FUR ANIMAL RESEARCH

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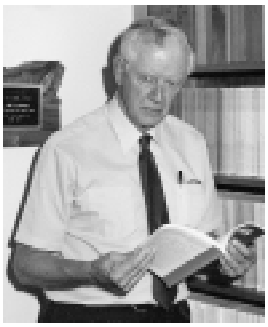
BY J.E. OLDFIELD
ELAINE SCHEFF, EDITOR



It's always nice to get comments about something one has written, particularly if it's positive. A reader of this Newsletter recently complimented me on the last issue, which he described, in fisherman's terms, as "a keeper." I think the particular article that he enjoyed was written by John Gorham and not myself, but I was happy to bask in John's reflected glory. More seriously, I hope that all the issues will be "keepers" and that you'll refer back to them time and again when you have a need for the information in them. Your Mink Farmers' Research Foundation Board has discussed ways in which the Newsletter might be made more useful to you. Some of the ideas expressed included providing looseleaf binders for them and reassembling the contents from time to time under different subject matter headings such as "Feeding and Nutrition," "Breeding and Genetics," "Reproduction and Hormone Applications," "Management" and the like. If you have thoughts on this issue, let us know; we're always glad to hear from you on this or any other issue affecting the mink business.

The early fur sales have been held and the prices have been a bit disappointing, but not surprising to most producers. Whoever said, "Man flourishes through adversity," could well have used the mink industry as a model. In tough times, we tend to become more innovative – to take closer looks at all phases of our operations to see how they can be made more efficient. In my role of information-gatherer for the mink business, I have found that people are operating on a global – worldwide basis – more than ever. I have had reason to call on experts overseas for advice on different matters recently and it has always been promptly and generously given. Among those who have helped me and have provided data that have been relayed to you in this Newsletter have been my old friend, Gunnar Jorgensen, the founder and editor of **Scientifur**; Anders Skrede, of the Agricultural University of Norway, and Vilhelm Weiss, consultant to the Fur Breeders' Association of Central Jutland, and I am deeply grateful to them. Material from them is included in this issue.

Along with the normal expected production problems, the mink industry of today is burdened by a host of governmental requirements. These include maintaining a desirable quality of environment surrounding mink operations and living with regulations imposed on various medicinal compounds and drugs. A case in point for the latter is the use of antibiotics in mink feeds. Unlike most species of farm animals, mink eat a largely fresh diet, which in addition to being nutritious to the mink, provides an excellent growth medium for bacteria. Antibiotics have a place in holding such bacterial growth in check, and they have been widely used. But concerns have been raised that the continued use of antibiotics in animal feeds may result in formation of strains of bacteria that are resistant to them, with the end result that the use of antibiotics to treat human diseases may be compromised. This is an emotional and persuasive argument, but it is one that is not supported by facts. One would think that if antibiotic-resistant bacteria were being formed, the animals fed the antibiotics would no longer show a benefit from their use, and this has not proven to be the case. Antibiotics have been used in feeds for some 30 years now, and they are giving the same level of effectiveness as they did when first used. The European union has recently proposed a ban on four antibiotics in feed: zinc bacitracin, spiramycin, virginiamycin and tylosin phosphate. The Charles Pfizer company – a US-based pharmaceutical manufacturer – has brought a lawsuit against the Danish Ministry of Food over its decision to ban the use of virginiamycin. This is an important matter because, if the ban is upheld, it could interfere with market-

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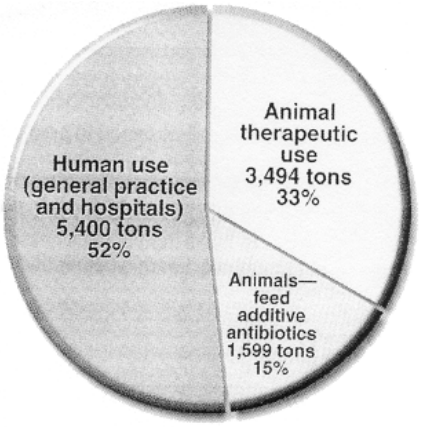
ing in Europe. Antibiotic use with animals gets "bad press" but it is really only a small part of the total use (see chart).

We wish you well in your sales and in your reproduction season.

J. E. Oldfield

Antibiotic Use in Europe



Total antibiotic use
10,493 tons

Estimated annual usage of antibiotics in humans and animals in the European Union (1997). Active ingredients at 100% purity.

