry matter) content.

The results on urine also showed a lowered surface tension measured in mink with wet belly disease. The reason was thought to be an increased excretion of dicarboxylic acids due to overloading with fat, e.g. more than could be oxidized to  $\text{CO}_2 + \text{H}_2\text{O}$ , releasing energy or stored as fat in the depots. However, when feeding dicarboxylic acids (Leoschke, 1961), urinary incontinence or wet belly disease did not occur. Saturation of the urine with these acids did not lower the surface tension of the urine.

### 2.2. Ca/P ratio.

Urinary incontinence may occur, if the available Ca/P ratio is high (Schaible et al., 1962), but this is in conflict with the hypothesis advanced by Leoschke (1959), who suggested that the binding of calcium to saturated fatty acids in the intestines was one of the reasons behind urinary incontinence and wet belly disease caused by high fat diets. Also it was found that in mink urinary calculi the content of calcium was very low in relation to magnesium, ammonium and phosphorus (Leoschke et al., 1952).

### 2.3. Total mineral content of the feed.

High intake of ash or minerals may also contribute to the development of urinary calculi and kidney stones (Leoschke, 1965 a) due to high excretion of minerals through the kidneys simultaneously making the urine alkaline and thereby contributing to stone formation. On the other hand, sufficient water intake may diminish the symptoms (Leoschke, 1965 b).

### 2.4. Summary.

Leoschke (1965 b) summarizes the observations already made in order to minimize the incidence of wet belly disease thus:-

1. Low fat - high carbohydrate diets.
2. Available Ca/P ratio = 1:1.
3. Good management to ensure that infections are avoided.
4. Early separation of kits, as "in a number of cases it has been observed that 80-90% of the cases of wet belly symptoms in kit litters clear up within three days of the separation." Limited water intake may account for this development of wet belly disease symptoms.
5. An increased watering programme during frosty weather.
6. Although the main reason seems to be related to nutrition, genetic aspects should also be considered as important.

## 3. Recent observations of the causative factors in mink.

### 3.1. Large-scale investigation on Danish mink farms.

In a large-scale investigation on about 3 million mink skins and on the background of knowledge of the composition of the feed at different times of the year, Juul-Nielsen (1972 b) found that wet belly is clearly correlated to nutrition. Both the content of protein, fat, ash and water in the diet is related to the incidence of wet belly and the overall conclusion seems to be that the protein quality and ash content but not fat (in Danish mink feed) are highly important nutritional factors in "wet belly" disease (Juul Nielsen, 1972 a).

Feed ingredients with protein (fishmeal, fish offal and meat) often contain considerable amounts of connective tissue and ash.

Ingredients containing fāt (slaughterhouse offal such as stomachs, lungs and other organs) often contain protein as well, but in this case connective tissue is the primary source.

The causative nutritional factor may be both "protein dependent" and "fat dependent" but not protein and fat as pure substances both rather a factor which is commonly supplied together with protein- and fat-containing ingredients. Minerals (ash) and connective tissue are possibly of major importance.

### 3.2. Genetic factors.

Kuznecov & Diveeva (1970) very clearly showed that the occurrence of wet belly disease was determined by a hereditary factor.

Recently Pastirnac (1977) reached the conclusion that wet belly disease is a very complex syndrome in which genetic factors play a determinant role and that nutritional, pathogenic and generally also environmental factors complete the role of favouring the disease.

### 3.3. Nutritional factors.

Skrede (1977) found that the nutritional factor was very marked. Feeding of diets with increasing amounts of extracted soybean meal and decreasing the amounts of fishmeal led to a fall in the occurrence of wet belly from 2.1 (arbitrary unit) to 0.2 - 0.0. Skrede (1977) concluded that the results would indicate that fishmeal contains the causative factors for the occurrence of "wet belly". He also suggests that the lipid fraction in the fishmeal may be suspected as a potential causative factor for the "wet belly" disorder.

