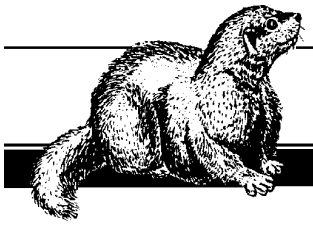

FUR ANIMAL RESEARCH

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BY J.E. OLDFIELD
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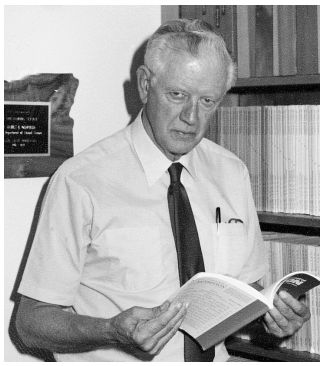

The annual meeting of your Mink Farmers' Research Foundation has come and gone and my report of it will be shorter than usual, since I was unable to attend. My doctor told me that I should have a heart pacemaker installed, which I have had done; it is working well, and I feel great, but the operation caused me to miss the meeting. My present state of good health reminds me of my good friend, Karlene Hart of the Canada Mink Breeders' Association, who when asked how she is replies, "If I felt any better, I'd be dangerous." And so it is with me; if Karlene and I meet on one of our better days, sparks will surely fly.

And, speaking of Canada Mink Breeders (CMB), they have scheduled their annual meeting for September 17, 18 and 19, at St. Foy, a beautiful area about 10 minutes away from the "old city" of Quebec. It will be at the Chateau Bonne Entente, where rooms are $135 per night in Canadian dollars. Reservations should be made through CMB (phone 416-675-9400; FAX 416-675-9401). Sunday, Sept. 17, is a social day involving golf or guided tours of nearby areas. The business meeting will be Monday and Tuesday, with three research presentations scheduled. There is a banquet on Tuesday evening, which is always an enjoyable affair.

Our annual meeting was held on the campus of Michigan State University, which gave the Board the opportunity to visit the mink research facilities directed by Dr. Dick Aulerich, who has been one of our most productive investigators over the years. We are sorry that Dr. Aulerich will be retiring this year, but pleased that his research program will continue under the direction of Dr. Steve Bursian who has worked with Dr. Aulerich for many years. The memorial fund for Dr. G. R. Hartsough continues to grow and we have been able to increase the yearly research award to $2,000, which is really helpful. As you think about tax-deductible contributions this year, keep the Hartsough fund in mind - it honors a wonderful man and supports mink research; a "win-win" situation. In addition to the Board members, the meeting was attended by Ted Parkinson who chairs the research committee for CMB, and by Dr. Bill Leoschke, a well-known mink nutritionist who is writing a book on mink feeding and nutrition. This year, also, we began the practice of inviting representatives from the major auction houses to attend our meeting. These people are in close touch with you ranchers and can reflect your research needs to us as they see them.

I have mentioned the name of Dr. G. R. Hartsough, and I often reflect on how much he did for the mink industry. Just as one example, this issue of our newsletter carries an article about salmonellosis, and one of the first investigators cited in it was Dr. Hartsough. John Gorham, who is becoming an elder statesman of the fur industry, frequently assembled data on some of these "older" problems (Aleutian Disease, Distemper) and they are always interesting because we still have to deal with them. But there are new problems cropping up all the time, too, and we included an article on one of these, assembled by Drs. Durrant and Westlake, our field men who have to deal with these things, as you do, on a day-to-day basis.

There is to be an international congress on research with mink to be held at Kastoria, Greece, next September, at which the MFRF Board will be represented. We will report to you on research done in other countries after the meeting.

I wish you all an enjoyable summer.

J. E. Oldfield

GROUP HOUSING FOR MINK

We are finding, as your Research Foundation board, that we need to get into new areas of research in addition to the traditional genetics, disease, nutrition and physiology. One of the areas of current interest is housing, or, if you like, caging. Part of the stimulus for work in this area comes in response to public demands for animal welfare and to improving the public image of the mink industry. Many people are demanding evidence that animals are living comfortable lives, and this applies to all species of animals - not just mink. Scientists have tried to find, and measure, indicators of animal well-being, but this does not satisfy many observers. They want to see evidence of comfort: large cages - some even feel that swimming pools need to be supplied. A good deal of work has been done in Europe on this issue, particularly in the Netherlands. The rancher, who also wants to ensure that his animals are well-cared for, of course, must somehow accomplish this at a low enough cost that he can make a profit in his business.