(Data from Lobo, P. Drugs and Superbugs. **Feed Management**, January, 1999, p. 4)

DISTEMPER INVESTIGATIONS: 1998

Distemper Virus infection has been responsible for the loss of thousands of mink during the 1998 season. In response to those losses and in an attempt to identify the source of the infection or problem, the research committee of Fur Commission USA set up and conducted a Distemper/Vaccine trial during the last quarter of 1998. Initially, several mink from across the country were blood tested to see if they possessed distemper specific antibodies which correspond to varying levels of protection and immunity. The results of these "titer tests" suggested that the vaccine used by many mink farmers did not provide adequate immunity against distemper. Unvaccinated mink were selected and tested to verify that they were not vaccinated and had not been exposed to the distemper virus. The mink were then divided into several groups. Each group (except for the control group) was then vaccinated with a different, commercially available mink distemper or distemper-combination vaccine. The experimental groups were as follows:

- Distemper Vaccine A 1998
- 4-Way Vaccine A 1998
- 4-Way Vaccine A 1997
- Distemper Vaccine B 1998
- 4-Way Vaccine B 1998
- Spray Vac Aerosol
- Spray Vac Intra nasal
- Control Group – unvaccinated

** Some of the mink included in the study were implanted with melatonin implants. Immune responses and vaccine titers will be evaluated to see if significant differences exist.

The results of this field experiment are currently being studied and evaluated for statistical significance. Some trends are evident and important. All results will be made available as soon as legal concerns can be addressed; i.e., the vaccine companies will be notified first and given time to evaluate the data.

In addition to the previously mentioned tests and field experiment, the research committee has been involved with overseeing research that involves testing the vaccines to determine the "strength" or immunization potential of the vaccines before they are introduced to the mink. We hope these tests will further aid us in determining if the vaccine/stock or base virus is adequate to confer immunity or if mixing multiple vaccines together has somehow neutralized or weakened the distemper fraction of the 4-way combination vaccines.

The members of the research committee want to remind everyone that it is not our intent to attack or malign our vaccine companies. It is very important that we maintain working relationships with those who provide us with vaccines and other important products we use and depend on in the mink industry.

Gary R. Durrant, D.V.M.
Robert Westlake, D.V.M.

G. R. HARTSOUGH MEMORIAL AWARD

It is a pleasure each year to report on the recipient of the G. R. Hartsough Memorial Award at Michigan State University – his alma mater. This year's winner is Miyuki Tauchi, and Dr. Aulerich sends the following statement about her. We offer congratulations to Miyuki.

The winner of the 1998 G. R. Hartsough Endowed Scholarship is Miyuki Tauchi. Miyuki is a veterinarian from Japan and pursuing a Ph.D. degree in Animal Science at Michigan State University under the direction of Dr. Adroaldo Zanella. Her research interests are in the development of abnormal behavior in mink. She is investigating the hypothesis that stress at an early age alters glucocorticoid receptor distribution in the brain which causes long-lasting changes in response to stress and contributes to the development of abnormal behavior.

This is a win-win situation, involving not only remembrance of Dr. Hartsough, who did so much for the fur industry, but also funding continued, important research with mink. The fund now stands at $35,535, which allows us to offer a $2,000 award from the earnings. If you wish to contribute, send checks to the Director of Development, CANR, 101 Agriculture Hall, Michigan State University, East Lansing MI 48824, and mark the check IMO G. R. HARTSOUGH. Such gifts are deductible for tax purposes.

HEALTH OF MINK KITS

With the all-important kit season approaching, it is timely to report on some of the things that affect the health of the newborn animals, and I draw on work from the Royal Veterinary and Agricultural University in Denmark.

Mink are born very immature, physiologically – blind, almost hairless, and without the ability to keep themselves warm. They have very limited energy reserves since their body fat content at birth is only about 1%. They have the capacity, however, for very rapid growth during the suckling period, with an amazing average growth rate of 12%/24 hours in the first three weeks of life when they are totally dependent on their mother's milk for nutrition. This makes the lactation period a critical one, nutritionally, for the females and despite a large increase in food consumption, dams with large litters are unable to meet their energy needs from their feed, and draw on body reserves, thus losing weight. Weight losses of 20% often occur among lactating females. It is extremely important to stimulate both energy and water intake during this critical period. Mink milk yield is very high in relation to body size, and the Danish data show that a female weighing 1100 grams, with a litter of five kits will produce 3,000 grams of milk in the first four weeks of lactation. Water to support milk production is also important. Most of it comes from the feed if wet diets are fed, but about 10% of the total is metabolic water from the mink's body. These conditions dictate that palatable diets of high energy content should be fed, along with an ample water supply (from Tauson, A.H., H.J. Sorenson, S. Wamberg and A. Chwalibog. 1998. Energy metabolism, nutrient oxidation and water turnover in the lactating mink. J. Nutrition 128:2615-2617).

