FUR ANIMAL RESEARCH

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BY J.E. OLDFIELD
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This is the issue that follows the Research Foundation's annual Board meeting, which was held a little later than usual, on May 14 and 15, in Seattle. The Seattle site was chosen because the time coincided with their May sale, which several Board members were attending, so we were able to save considerably on transportation costs.

You've heard me say this before, but I'll repeat it because I really think it's important. This is an exceptionally hard-working group of people. In advance, I send each Board member a copy of the progress report from each of our scientific investigators (we currently have seven), along with proposals for continuing, or new studies. They read this fairly voluminous mailing before the meeting and come prepared to rate the merits of the research and to offer suggestions for future studies. The discussion is earnest, and sometimes a bit heated. We also usually have some visitors, invited because of positions they hold or specialized expertise they can share, or both. This year we were joined by Ted Parkinson, who heads the Research Committee for Canada Mink Breeders, and by Drs. John Gorham and Jack Rose, who are both doing research for us. All made useful contributions to the meeting, and I'm including pictures of them, and us, in action. I will be reviewing results of the various research projects with you, in this and future newsletters. I do want you to know that you have a diligent and hard-working group monitoring the research program, on your behalf. Another important part of these meetings is our annual review of research priorities – trying to identify important problem areas and researchers capable of getting useful data concerning them. The list of priorities we agreed upon this year is at the end of this newsletter. One difference that you'll find is that we've included Environmental Problems as a top-priority area. New regulations are being imposed on the mink industry (and other agricultural businesses) including disposal of manure and other wastes, and we need to know how to deal with these in a cost-effective way. If you have questions or suggestions about this, or other research areas, we'd be glad to hear from you. The members of the Board, with their addresses, are listed at the back of this letter. Finally, I must mention the effective cooperation we are getting from Canada Mink Breeders (CMB), who are funding some important research areas we haven't been able to handle. This year we are jointly funding research on corona virus, at Ohio State University. Special thanks are due CMB Research Chairman, Ted Parkinson and CMB President Lu Bernemann for their effective help. Best wishes to you for a good summer growth season.

Your Board, in action. Counter-clockwise, from right: Bob Zimbal, Chairman; Ted Parkinson (CMB); Dr. Bob Westlake; Jed Geary; Dr. Gary Durrant (back of head) and Kent Disse. Not shown, Ryan Holt and Jim Oldfield.

Dr. John Gorham; investigator and consultant to the Board. Here, John is expounding from his long-time experiences with distemper and Aleutioan Disease in mink.

J.E. Oldfield

DISTEMPER: A CONTINUING PROBLEM

Last year's disastrous losses from distemper were a terrible problem for many in the fur industry. Dr. John Gorham was a pioneer in working on distemper and means of controlling it, and he has kindly provided the following information on it.

DISTEMPER VIRUS TYPES AND STRAINS

John Gorham
Department of Veterinary Microbiology and Pathology
Washington State University
Pullman, Washington

Since the 1940's, the late Dr. G. R. Hartsough and I were consulted on over 100 mink distemper outbreaks. If the distemper vaccine was not given until the outbreak was underway or if the vaccine was of poor quality and the losses continued, we were frequently asked if a different type of distemper virus was involved in the outbreak. Similarly, if there were a high number of nervous cases (screaming fits), ranchers again suspected a different type of distemper virus. These are reasonable questions.

Types of Distemper Virus

Our observations, research, and the investigations of others involving distemper in mink, dogs, foxes, ferrets, and raccoons have shown that there is only one type of distemper virus. And this single type can cause nose and eye signs as well as nervous signs.

Strains of Distemper

While there is only a single type of distemper, there are many different strains that can be identified clinically as to their virulence and to their ability to invade the brain and cause death.

An example of how one strain of distemper protects against another strain was illustrated in Denmark in an outbreak of seal distemper off the island of Jutland. A mink farmer was hired to remove the dead seals from the beaches. The mink farmer did not feed the seal carcasses to his mink, but he apparently carried the seal distemper virus back to his mink on his clothes or hands and started an outbreak on his farm. He did not vaccinate as quickly as he should have and he lost several mink. However, following vaccination with the Onderstepoort (South Africa) vaccine distemper strain, the distemper losses subsided.