Increasing the size of mink cages without decreasing the mink producer's profit is only possible if mink are housed in groups. This introduces other problems. Mink are by nature solitary animals, and when grouped, they tend to fight and damage each other's pelts. In the Netherlands, it is now common practice to keep groups of three or four animals together, in conventional cages, and allow access of one to another by cutting circular holes in the wire-mesh wall between the cages.

Another problem with group housing is that it seems to increase tail-chewing; however, this can be alleviated by later weaning (Mason, J. 1994. Tail biting in mink is influenced by age at removal from the mother. Animal Welfare 1:305-311). Later weaning is possible in cages more than 30 cm (about 12 inches) wide, and the entryways cut in the walls between cages makes this possible. The Dutch workers concluded that mink can be successfully raised in groups in large cages and that they develop pelts that are not significantly different from those produced in traditional caging systems. Production costs were practically the same (from: de Jonge, G. 1996. A new housing system for mink. Animal Production Review. Polish Soc. An. Prod. Pp. 45-51).

SALMONELLOSIS OF MINK

The following review of salmonella infection in mink has been prepared by Drs. John Gorham, Gary Durrant and Robert Westlake.

This paper deals with the role of *Salmonella* - a microscopic rod-shaped bacterium - as a disease-producing agent in mink. It is difficult to diagnose *Salmonella* as a disease problem in mink except in cases where *Salmonella* causes abortions. However, even in abortion outbreaks a bacteriological confirmation is necessary for a positive diagnosis, as there are other causes of abortion. For example, *Campylobacter* bacteria caused the loss of 2000 aborted and stillborn kits on a Washington farm.

<u>*Salmonella* as a cause of abortions</u>

There have been several reported outbreaks in which *Salmonella* infections have led to abortions, stillborn kits, and "open" females. Dr. G. R. Hartsough reported outbreaks in the spring of 1946, 1947 and 1960. There were a few deaths in the pregnant females, but many kits were aborted. A number of aborting females were killed and examined bacteriologically and, in every instance, *Salmonella choleraesuis* var. *Kunzendorf* was isolated from the uterus and expelled feti. In some instances, necrotic metritis (inflammation of the uterus with tissue death) and peritonitis was observed. The source of infection in all three outbreaks was *Salmonella*-contaminated inedible pork livers.

Inasmuch as normal appearing livers may harbor *Salmonella*, it is difficult to keep such livers out of the ration. Hartsough suggested that some consideration be given for the elimination of pork livers from the ration during the gestation period.

Loliger (1959) reported the first outbreak of *Salmonella* abortions in German mink. The cause was *Salmonella infantis*, a species closely related to the one isolated by Hartsough in Wisconsin. Shortly after aborting their young, a number of female mink became ill. Autopsy revealed metritis with portions of the remaining placenta extending through the uterine wall with resultant gangrenous peritonitis. Pregnant females found infected with *Salmonella* early

continued on next page

SALMONELLOSIS OF MINK Cont.

in pregnancy did not abort.

Larsen has also described an outbreak of *Salmonella* abortions that occurred in the Utah area. That *Salmonella* bacteria can also infect humans was shown in this outbreak. The mink farmer put a kit in his mouth "to warm it up" and infected himself. He became ill and *Salmonella dublin* was isolated from his blood.

About ten years ago, Westlake reported salmonellosis in a mid-western outbreak. No adult females died but about 20 percent of the kits were lost. The loss was based on the previous year's kit production. *Salmonella enteritidis* was isolated from the aborted kits and the uteri of the affected females. The source of the *Salmonella* was traced to turkey byproducts.

There have been no reported outbreaks where pellets have been fed. The high heat in the processing of the pellets might kill or reduce the numbers of *Salmonella* bacteria.