## 4. Some observations of the causative factors in man.

### 4.1. Nutritional survey studies.

In many industrialized and developing countries urinary calculi is a problem of importance in human health. In Thailand the frequency of bladder stones is very high and predominant in children among whom stones are found more frequently in boys than in girls (Halstead & Valyasevi, 1967 a). On the basis of

studies of dietary habits in large areas with low and high incidence rates of bladder stones Valyasevi et al. (1967 a) reported significant differences in the way of feeding the infants 1 - 6 months after birth. Supplementation of rice gluten to the newborn infant probably lowered daily breast milk consumption and thereby intake of fluid. Halstead & Valyasevi (1967 b) further found, that the amounts of fish and drinking water available influenced the frequency of bladder stones as shown in Table 1.

Table 1.

Correlation of positive episodes of bladder stone with abundance of freshwater fish and drinking water in 44 villages, Ubol Province, 1964 (Halstead & Valyasevi, 1967 b).

	Abundance of Fish			Number of Months Drinking Water Available		
	+	++	+++	Less than 10 months	10-11 months	12 months
Number stones per total persons sampled	34/4,277	70/5,406	101/4,743	2/214	55/2,629	148/11,583
Prevalence per 1,000	8.0	12.9	21.3	9.3	20.9	12.8

+ = Fish not available for consumption daily or seasonally.

++ = Fish available 12 months/year in quantity sufficient for family consumption.

+++ = Excess fish for sale.

#### 4.2. Investigations on urinary excretion.

Valyasevi et al. (1967 b) studied constituents in urine from children of 2 - 10 years of age in areas with different frequency of bladder stone cases. In hyperendemic areas the results showed

1. g Calcium/24 hours and concentration of magnesium were consistently higher.
2. g Phosphorus/24 hours and g Sodium/24 hours were consistently lower.
3. Consistently high oxalate and uric acid crystalluria were observed.

Later on Valyasevi & Dhanamitta (1967) established that 43% of the infants under 45 days of age in hyperendemic areas showed oxalate crystalluria in freshly voided morning specimens, whereas the condition was not observed in infants in hypoendemic areas.

Further studies (Dhanamitta et al., 1969) showed that orthophosphate and fat-free powdered milk supplementations significantly reduced the occurrence of oxalcrystalluria (Table 2) and uric acid crystalluria (Table 3), while supplementation of methionine or Vitamin B<sub>6</sub> did not have this effect.

Table 2.

Occurrence of oxalcrystalluria in village infants following supplementation with a variety of substances (Dhanamitta et al., 1967).

Supplement	No. of infants	Oxalcrystaluria		
		No. of occurrences	No. of examinations	No. of infants with crystalluria
Placebo	17 <sup>a</sup>	25	93	17
Orthophosphate	17	0	83	0
Milk	17	7	87	5
Placebo	14 <sup>b</sup>	20	70	7
Methionine	14	20	70	10
Vitamin B <sub>6</sub>	14	16	70	11

a There were 17 of the original 21 infants who showed oxalcrystalluria at some time during the study.

b There were 14 of the original 19 infants who showed oxalcrystalluria at some time during the study.

Table 3.

Occurrence of uric acid crystalluria in village infants following supplementation with a variety of substances (Dhanamitta et al., 1967)

Supplement	No. of infants	Uric acid crystalluria		
		No. of occurrences	No. of examinations	No. of infants with crystalluria
Placebo	15 <sup>a</sup>	22	83	15
Orthophosphate	15	6	73	3
Milk	15	10	77	5
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Placebo	16 <sup>b</sup>	11	80	7
Methionine	16	18	80	11
Vitamin B <sub>6</sub>	16	12	80	8

a There were 15 of the original 21 infants who showed uric acid crystalluria at some time during the study.

b There were 16 of the original 19 infants who showed uric acid crystalluria at some time during the study.

The mean urine pH rose from 5.9 during the control period to 7.1 during the orthophosphate supplementation period. To show whether this was due to a phosphate effect or a pH effect sodium bicarbonate was administered for 6 days. A rapid rise in urinary pH was obtained, but 9 out of 30 urine examinations still demonstrated oxalate crystals. Consequently the alkalinity of the urine per se is not involved in the disappearance of oxalcrystalluria.

Similarly no change in urinary pH was observed during the milk supplementation period (Dhanamitta et al., 1967 a).