Three mink distemper vaccine strains have been used in vaccines. Lederle and Onderstepoort are in use today; the Wisconsin strain was employed in the past. All three were attenuated by passage in chick embryo cell cultures and will protect mink, dogs, ferrets, and foxes against all known virulent strains of distemper.

In a recent experiment, to examine different strains of distemper, we vaccinated a group of ferrets with the Onderstepoort vaccine strain and later challenged the ferrets with the virulent African distemper virus that was isolated from lions. None of the ferrets showed signs of distemper, which indicates the close relationship between the Onderstepoort vaccine strain and the lion distemper strain. It should be pointed out that domestic cats found on almost all mink farms are not susceptible to the distemper virus strains.

There are high and low virulent strains. In research supported by the Mink Farmers Research Foundation, we have obtained distemper virus strains of low, high, and medium virulence by many transfers of the virus in ferrets. No doubt these strains would behave similarly in mink. While there is no research to verify recent field observations, it would appear that the distemper virus strain carried by raccoons to unvaccinated mink is a highly virulent strain. In some distemper outbreaks, there is a definite increase in proportion of nervous cases to the usual number of catarrhal cases. In one Wisconsin outbreak, the unvaccinated mink showed only mild nose and eye exudates but a very high number of screaming fits. To our knowledge no one has studied these neurotropic mink strains to determine why they attack the brain.

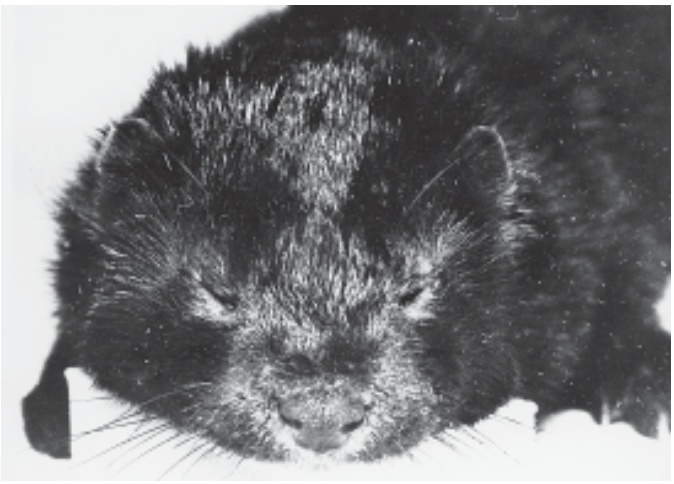
The Genotype of the Mink and Distemper

All veterinarians familiar with mink diseases and mink farmers who have had a distemper outbreak have noticed that pastels *bb* or *bgbg* seemed to be more susceptible to distemper than other genotypes. Moreover, on farms where a variety of mink were raised – darks, blue iris, etc. – the greatest mortality was in the pastels. Therefore, when discussing virulence of a particular strain of virus, the color phase of the mink must also be considered.

DISTEMPER continued

Summary

In the future, molecular biologists will identify the genes of the distemper virus that control virulence, transmissibility, and neutrotropism. This research is not done on a Sunday afternoon. I will leave these sophisticated investigations to others who are much younger and brighter than I am.



This mink shows the first signs of distemper – "squinty" eyes and swollen eye lids. The eyelids soon become glued shut with a crusty exudate.

The distemper eye and nose signs may disappear and the mink appears normal. Depending on the strain of distemper, a varying number of these "recovered mink" may show intermittent convulsions (screaming fits) and die.

HANDBOOK OF BIOLOGICAL DATA

One of the strongest contributors to mink research over the years has been Dr. Dick Aulerich, at Michigan State University. In the course of this work, he has accumulated a lot of information about mink, which he has assembled into a handy reference guide, "Handbook of Biological Data for Mink." If you want to know normal blood values for different nutrients, heritability of different fur characteristics, composition of mink manure and other wastes, they are all there, with a whole lot more, in this useful, 139 page book. If you would like a copy, Dr. Aulerich will provide one, as long as his supply lasts. Write: Dr. R. A. Aulerich, Department of Animal Science, Michigan State University, East Lansing, MI 48824.