In the last few years, Durrant has diagnosed *Salmonella* abortions on several Utah farms. The losses varied from one to 12 percent of the kits. The percent loss due to the abortions was again based on the previous year's kit production. *Salmonella typhimurium* was isolated from the aborted kits. Attempts were made but it was not possible to nail down the source of the *Salmonella* in the feed in these outbreaks but poultry byproducts were suspected. In one outbreak, the farmer thought the feed "smelled bad" so he tasted the mink food. He infected himself and he was hospitalized. *Salmonella dublin* was isolated from him and the aborted kits.

Seven or eight Danish mink farmers have experienced outbreaks of salmonellosis this year (2000). All of these farms received their feed from one food kitchen. *Salmonella dublin* was isolated from the aborted kits. Beef byproducts were the suspected source.

A comment on the abortion outbreaks

Since pork livers, beef and poultry byproducts have been incriminated in the abortion outbreaks, it would strongly suggest that mink are frequently exposed to *Salmonella* bacteria in the feed throughout the year. For some unexplained reason, the *Salmonella* bacteria "zero in" on the pregnant females in late pregnancy and cause the females to abort.

Salmonella isolations from mink other than from pregnant females or aborted kits are not considered to be significant unless the *Salmonella* is isolated in outbreaks of enteritis. *Salmonella* is frequently isolated from normal mink. Almost all mink that have eaten contaminated byproducts show no signs of disease and may be called carriers. When the *Salmonella* bacteria enter the intestine, instead of invading and causing inflammation of the lining membrane, they pass through the mink with the intestinal contents.

Our investigations showed that mink during the summer were resistant to experimental rations containing *Salmonella*. Clinical disease was not observed (Gorham et al., 1949).

With the exception of agents such as mink virus enteritis, coronavirus, coccidiosis, *Campylobacter* and perhaps *E. coli*, the major infectious causes of enteritis are unknown. Perhaps it would be well to leave the "back door open" and say if the conditions are appropriate, i.e., if the resistance of mink was lowered by some factor, *Salmonella* might play a role in enteritis as a secondary invader.

Treatment. *Salmonella* organisms are sensitive to certain antibiotics and sulfa drugs. It should be pointed out that sulfa drugs should never be fed to pregnant females. The results of such feeding have been disastrous. The sulfa drug itself caused the pregnant females to abort.

Since the treatment may vary between outbreaks due to the varying sensitivity of strains of *Salmonella*, it would be well to consult a veterinarian familiar with mink diseases before any treatments are given.

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Hartsough, G.R. (1947-1960). Personal communication.

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Gorham, J.R. et al. (1949). *Salmonella* Infections in Mink and Ferrets. *Am. J. Vet. Res.* 10:183-192.

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These *Salmonella* investigations were supported by the Mink Farmer's Research Foundation.

USE OF SULFA DRUGS

The previous article cautions us on the use of sulfa drugs, indicating they should never be given to pregnant females. Dr. Gary Durrant adds the following, based on observations made this year by Dr. Westlake and himself:

"Sulfonamides, or sulfa drugs as they are commonly referred to, are excellent microbials, and ranchers use these drugs to combat many diseases that affect commercial mink herds. It has been emphasized that these particular drugs are contraindicated (don't use them) during pregnancy. Sulfa drugs bind the essential nutrient folic acid, making it unavailable to the growing and developing kit feti. Use of sulfa drugs during gestation has caused some disastrous results at whelping time."

"Sulfa drugs are also being used by some ranchers after whelping to help the young kits fight off many bacterial diseases. I would like to take this opportunity to remind all ranchers that care must be taken in the use of sulfa drugs, even when mink are not pregnant. We have had some problems this year with kit losses that we believe may be associated with the use of sulfa drugs on kits. If sulfa drugs are used, it is essential that the kits have easy access to drinking water. If the weather is hot and the kits become dehydrated due to the high temperatures, use of sulfa drugs should be discontinued. And conversely, if it is cold and the kits are not venturing out of the nest boxes to drink, the sulfa drugs should be discontinued, also."