Supplementation with orthophosphate (75 mg phosphorus per kg body weight daily) markedly decreased the excretion of calcium and increased the excretion of urinary phosphate. According to Valyasevi et al. (1967 c), oral phosphate administration may:

1. Reduce the calcium absorption in the intestine,
2. Diminish the resorptive processes of bone by which calcium is released, or
3. Increase bone growth and utilization of calcium.

#### 4.3. The possible nutritional source of oxalate in urine.

Further studies were carried out to find the possible nutritional and metabolic sources of oxalic acid and the possible role of phosphate on oxalate metabolism (Dhanamitta et al., 1967 b). 4-hydroxy-L-proline (125 mg/kg body weight daily) and orthophosphate (0.220 g Na<sub>2</sub>HPO<sub>4</sub> + 0.034 g KH<sub>2</sub>PO<sub>4</sub>/kg body weight daily) were introduced orally. It was found that oxalate crystalluria was markedly increased and clumping of crystals occurred after oral hydroxy-L-proline supplementation. The orthophosphate supplements reduced crystalluria and clumping within three days of supplementation (Dhanamitta et al., 1967 b).

#### 5. Observations of secondary clinical symptoms.

Temporary wet belly disease is seen among mink kits around the time of weaning and in cold periods during the autumn among male mink. This is probably due to insufficient water uptake (Leoschke, 1965 b).

The above observations concerning crystalluria together with insufficient water uptake and excretion may be the reason for the wet belly disease to break out with clinical symptoms.

More chronic "wet belly" is seen during exposure to bacterial infections with Proteus mirabilis (Pastirnac, 1977), but it is said that the surface of the epithelia is disturbed in some way e.g. probably mechanically by crystalluria or biochemically during periods of Vitamin A or other deficiencies.

Gunn (1966) has stated that in mink with wet belly disease 85% are infected with Proteus mirabilis. In addition it was found that heating of wet belly inducing feed (Gunn, 1964) strongly decreased the occurrence of disease.

#### 6. How to prevent the symptoms.

##### 6.1. Empirical curative methods.

According to Børresen (1973) urinary diseases generally diminish when ample water supply is available and a consequently high excretion of water through the kidneys.

The occurrence of bladder stones and infections is also diminished following administration of ammonium chloride (1 g  $\text{NH}_4\text{Cl}$  per mink per day) (Leoschke, 1954). The effect of ammonium chloride is suggested by Leoschke (1954) as a consequence of a fall in the urinary pH, but according to Dhanamitta (1967 a) urinary components such as citrate, urea, K, Na,  $\text{SO}_4$ ,  $\text{PO}_4$ , Cl and Mg ions are all effective in increasing the solubility of calcium phosphate and calcium oxalate in water. Therefore it seems more reasonable to assume that the effect of supplementary ammonium chloride increases excretion of urea and chloride, thus causing a higher urinary volume and increased solubility of oxalate crystals.

### 6.2. Theoretical preventive methods.

Fortunately Skrede (1977) has published analytical results on the concentration of hydroxyproline in nine different feed rations used in experiments with mink.

Table 4 shows the analytical data on the basis of average daily intake of hydroxyproline in relation to the occurrence of wet belly and protein level in the feed.