ANTIBIOTIC RESTRICTIONS

The fur industry, along with other animal production industries, is facing potential problems in proposed restrictions on antibiotic use with animals. The U.S. Food and Drug Administration (FDA) is addressing concerns that on-farm antibiotic usage is creating drug-resistant germs. This is a complex situation, and while the potential for creating drug-resistance certainly exists, it is far from clear that it is actually happening and if it is, from what specific causes. Many people in positions to know feel that the human medical profession is the greatest offender, but there is concern about use of antibiotics on farms, too. Almost half of the 50,000,000 pounds of antibiotics produced in the U.S. annually is used with animals. Alexander Mathews, who is President of the Animal Health Institute says that the animal health industry has already developed a reasonable and comprehensive approach to addressing the antibiotic problem. He says, "We support a comprehensive program that will encourage research on and development of new antimicrobial drugs, allow the continued use of antibiotics already in farm use and, most important of all, protect human health." This situation is one you should keep an eye on. Hopefully, final decisions on it will be made on the basis of good scientific evidence and not emotion (from **Veterinary Product News**, March 1999, p. 7).

GROWTH RATE AND MINK KITS

The mink kit growing period is always an important time in shaping annual cash returns, and it is becoming more so with the market demand for large skins. It is generally agreed, and has been recently confirmed by Finnish studies, that kits that were larger at birth are also larger at 6 weeks (Korkonen, H., J. Mononen, K. Haapanen and M. Harri, 1991. Factors including reproductive performance, kit growth and pre-weaning survival in farmed mink. **Scientifur** 15:43-47). Another factor influencing individual animal size is litter size, and it appears that some females cannot produce enough milk to properly feed large litters. It has been calculated that each additional kit born in a litter decreases the average birth weight by 0.2 grams. Such differences in weight persist through lactation and may continue after weaning (Hanson, B.K., O. Lohi and P. Berg. 1992. Correlation between the development of mink kits in the nursing and growth periods, correlations to fur properties and heritability calculations. **Norw. J. Animal Sci.** Supp. 9, 87-92). Condition of the mother, of course, influences growth of the young. A loss in female weight usually reflects good milking ability and it has been noted that even a fairly heavy weight loss by the females is accompanied by better growth of her kits (Therkildsen, N. 1989. Et oxytocinvirkende praeparats inflydelse pa lakterende minktaever og hvalpes vaegtudvikling. **Dansk Pelsdyravelerforening** 212-215). Two year-old females tend to lose more weight than kit females. It is thought, but has not been definitely proven, that number of teats is related to litter size, and it has been suggested that females with few teats should be removed from breeding (Einarsson, E.J. 1987. Selection for litter size in mink. Background, analyses of the base population and design of the experiment. **Norw. J. Animal Sci.** 1:131-153). It has been suggested, too, that early kits, born before May 2nd, are heavier at pelting, and that breeder females should be selected from early-born litters (Jorgensen, G., G. Hillemann and H. Clausen. 1961. Fodrings forsog med mink. Ber. Fra Forsogolaboratoriet. 62 pp.)

AMINO ACID REQUIREMENTS

We now recognize that mink and other animals don't have dietary requirements for protein, as such, but rather for the amino acids that the dietary protein supplies. Such being the case, it is useful to know just what the requirements are for the various amino acids by mink. A table of amino acid requirements of mink has recently been assembled, by Danish workers:

Amino Acid	Requirements (g amino acid/100 kcal ME)
Methionine + Cystine	0.30
Lysine	0.40
Tryptophan	0.03
Threonine	0.15
Phenylalanine	0.30
Tyrosine	0.22
Leucine	0.50
Isoleucine	0.30
Valine	0.35
Arginine	0.40

To use these figures in your diet formulation, you will of course need to know the amino acid content of your available feeds. There is a good table of amino acid values in a number of commonly-used mink feeds in the NRC bulletin, **Nutrient Requirements of Mink and Foxes**, pp. 56-61. (from Borsting, C.F. and N. Glem-Hansen. 1993. **Research in Fur animals at the National Institute of Animal Science**, no. 720, pp. 48-58).