FORMALDEHYDE APPROVED FOR USE IN ANIMAL FEEDS

We have written earlier about the use of formaldehyde as a mink feed preservative, citing studies with it by Dr. Aulerich at Michigan State University. On October 6th, 1998, the Food and Drug Administration (FDA) published a final rule permitting the use of formaldehyde as an antimicrobial additive for maintaining feeds salmonella-negative for up to 23 days. The FDA allows formaldehyde to be used at a rate of 5.4 pounds per ton of feeds, or 0.1% (from **Render**, the National Magazine of Rendering, December 1998, p. 9).

STRAINS OF ALEUTIAN DISEASE (AD) VIRUS

I am indebted to Dr. John Gorham for this interesting summary.

We, as well as others, have recognized differences in the appearance of Aleutian Disease in field outbreaks and laboratory experiments. In this brief report, some identifiable features are described that may be used to designate different strains of AD on a clinical basis.

Since any known ADV strain will kill Aleutian mink **aa** within a few months after infection, a description of AD strains must be based on AD in non-Aleutian mink. Here, there are observable differences in the ability of AD strains to cause disease.

It should be pointed out that molecular markers will in the future identify and "sort out" the strains of AD affecting mink. This time-consuming research is currently underway at the Rocky Mountain Laboratories under a Mink Farmers Research Foundation Grant.

The Virulence of Aleutian Disease Virus Strains in non-Aleutian Mink Genotypes

Highly Virulent	Medium Virulence	Low Virulence
Utah I	Montana	Pullman
Utah II	Ontario Danish	ADV-P (Porter) Tissue culture adapted ADV-G (Gorham) Tissue culture adapted and used for the CIEP tests
Wisconsin (Neurotropic)		

The Utah I strain was first described by Porter and Larsen and is considered by most virologists to be the "classic" highly virulent AD virus. Utah II virus strain, which was isolated by Durrant, has a slightly different molecular makeup than the Utah I strain but is as virulent as Utah I. Raccoons were infected with ADV in the areas where Utah II was isolated. The role of raccoons in the emergence of Utah II is not known.

Dr. William Hadlow found in trials conducted at the Rocky Mountain Laboratory that Utah I strain was highly virulent for pastel mink. His work also confirmed the many field observations that showed the Utah I strain is highly virulent for darks, pastels, and all other non-Aleutian mink.

Dr. Morgens Hansen, Danish Fur Breeders Cooperative, observed that AD killed a higher percentage of non-Aleutian mink. There is probably more than one Danish strain of ADV but for the present we will simply designate them as the Denmark strain.

The Wisconsin strain is not only highly virulent for pastels and darks but it has another important identifiable feature – neurotropism. In this instance, the AD virus attacks the brain. It was estimated in a single Wisconsin outbreak that about 50 percent of the non-Aleutian mink died of AD showing convulsions and other nervous signs prior to death. With other strains of AD, only 1 to 2 percent of AD-affected mink show nervous signs.

Hadlow observed in experiments that the Ontario and Montana strains were not as virulent for pastels as Utah I but they were more virulent than the Pullman strain. Ontario and Bitterroot strains were arbitrarily designated as medium virulence strains.

Pastels, darks, and other non-Aleutian mink infected with the Pullman strain of ADV may succumb but many are infected subclinically without showing any signs of disease. Interestingly, Hadlow, who has done a great deal of solid AD research, has detected AD virus in the mesenteric lymph nodes of pastels two years after they were experimentally infected. This is good evidence that the AD virus can persist in non-Aleutian mink and serve as a continuing source of AD virus on a farm.

Aleutian disease virus – Porter (ADV-P) is a strain of tissue culture virus that was adapted in the laboratory from the Utah I strain. Similarly, ADV-G (Gorham) is another tissue culture strain that was adapted from the highly virulent Utah I strain. ADV-G is used worldwide for the production of CIEP antigen. Since the CIEP antigen apparently reacts with mink infected with any known strain of AD virus, it would appear

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STRAINS OF ALEUTIAN DISEASE (AD) VIRUS cont.

that Utah I strain is closely related to all other recognizable strains.