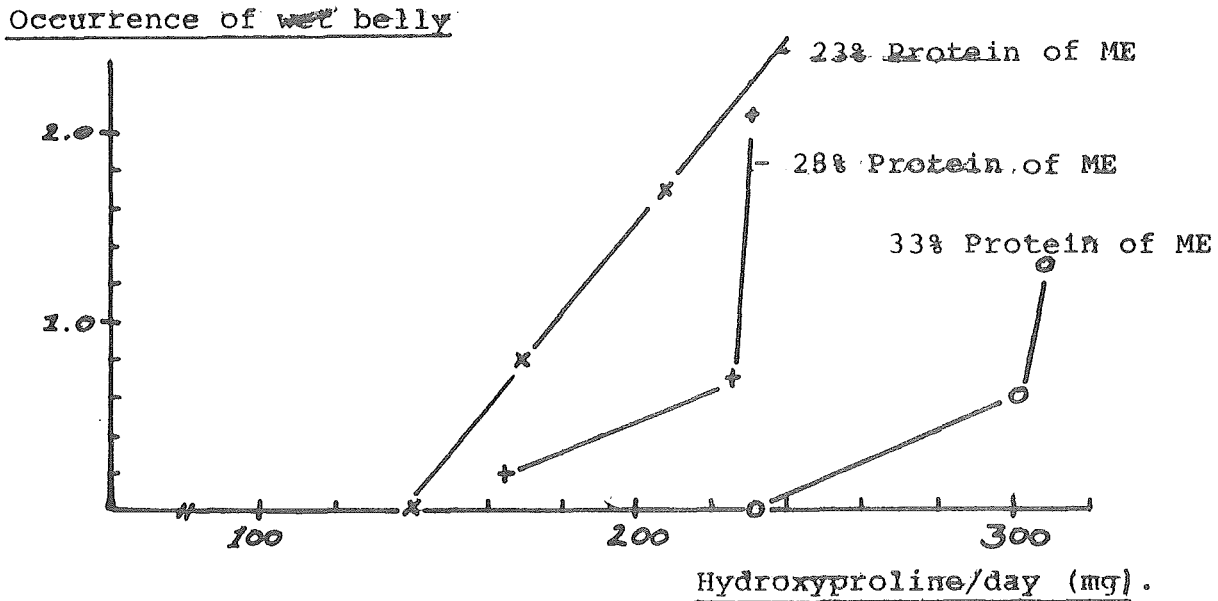
Table 4.

The occurrence of wet belly related to the daily consumption of hydroxyproline (mg) and protein concentration (% of metabolizable energy). (Modified from Skrede, 1977).

Protein concentration (% of ME)	Soybean meal (% of dig. Protein)	OH-Proline intake (mg/day)	Occurrence of wet belly 1) score
33	0	308	1.3
	22	301	0.6
	44	232	0.0
28	0	231	2.1
	21	226	0.7
	42	165	0.2
23	0	208	1.7
	20	169	0.8
	40	140	0.1

1) Occurrence and severity of wet belly are subjective rated from 0 (no wet belly) to 5 (severe wet belly).





Graph 1: The occurrence of wet belly related to the consumption of hydroxyproline at different protein concentrations in the feed (Figures from Table 4).

From Graph 1, showing the occurrence of wet belly in relation to daily intake of hydroxyproline, it is obvious that the occurrence of wet belly increases with increasing hydroxyproline intake. But it may also be seen that the occurrence of wet belly decreases with increasing protein contents of the diet. This is due to an elevated urea excretion through the kidneys with increased protein contents in the feed, implying less frequency of crystalluria and a corresponding lessening of the frequency of wet belly cases.

It may, therefore, be expected that with an increase in the protein content of the feed, the maximal consumption of hydroxyproline, without incidences of wet belly, could be increased as well.

Hypothetical values for maximal consumption and maximal concentrations of hydroxyproline are given in Table 5.

Table 5.

Hypothetical maximal values of hydroxyproline in the feed to avoid crystalluria and wet belly, etc. at different protein levels. (Computed from Skrede, 1977).

Protein concentration (% of ME)	Protein intake (g/day)	Energy intake (Kcal/day)	Maximal OH-proline	
			Intake 1) (mg/day)	Concentration (% of protein)
23	16.5	322	140	0.8
28	19.4	311	160	0.8
33	23.8	325	230	1.0

1) Estimated from Graph 1.

If the wet belly disease is to be avoided altogether, the content of hydroxyproline in the protein must not exceed 0.8 g per 100 g of protein in the feed; this is in agreement with the analytical data on amino acid composition given by Skrede (1977, Table 5).

### 6.3. Practical preventive methods.

The observations on urinary calculi, bladder stones, urinary incontinences and wet belly disease can almost - if not totally - be explained from the occurrence of crystalluria.

On the basis of the literature reviewed above, the nutritional aspects of wet belly disease may in theory be solved by minimizing the content of hydroxyproline in the feed, and, if crystalluria still occurs under practical conditions, ammonium chloride or orthophosphate should be administered orally as a supplement.

Hydroxyproline is found in the collagen fraction of connective tissues, containing about 27% glycine and 14% hydroxyproline. Collagen is a structural protein found in all vertebrates, but it is found in relatively larger proportions in large animals (horse, cattle and pigs) than in smaller animals (fish and poultry). In diets for mink fish and poultry products should therefore be used in preference to those from cattle, horses and pigs. But also fish offal - without the fillet - should be used in limited amounts.