"If you plan on using a sulfa drug, it is wise to consult with a veterinarian who is knowledgeable about mink and it is important to keep a continuous check on weather conditions. If you believe you may have a sulfa drug toxicity in your mink herd, especially among your kit mink, you should immediately discontinue the use of the drug and contact your veterinarian as soon as possible. If you have further questions or concerns, please contact your consulting veterinarians of the Mink Farmers' Research Foundation, Dr. Gary Durrant (phone 801-255-4228) or Dr. Robert Westlake (phone 218-847-5674)."

Dr. Gary Durrant

EFFECTS OF FATTENING MINK ON PELT LENGTH

Along with fur color and quality, the size (pelt length) of mink pelts is a prime determinant of pelt prices. Some ranchers have questioned whether fattening mink up before pelting will increase pelt size, and this matter has been investigated by Finnish researchers.

They found that the body length of mink is fully developed by September 1st, and that growth after this is almost entirely accounted for by an increase in body fat. The Finnish workers set up two groups of scanbrown mink, which, after September 14 were fed either *ad libitum*, or restricted to 80% of ad lib. feeding. The full-fed group males and females gained 329 and 227 grams, respectively, as compared to 172 grams and 76 grams for the restricted group. Despite the considerable increase in weight, however, there was no significant difference in pelt length between the two groups (Figure 1). It was concluded that fattening animals up after September 1st had a very minimal effect on pelt length, and was consequently un-economic (from: Nurminen, L. and J. Depponen. 1996. Effects of fattening on the skin length of farmed mink. Animal Production Review. Polish Soc. An. Prod. Pp. 159-163.

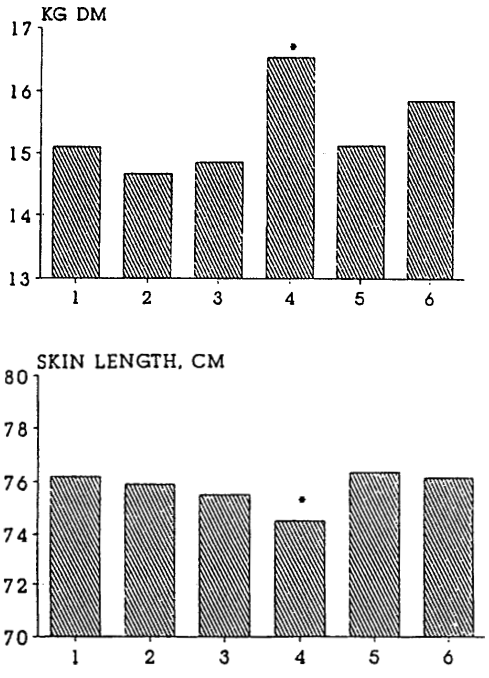

Figure 1. Mink body weights in September, weight gain, body weight at pelting and skin length in full, and restricted-fed mink.

EMBRYONIC MORTALITY IN MINK

It is well-known that losses *in utero* make up a sizeable proportion of total mink losses, and Russian scientists at Novosibirsk, in Asiatic Russia, have studied the time sequence in which the losses occur. It has been estimated that there are 25% prenatal and early postnatal losses, which is a serious detriment to the profitability of commercial mink operations. There are a number of factors that contribute to such losses, including the nutrition of the females, their hormonal status and the date of mating.

In a study of 270 standard, dark mink embryos, it was found that percentage embryonic death was approximately 22%, 12% and 25%, in the zygotes, cleavage and blastocyst stages, respectively. The major causes of preimplantation losses seem to relate to: (1) impairment of the fertilization process and (2) influence of the maternal hormones. Some further embryonic losses are apparently the result of bacterial invasion, and this concept requires further study. (from: Kizilova, H. A., A. M. Golubitsa, A. I. Zhelezova, S. I. Baiborodin and O. L. Serov. 1999. Embryonic mortality in the American mink: a morphological analysis of preimplantation loss. *Scientifur* 23:307-314).