BENZOIC ACID METABOLISM BY MINK

Mink diets can contain an almost endless variety of feed products, by-products and waste materials, and one needs to know not only the nutrient values for these materials but also whether other substances may have been added to them. An example is preservatives: many foods and feeds contain preservatives and one of the oldest and most widely used is benzoic acid, or its sodium salt, sodium benzoate. Last year, Ilpo Polonen, in Finland, showed that adding sodium benzoate to slaughter house offal would effectively inhibit fungal growth. It has been shown that even fairly low levels of sodium benzoate cause intoxication in cats, so the question arose, "what will it do to mink?"

Benzoate is usually eliminated from the body by combining it with the amino acid, glycine, which forms benzoyl glycine, or hippuric acid, which can then be safely excreted. The Danes fed four benzoic acid levels 90, 1, 2 and 4 mmoles/kg body weight) and two dietary glycine levels (0 or 3 g/kg of glycine HCl). Dietary glycine level was not a limiting factor in getting rid of sodium benzoate, and even the unsupplemented diet apparently had plenty of it. Over 80% of the ingested benzoate was found in the minks' feces and urine, as hippuric acid. The investigators recommend that mink diets should not contain more than 0.71 g benzoic acid/kg of feed (from Polonen, I., K. Partanen, T. Jalava and V. Toivonen. 1998. Metabolism of benzoic acid in fur animals. NJF Seminar on Fur Animal Production. Bergen, Norway, Sept. 7-9, 1998).

A NEW MINK VETERINARIAN

Industry concern has been expressed from time to time about the few veterinarians that are available to deal with mink disease problems and about what may happen in the future when some of our present mink practitioners retire. Your Mink Farmers' Research Foundation has taken note of this situation and last year made a small grant available to help train a veterinarian to work with mink. Our choice was Kamala Venable, a junior veterinary student at Washington State University, and she has proven to be an excellent candidate. She has studied with Dr. John Gorham, and our grant made it possible for her to do field work with mink under the direction of Dr. Gary Durrant, in Utah.

Kamala is the daughter of Rose Venable, who owns and operates the Luna Rose Farm, in Olympia, WA. We are delighted to report that she received two scholarships this past year: a $1,000 award from the Olympic Fur Breeders' Association and a $900 one in comparative medicine, which is named the John R. Gorham Award. Congratulations, Kamala, and best wishes for your future. We hope you'll maintain your interest in mink problems.

Kamala Venable

HORMONAL CONTROL OF FURRING IN MINK

Dr. Jack Rose, at Idaho State University – one of the earlier investigators of melatonin as an accelerator of winter fur growth – reported on his continuing work at the MFRF meeting in Seattle. For years it has been thought that melatonin produces its effect by inhibiting the secretion of another hormone, prolactin, which is produced by the pituitary gland. Dr. Rose's work shows that this is not the case and that changes in prolactin levels are not required to initiate growth of winter fur. He suggests that in the future it may be possible to add other factors to make the use of melatonin more effective, or perhaps to eliminate the use of melatonin entirely. He points out that one of the criticisms of pelts from melatonin-treated mink is that the fur follicles are still deep in the dermal layer. When the pelts are fleshed, if they are overly-scraped on the leather side, the fur fibers may fall out. By understanding what controls this part of the fur growth cycle, we may be able to avoid this problem by adding specific growth factors to the melatonin implant. Dr. Rose goes on to say that he would direct his work toward regulating both the time of onset of fur growth as well as quality of the pelt, including fur density, fur length, depth of follicles and skin thickness and he suggests that improvement of these pelt characteristics would yield greater pelt price returns to the ranchers. Also, production of new types of pelt that are unique and different could create markets that at present do not even exist. An exciting feature of Dr. Rose's studies is the successful development of a hair follicle model that will allow him to grow fur fibers in culture. Addition of specific substances to the culture medium may make it possible to grow furs with certain desirable characteristics.