Eggum (1969) has shown that the biological value of protein in meat and bone meal decreases with increasing amounts of glycine (mainly arising from connective tissue) and Juul Nielsen (1969) on the basis of 40 different mink feed rations calculated that the utilization of protein in feed (NPU) decreases with increasing contents of ash (of skeletal origin) and the following equation is given:

$$\text{NPU} = 80.75 - 1.20 \times \text{g ash}/100 \text{ g dry matter} \quad (n = 40, r = 0.72, s_b = 0.19)$$

If the content of hydroxyproline and consequently the content of glycine and that of ash is reduced in order to prevent the occurrence of wet belly, then the biological value of the protein in the feed ration is increased and the requirements for crude protein in the feed may be diminished.

During the latest years, the feeding tradition in Denmark has changed to use of rather more whole fish silage, conserved with strong mineral acids, instead of offal from pig and cattle slaughterhouses. From Table 6 it can be seen that the frequency of skins with pronounced wet belly has diminished dramatically.

Table 6.

The frequency of skins with pronounced wet belly sold at Danish Fur Sales.

Period	Total number of male skins	Percentage of male skins
1968/74 (average)	44272	3
1974/75	43680	3
1975/76	12629	1

This result is expected from the information found in the literature cited above.

## 7. Conclusion.

The problems of urinary calculi, urinary incontinence and wet belly disease are thought to be caused by the content of hydroxyproline in the feed. To prevent the occurrence of wet belly

etc. the theoretical value of maximal hydroxyproline concentration in the protein should not exceed 0.8 g hydroxyproline/100 g protein, but if this is not possible under practical conditions, orthophosphate should be added to the feed in order to diminish the frequency of disease incidence.

Water supply is also considered to be of importance in the prevention of wet belly disease. Water must be freely available during the whole year, but especially in the period around weaning and during the winter time.

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THIAMIN DEFICIENCY IN FUR-BEARING ANIMALS CAUSED BY  
ANTITHIAMIN FACTORS IN THE FEED.



A. Helgebostad and I. W. Dishington, The research Station for Fur-bearing Animals and Department of Biochemistry, Veterinary College of Norway, Oslo.

The authors give a review of thiamin destructing factors in different feed.

In laboratory experiments they have demonstrated that 23 % of the thiamin content of a fodder containing 50 % of blood will be destroyed within two hours when stored at a temperature of 37°C. The same diet without supplement of blood did not show any thiamin destroying effect when treated in the same manner.

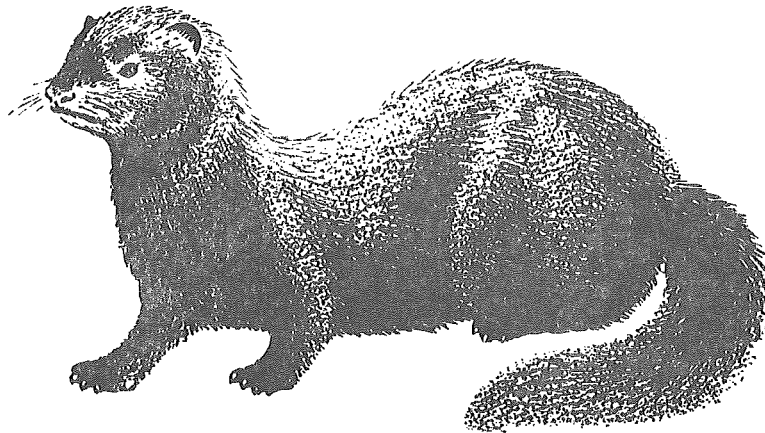
Feeding experiments have been carried out with 210 standard mink and 60 blue foxes equally distributed in a control and a test group. Both groups got a basal diet supplemented with the usual quantity of vitamins. In the test group, however, the slaughter offal was replaced by 11 % blood. Despite

its antithiamine effect, the blood content in this diet was not high enough to produce deficiency symptoms during the test period, from weaning to pelting. During pregnancy and lactation, however, when the need of vitamins is highly increased, the authors still find it advisable to reduce the blood content in the diet for fur-bearing animals.