Molecular and genetic studies of AD virus will yield significant information on markers for virulence and on a variety of other factors that must be known for a better understanding of AD and its control.

STRAINS OF ALEUTIAN DISEASE (AD) VIRUS
John Gorham and Kamela Venable
Dept. of Veterinary Microbiology & Pathology
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Pullman, Washington 99164

The report (Hadlow, W., Race, R., and Kennedy [1983]: Comparative Pathogenicity of Four Strains of Aleutian Disease Virus for Pastel and Sapphire Mink, *Infection and Immunity* 41:1016-1023) and conversations of Dr. William Hadlow, Hamilton, Montana, were extensively consulted for this short review.

Sapphire mink in terminal stages of Aleutian Disease. Loss of appetite, emaciation, rough hair coat, bleeding at the mouth, and black tarry feces are common signs. All Aleutian mink (genotype **aa**) will die following infection.

A NEW PROTEIN SOURCE

Sometimes we pass on to you some information that has no immediate application, but has potential for the future, and this item is a case in point. Norwegian investigators have tested a new protein source, **Bio Protein**, in diets for mink. An interesting feature of Bio Protein is that it is, as the name implies, a bacterial protein, but it is grown in a medium using natural gas as a source of carbon and energy. The bacterial culture consists of **Methylococcus capsulatus** and some heterotrophic bacteria. The Bio Protein is produced by a firm called Norferm DA, at Tjeldbergodden, Norway and the name **Pronin** will be applied to the protein intended for use as an animal feed. Bio Protein is a reddish-brown meal that contains about 95% dry matter, 70% crude protein and 10% fat. The amino acid composition is favorable for use in mink diets; e.g., the content of methionine and cystine is about the same as in fish meal. Digestibility studies with Bio Protein show it to be about 80% digestible by mink, which is satisfactory. No price is available as I write this, nor have long-term feeding trials been done with mink, but they have with pigs and poultry and the results have been good. This work has obviously been stimulated by Norway's involvement in the North Sea natural gas fields and when one considers the usual wastage in natural gas operations the possibility of a low-cost protein product from them seems attractive (from Skrede, A. 1998. Single cell protein produced from natural gas (Bio Protein). A new protein source for fur animals. Agricultural University of Norway, PO Box 5025 N-1432 Ås, Norway).

CARCASS DISPOSAL METHODS

Carcass disposal after pelting has been a problem for mink producers from time to time. Dr. Richard Aulerich, at Michigan State University, has shown that composting can be done effectively, and his work has been reported in this Newsletter. Recently, scientists at North Carolina State University developed a method of carcass disposal that involves grinding up the carcasses and adding carbohydrates and bacterial cultures to ferment the material, or phosphoric acid to preserve it. The method stabilizes the material so that it can be kept on the farm almost indefinitely, until it can be picked up for recycling as feed or fertilizer. The University has licensed the technology to Environmental Machine Systems, Inc., in Fletcher, NC, which will build the machinery necessary for grinding the carcasses and adding the preservatives. The process will lower the risk of spreading disease from farm to farm, they suggest (from **Render**, The National Magazine of Rendering. December, 1998, p. 14).