MANAGEMENT SYSTEMS IN MINK PRODUCTION

Mink production differs significantly from that of other domestic animal species, and it lends itself to the development of management schemes that have the potential for minimizing labor costs and improving profit margins. Steam Møller, at the Danish Institute of Animal Sciences in Tjele, has proposed some interesting management programs. He suggests three systematic operation programs (SOP) covering specific periods of time during which certain planned activities can take place. Two of these SOP's were the labor-intensive times of mating and whelping, while the third incorporates disease-preventive measures in the normal farm routines. Dr. Møller set up meetings of mink farm operators at which management systems for their specific ranch conditions were discussed. Some of the points that emerged in these discussions included: (1) Delayed pelting had no effect on skin length of the mink, (2) Body weight of the mink during summer fur shedding in October had a greater effect on pelt length than later weight gains, from October to pelting. He covers his study in a 172-page thesis, which has been abstracted in **Scientifur** and has diagrammed the various items in fur farm management that need to be separately planned for (Figure 2) (from: Møller, S. H. and J. T. Sørenson. 1999. A systems description of a strictly synchronized animal production: the case of mink production.)

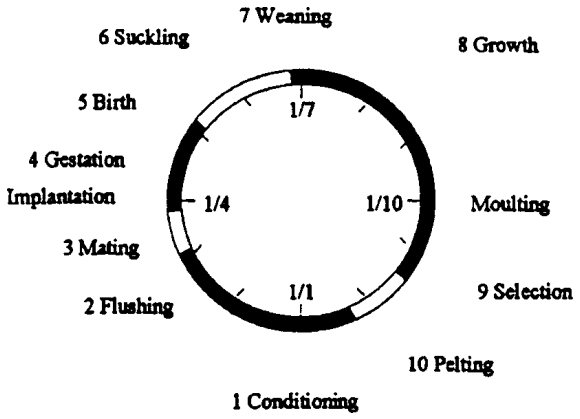

Figure 2: An annual cycle of synchronous mink production periods (numbered periods indicate special management routines).

MINK WATERING SYSTEMS

Steen Møller also provides some interesting observations on mink watering systems. Most Danish waterers, he notes, consist of a black plastic pipe, equipped with spring nipples which runs along the back of the cages. During lactation, additional arrangements were made to help make water available to the kits and to keep the water fresh. In winter, water was either continuously circulated, or heated, to keep it from freezing. The supplemental watering system for the lactation period was a drip system and this was found useful when the daytime temperature was over 25°C. In a warm and dry lactation period, such a drip system reduced weight loss of the females and increased weight gains of the kits up to 7 weeks. Kits located the water system at about 5-6 weeks of age, and since this is some 2 weeks later than they start to eat solid food, it emphasizes the need to increase the water content of the diet. Temperature of water offered to mink can vary considerably from about 0°C in winter to 45°C in summer. Mink appear to drink more often, but less at each time, of cold water, rather than warm. An adult male mink drinks 25-30 times a day from a nipple waterer, taking from 2.5 - 5 ml of water each time. Before whelping, females prefer warm water but after the kits are born they drink mostly cold water when available. (from: Møller, S. 1993. Production systems and management. Report 720, National Institute of Animal Science, Denmark, pp. 86-93).

PROTEIN QUALITY & QUANTITY FOR MINK

The importance of dietary amino acids and protein for mink is well-known. Since mink are naturally carnivorous, the feeds which they like and which make up a substantial part of their diets is protein, with the result that protein contents of mink diets tend to be very high when compared to those in diets for other domestic animal species. But, since protein costs are high compared to other nutrients, it is sometimes tempting to include in the diet some lower-quality (and cheaper) protein sources, as "protein extenders." Some evidence has been presented, from Finland, to suggest that this may not be wise. The researchers allotted 300 mink to 6 groups of 50 each and fed them diets as follows, from the 1st of July on:

Group	Diet Characteristics
1	Low protein level; poor quality
2	Low protein level; average quality
3	Low level; good quality
4	High level; poor quality
5	High level; average quality
6	High level; good quality

The low and high protein levels were 30% and 40% of the diet's metabolizable energy. The results of the test confirmed the importance of the quality of protein in mink diets. For example, the sulphur-containing amino acids, cystine and methionine, cannot be compensated for by simply increasing the dietary levels of protein, since a high level of a low-quality protein will likely lower the levels and availability of other essential nutrients in the diet. The results of this study (see Dahlman, T., P. Niemela, T. Kiiskinen, J. Makela and H. Korhonen. 1996. Influence of protein quantity and quality on mink. Animal Production Review. Polish Soc. Animal Prod. pp. 9-14) are presented in Figure 3.