3 Tables, 16 References.

Norsk Pelsdyrblad 1977, 155 - 157.

Authors abstract.





FELINE ONCORNAVIRUS - ASSOCIATED CELL MEMBRANE ANTIGEN: EXPRESSION  
IN TRANSFORMED NONPRODUCER MINK CELLS.

A.H. Sliski, M. Essex, Dept. of Microbiology, Harvard University  
School of Public Health, Boston, Massachusetts 02115, USA.

C. Meyer, G. Todaro, Lab. of Viral Carcinogenesis, Natl. Cancer Inst.,  
Bethesda, Maryland 20014, USA.

The feline oncornavirus - associated cell membrane antigen (FOCMA) is a target for naturally occurring immunity that protects the cat against development of fibrosarcoma and leukemia. Feline sarcoma virus-transformed "nonproducer" mink cells express high levels of FOCMA, but not of the major viral structural proteins. Transformation of the same cells by marine sarcoma virus, or infection with feline leukemia virus, which is nontransforming for epithelial or fibroblastic cells, did not induce FOCMA. Thus, FOCMA expression in mink lung cells is specifically associated with transformation by feline sarcoma virus.

SCIENCE, Vol. 196, 1977, 1336-1338.

4 photos, 1 table.

Authors abstract.



MERCURY AND MINK.

I. THE USE OF MERCURY CONTAMINATED FISH AS A FOOD FOR RANCH MINK.

G. Wobeser, N.O. Nielsen, B. Schiefer, Dept. of Vet. Pathology,  
Western College of Vet. Med., University of Saskatchewan,  
Saskatoon, Saskatchewan, S7N 0W0, Canada.

Mercury pollution of natural waters has been recognized in many areas of the world. Intoxication from the consumption of contaminated fish from these waters has been reported in humans, cat and sea birds (5).



An understanding of the possible hazards of mercury in fish for piscivorous animals is important because freshwater fish are used as a large portion of the diet of ranch mink in some areas of Canada and such information would also be of value in assessing the risk to wild piscivorous animals dependent upon fish from contaminated waters. The present experiment was designed to study the safety of fish from a polluted water body as a dietary constituent for ranch mink.

Adult female and juvenile ranch mink were fed rations containing 50 and 75% of fish containing 0.44 ppm total mercury over a 145 day period. There was no clinical or pathological evidence of intoxication in these animals and mercury concentrations in tissue appeared to be at a level below that associated with toxicity.

Canadian Journal of Comparative Medicine,  
Vol. 40, no.1, January 1976, 30-33.

1 table, 8 references.

Authors introduction and  
abstract.



#### MERCURY AND MINK.

#### II. EXPERIMENTAL METHYL MERCURY INTOXICATION.

G. Wobeser, N.O. Nielsen, B. Schiefer, Dept. of Vet. Pathology,  
Western College of Veterinary Medicine, University of  
Saskatchewan, Saskatoon, Saskatchewan S7N 0W0, Canada.

Adult female mink were fed rations containing 1.1, 1.8, 4.8, 8.3 and 15.0 ppm mercury as methyl mercury chloride over a 93 day period. Histopathological evidence of injury was present in all groups. Mink fed rations containing 1.8 to 15.0 ppm mercury developed clinical intoxication within the experimental period. The rapidity of onset of clinical intoxication was directly related to the mercury content of the ration. Mercury concentration in tissue of mink which died were similar, despite differences in mercury content of the diets and time of death. The average mercury

concentration in the brain of mink which died was 11.9 ppm. The lesions of methyl mercury poisoning are described and criteria for diagnosis are discussed.

Canadian Journ. of Comparative Medicine,  
Vol. 40, no. 1, January 1976, 34-45.

10 photos, 3 tables, 35 references.

Authors abstract.



#### MERCURY POISONING IN A WILD MINK.

G. Wobeser, Dept. of Veterinary Pathology, University of Saskatchewan, Saskatoon, Saskatchewan S7N 0W0, Canada,  
M. Swift, Dept. of Biology, University of Saskatchewan, Saskatoon, Saskatchewan S7N 0W0, Canada.