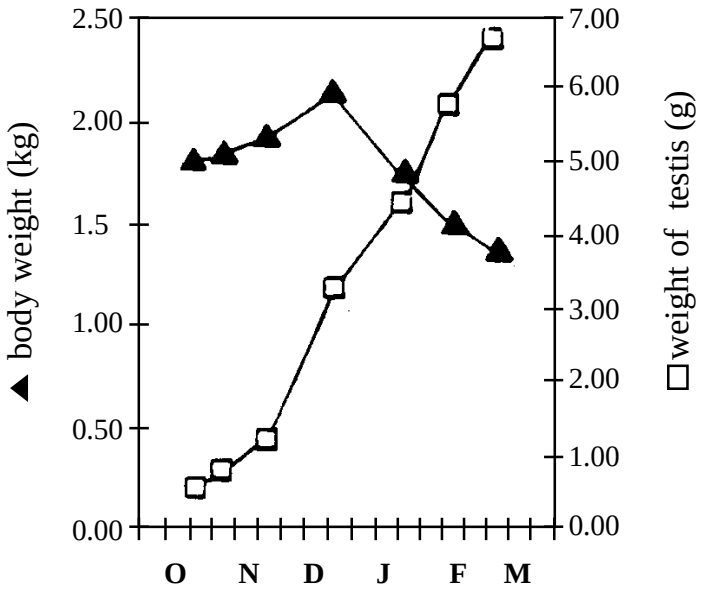
COMPUTERIZED BREEDING PROGRAMS

Enough use has been made of computerized record-keeping for breeding programs to show that they are an effective way of improving both numbers and quality of kits produced. Most of this experience has been gained in the Scandinavian countries, and you will remember that the Mink Farmers' Research Foundation studied a number of options several years ago and suggested the Danish MORSO system for use in this country. I have a report on another system, named SAMPO, which was produced in Finland, and may interest you. The first software for fur animals in Finland was developed in 1972-1975 and is currently being used (1997) on 42,600 animals, including 36,600 mink and 6,000 foxes. The system can be used for calculating breeding value estimates for litter size with a selection index.

SAMPO is available in Finnish or Swedish, and was produced by the Finnish Fur Breeders' Association (FFBA) using index calculations developed in the Department of Animal Science at the University of Helsinki. A Windows version of SAMPO was introduced in 1998. It can be used for calculating breeding value estimates for fertility and fur traits. The fertility index is based on litter size at two weeks of age. The fur-grading index, on a scale of 1-5, is figured for size, darkness, underfur density, guard hair density and clarity. A pelt-sorting index uses data from the Finnish Fur Sales Company for size, color, clarity and quality. SAMPO is now used on over 300 fur farms – about 15% of the farms in Finland. Over 100,000 breeding animal cards were printed by the FFBA this year and another 99,000 pre-printed base cards were distributed to farmers who do their own printing. Reproduction records show that farms using the SAMPO system average 0.1-0.4 more kits per litter than the national average, and SAMPO farms have placed high in the annual top-pelt list from FFBA (from Smeds, K. and S. Nikula. 1998. Breeding Systems for Fur Animals in Finland – given at a seminar in Bergen, Norway, Sept. 7-9).

SPERMATOGENESIS IN MINK AT THE BREEDING SEASON

There have been many useful studies over the years about the process of sperm production in male mink that have helped in selection of breeder males, and I add results of a recent one, from Korea. In 24 male mink from the Taekwalryung area, size and weight of testes gradually increased, eve in the face of a sharp decrease in body weight from October to March. The testes weight increase was most noticeable from December – March. Overall ratio of testis to total body weight increased over 12 times during the six-month period. Visible spermatozoa were found from February through March, at concentrations of 2.3-3.8 x 10^7/ml and 5 x 10^7/ml for the two months. Changes in average body weight and testis weight are charted in the accompanying diagram:



(from: Aeo, K. D., J. H. Lee, T. H. Byun, K. S. Shim and S. H. Lee: 1993. Spermatogenic activity in male mink prior to the breeding season. Korean J. Animal Sci. 35:24-31).

SYNCHRONIZED BREEDING: IS IT FOR MINK?

In a number of animal species, estrus synchronization, through hormone administration, is practiced, both to shorten the breeding season and to time births of the young at advantageous periods. Recent studies at the University of Wisconsin/Milwaukee sought to evaluate such practices with mink. Female mink were injected with either saline (control group) or 250 I.U. of human chorionic gonadotropin (hCG) between March 8 and 12. The saline-treated animals were mated immediately, while the hCG-treated animals were mated eight days after treatment. Breeding efficiency, figured on the basis of number of successful matings divided by the total number of mating attempts, was improved by 14% by the hCG treatment, but the number of females actually whelping was lower. Accordingly, the investigators do NOT recommend this method of estrus synchronization for mink (from: Heimler, I., R. J. Hutz, D. M. Voltz and W. B. Wehrenberg. 1996. Exogenous chorionic gonadotropin and breeding efficiency. Norwegian J. Animal Sci. 10:179-186).

FACTORS AFFECTING PROFITABILITY IN MINK

As we all know, the standards by which pelt prices are assessed can vary from year to year, and it is interesting to read the results of a recent Danish economic study. They found that pelts from litters of 10 or more kits tended to be smaller and sold at lower prices than pelts from smaller litters. On the other hand, litter size did not seem to influence fur quality. Pelt quality scores decreased with increasing body weights in September, but pelt quality had little effect on price. Mink with September weights of 2,000 grams or less and pelting weights of 2,300 grams had a lower sales price than those from heavier animals. The investigators concluded that, under existing market conditions, the greatest economic gain could be achieved by increasing litter size (from: Lagerqvist, G. 1997. Economic profit from increased litter size, body weight and pelt quality in mink. Acta Agr. Scand. A 47:57-63).

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