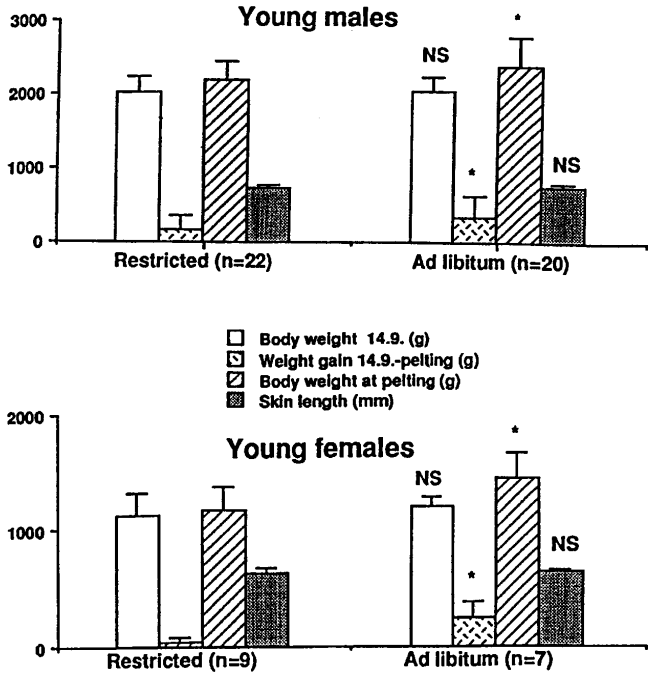

Figure 3: Average daily feed consumption (top) and skin lengths (bottom).

RESEARCH PRIORITIES

This year, as we always do, your MFRF Board discussed research priorities, and these are listed on the following page. Let us know what you think of them. Board members' names and addresses are on the back page.

THE MINK FARMERS' RESEARCH FOUNDATION: RESEARCH PRIORITIES
Revised 31 March, 2000

AREA OF RESEARCH	DISEASE	FEEDS/NUTRITION	PHYSIOLOGY/ MANAGEMENT
PRIORITY RATING	**Viral Diseases (AD and Distemper):** Continue studies to identify new virus strains and develop means of control.	**Feed Processing**: Investigate methods of preserving fresh feeds, including acidification, ensiling, and use of preservatives (Cu, formaldehyde).	**Early Kit Loss:** Continue studies to identify causes and prevention of losses of neonatal kits. Investigate lactobacillus spray products as preventatives.
I	**Enteritis/Septicemia:** Identify and isolate various bacterial and viral strains and develop control methods. **Blue Mink Problems:** Investigate boils, pussy lungs and various problems occurring predominantly in blue mink.	**Feed Additives:** Test usefulness of feed additives against specific problems, e.g. electrolytes in times of heat stress, enzyme 'cocktails,' probiotics, and DL methionine as a cannibalism-preventer.	**Environmental Problems:** Investigate and develop practical, cost-effective ways of disposing of mink farm wastes, including composting, and fly and odor control. Determine nutrient and fertilizer values for mink manure. Develop uses for it.
II	**Nursing Sickness:** Identify physiological basis for nursing sickness and study relationship to management practices.	**Alternate Feeds:** Identify and analyze various potential feeds for mink, including spent hens. Compile tables of nutrient values.	
III		**Food Poisons:** Continue investigation of toxins that may occur in, or contaminate, mink feeds. **Nutrient Requirements:** Assemble data on nutrient needs of mink at different stages of the life cycle. Combine these with data on feed nutrients in a form suitable for computer formulation of diets.	**Housing:** Develop recommendations on multiple caging of mink, consistent with the welfare of the animals. Investigate means of measuring stress in mink. **Hormone Studies:** Investigate effects of lighting on mink life processes. Continue investigation of ways in which hormones influence basic processes of growth, reproduction, lactation, and fur production. Study possible involvement of melatonin in immunity with specific types of mink.

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