Although aquatic mercury contamination is widespread and high concentrations of mercury have been detected in a variety of piscivorous birds and mammals from several areas of the world, clinical mercury intoxication of such animals has been reported only from Japan and Sweden. The present case is the result of a fortuitous encounter by one of us (M.S.) with a clinically-sick wild mink (*Mustela vison*) near a river known to be contaminated with mercury.

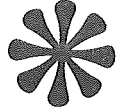
Mercury poisoning was diagnosed in a clinically-ill wild mink (*Mustela vison*) on the basis of clinical signs, histopathologic lesions and tissue mercury concentrations. The probable source of mercury was through ingestion of fish from the nearby South Saskatchewan River which is known to be contaminated with mercury. This is believed to be the first documented case of mercury intoxication of a wild animal in North America.

Journ. of Wildlife Diseases, Vol. 12, July 1976, 335-340.

4 photos, 1 table, 20 references.

Authors introduction and abstract.

## PREVALENCE OF COCCIDIA IN DOMESTIC MINK IN WISCONSIN.



William J. Foreyt and A.C. Todd, Dept. of Veterinary Science,  
University of Wisconsin, Madison, Wisconsin 53706, USA.

Five species of coccidia: *Eimeria vison*, *E. mustelae*, *E. hiepei*, *Isospora laidlawi*, and *I. bigemina* have been reported from mink, but few other reports about coccidia in mink have been published since the mink industry changed from pens on the ground to elevated pens with wire bottoms.

Because of the potential importance of coccidiosis in domestic mink, a study was done to determine the prevalence and distribution of coccidial species in Wisconsin. Between June and September 1975, 10 to 19 fresh fecal samples were randomly collected from individual mink in elevated pens on each of 29 ranches throughout the state.

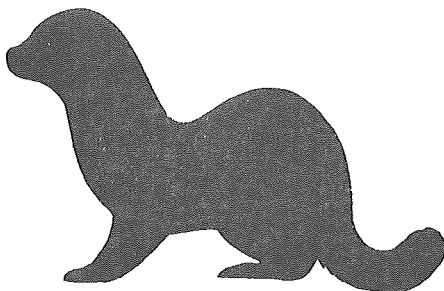
Oocysts were detected on all ranches and in 173 of 323 (54%) mink samples collected from the 29 locations.

Three species, *I. laidlawi*, *E. vison*, and an undescribed *Eimeria* sp. were detected on 90%, 62%, and 66% of the ranches, respectively. Mixed infections were present on all ranches except four.

These studies found that the coccidia of domestic mink in Wisconsin are prevalent and widespread.

Journal of Parasitology, Vol. 62, no.3, 1976, 496.

Ref. G. Jørgensen.



## ANTICOCCIDIAL ACTIVITY OF EIGHT COMPOUNDS IN DOMESTIC MINK



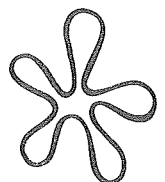
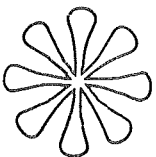
W.J. Foreyt, A.C. Todd, G.R. Hartsough, Dept. of Veterinary  
Microbiology, Washington State University, Pullman,  
Wa 99163, USA.

Eight compounds were tested for anticoccidial activity in 44 domestic mink (*Mustela vison*). A treatment group consisted of 4 mink exposed to 2 inoculums of sporulated oocysts on day 0 and day 22 of the experiments. Each inoculum contained 2,000 *Isospora laidlawi*, 2,000 *Eimeria vison*, and 2,000 *Eimeria* sp. One compound was administered to each treated group; a control of 4 juvenile mink and a control group of 4 adult mink were designated. All treatments were given each day for 30 days after the initial exposure, except lincomycin which was administered for 14 days.

In juvenile mink (3 to 4 months old), amprolium at dose level of 0.012% and sulfaquinoxaline at dose level of 0.024% in the water inhibited almost all of the oocyst production when compared with that of the control group. Lincomycin injected at dose level of 5 mg/day/mink was ineffective in suppressing oocyst production. In adult mink (2 to 4 years), monensin sodium at dose level of 0.012% a commercial antibiotic-sulfonamide mixture at dose level of 0.49%, and lasalocid sodium at dose level of 0.01% in the feed inhibited almost 100% oocyst production. Lasalocid sodium at dose level of 0.10% in the feed was lethal to 3 of 4 mink. Sulfamethazine at dose level of 0.014% and sulfathiazole at 0.014% in the feed had limited anticoccidial activities.