CONTROLLING E. COLI INFECTION

Dr. Neil Dyer at North Dakota State University has been working on ways to identify virulent strains of **E. coli** bacteria from infected ranch mink and to find ways to control them. A year ago, he showed that, in a study of 40 **E. coli** isolates from diseased mink, 50% contained genes for encoding CNF-1, which is a cytotoxic necrotizing factor, responsible for the virulence of the infection. He now proposes to clone the CNF-1 gene, to create a strain of **E. coli** containing the desired gene without the presence of the usual, accompanying DNA. Following this, the gene will be sequenced and ultimately the CNF-1 protein will be purified and used to produce monoclonal antibodies and hopefully, a mink collibacillos/colisepticemia vaccine.

ALEUTIAN DISEASE RESEARCH

At the Rocky Mountain Laboratory (RML), in Hamilton, Montana, Dr. Marshall Bloom is following a somewhat similar research approach in his continuing studies of Aleutian Disease (AD). Both Dr. Bloom and Dr. Dyer at ND State University are asking the question, "What actually causes the pathogenicity of these microorganisms?" As noted in the preceding item on **E. coli**, Dr. Dyer feels a specific protein is responsible. Dr. Bloom and his colleagues suggest that specific amino acids may be the pathogenicity-inducing factors. If the specific causative substances can be identified, it will help develop improved test procedures and ultimately protective mechanisms against AD. In the course of the studies at RML, Dr. Bloom's colleague, Dr. Fox, has found a liver lesion in AD-infected mink that is also found in Reye's Syndrome in humans. This has not previously been noticed in ADV-infected mink and it is important not only because it tells us more about AD, but also – since it involves humans – it may make it possible for the investigators to attract more research funding and thus extend what we are able to do. Let me add a quick comment here, that research takes time. This is frustrating to producers who are barely able to keep their operations going and need all the research help they can get, right now, but that's the way it is. You may be sure that the MFRF will move these programs along as rapidly as possible.

RESEARCH PRIORITIES

Each year, your MFRF Board sets some priorities for mink research. Below you will see this year's list. What do you think of them?

THE MINK FARMERS' RESEARCH FOUNDATION: RESEARCH PRIORITIES Revised 15 May, 1999			
AREA OF RESEARCH	DISEASE	FEEDS/NUTRITION	PHYSIOLOGY/ MANAGEMENT
PRIORITY RATING I	**Viral Diseases (AD and Distemper)**: Continue studies to identify new virus strains and develop means of control. **Enteritis/Septicemia:** Identify and isolate various bacterial and viral strains and develop control methods	**Alternate Feeds:** Identify and analyze various potential feeds for mink, including spent hens. Compile tables of nutrient values. **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. **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	**Blue Mink Problems:** Investigate boils, pussy lungs and various problems occurring predominantly in blue mink. **Nursing Sickness:** Identify physiological basis for nursing sickness and study relationship to management practices.	**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.	**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.
III		**Food Poisons:** Continue investigation of toxins that may occur in, or contaminate, mink feeds. **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.	**Housing:** Develop recommendations on multiple caging of mink, consistent with the welfare of the animals. Investigate means of measuring stress in mink.

EFFECTS OF MELATONIN IMPLANTS ON ALEUTIAN DISEASE

As we've mentioned before, some ranch observations, including some in Canada, suggested that mink that had received melatonin implants seemed more resistant to AD. This was a potentially important suggestion that could have easily been made a part of ranch practice, so the MFRF asked Dr. Dale Barnard at Utah State University to investigate the situation. He did three trials, to see whether melatonin implants would protect dark mink from experimental, progressive AD. In the first, mink were implanted with melatonin in April and challenged a month later with the AD virus. In the second trial, mink were implanted with melatonin in July, which is when such implantation is usually done, on ranches, and again challenged with AD a month later. In the third trial, mink were first infected with the AD virus and then were implanted with melatonin one month later, in July. In the first two trials, about 88% of the implanted animals died within 5 months from AD. In the third trial, the virus exposure before melatonin implantation resulted in about 33% of the animals dying from AD, as compared with the infected but not implanted control group. Dr. Barnard interpreted his results to indicate that melatonin implants, although effective in accelerating winter furring, were not protective against Aleutian disease.

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Members of your Research Foundation Board of Directors invite your input into the ongoing program of research. Please contact any of the Board with suggestions or comments. You may reach them at:

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