Am. J. Vet. Res., Vol. 38, no.3, March 1977, 391-394.  
2 tables, 17 references.

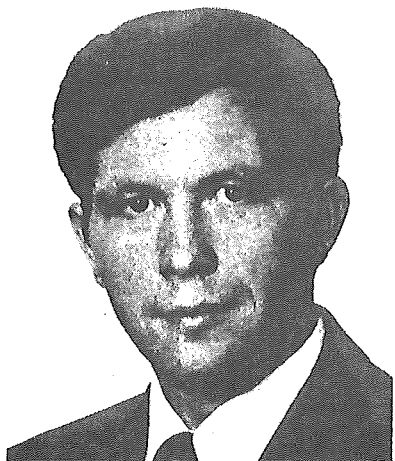
Authors summary.



COMMUNICATION.

From Norsk Pelsdyrblad no. 1, 1977.

NEW LEADER OF FUR ANIMAL RESEARCH AT THE VETERINARY UNIVERSITY OF NORWAY.



Dr. med. vet. Ordin M. Møller has been appointed Reader in Fur Bearing Animal diseases at Vet. University in Norway as leader of the research farm for fur bearing animals in Heggedal.

Dr. Møller succeeds Dr. Helgebostad who retired on the 1st August. Dr. Møller graduated from N.V.H. in 1970. He is from Rogaland. As a lad he worked on his father's mink farm and has therefore a solid background in progressive fur production. It was natural that he should decide to specialize in fur bearing animals and reproduction problems.

After he graduated, Dr. Møller worked as research student at the Institute for Reproduction Physiology at N.V.H. This resulted first in a masters degree and later a doctors degree on the subject "Studies on Plasma Progesterone and Ovarian Morphology in mink and Blue Fox", in which he describes the location and pattern of production the sex hormone progesterone. The hormone progesterone has a central place among the hormones which control the functions of the sex organs, especially during heat and pregnancy. These investigations are very important in that they form the basis for further investigations into the many reproductive problems to which fur bearing animals are subject.

Dr. Møller was a frequent visitor to the research farm at Heggedal while he was working on his doctoral thesis, since his experimental animals were obtained and kept there.

Now that Dr. Møller has taken over the leadership of the experimental work with fur bearing animals at N.V.H., we can expect revolutionary investigations into the many sterility problems which fur bearing animals have.

We send him our best wishes in his new position and hope that he finds it an inspiring and fruitful one.

Refer to: WR-21-77 5/3/77  
L. C. Yarris, (415) 486-3602  
W. J. Whorton, (415) 486-3350

## NEWS

Western Region  
Agricultural Research Service  
U.S. Department of Agriculture  
2850 Telegraph Avenue  
Berkeley, California 94705

### MINK DISEASE SERVES AS A MODEL FOR STUDY OF HUMAN MUSCULAR DYSTROPHY:

A new disease in mink has been identified as a form of muscular dystrophy. Studying mink afflicted with this disease could provide better understanding and possibly treatment of the disease in humans, says the U.S. Department of Agriculture (USDA).

Muscular dystrophy is a disease which progressively wastes muscles in the body, impairing muscle strength. The disease affects over 250,000 persons in the United States. Though it has long been recognized, little is understood about the treatment for muscular dystrophy.

The newly identified mink disease is a hereditary disorder affecting skeletal muscles throughout the body. The mink disorder strongly resembles human muscular dystrophy; both clinical and laboratory changes of elevated muscle enzymes in the serum and the severe destructive changes present in the skeletal muscle.

Using an animal as a genetic model of a human disease provides medical researchers much greater opportunities to study the disease and experiment with treatments than they would have using only human patients.

The mink disorder is being studied by veterinarians Gerald A. Hegreberg and Steven L. Norton of Washington State University and John R. Gorham of USDA's Agricultural Research Service, all at Pullman, Washington.

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Recieved from John R. Gorham, U.S. dept. of Agriculture,  
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202 Wegener Hall, WSU, Pullmann, WA 99164, USA.

