bleeding at the mouth, become extremely thin, and succumb in a month or less. To increase the hardiness of this beautiful mutation, many ranchers outcross them with standard black minks. No effective treatment is yet known.

The gray fleshfly (of Wohljahria species) is responsible for the death of many young minks. The female fly deposits eggs, which are quickly transformed into moving maggots on the skin of the young kitten. The maggots bore into the skin and leave a deep sore behind them.

The young minks become extremely restless and cry pitifully. Infection, lack of appetite, and exhaustion frequently lead to death.

The kits that have maggots should be removed and treated by injecting hydrogen peroxide, chloroform, or ether into the opening—the substances usually make the maggot back out. The wound should then be treated with an antiseptic, such as mild tincture of iodine.

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Diseases and Parasites of Foxes

JOHN R. GORHAM

THE IMPORTANCE of cleanliness in the care of foxes cannot be overemphasized. With them, as with many other animals, it is easier to prevent a disease than to cure it.

Foxes are hearty, vigorous animals and rarely are sick if they have an adequate diet and healthy conditions in which to live. They must be reared in pens with woven-wire bottoms. That method of husbandry disrupts the life cycle of many disease agents and parasites, because the feed does not become tainted with droppings.

To make the use of disinfectants easier, the equipment and construction should be designed to save labor. Simple, handy pens, kennels, feed houses, and feeding equipment are best. Because fecal matter and other organic material harbor bacteria and viruses, cleaning should precede disinfection. One agent can do both jobs.

When routinely cleaning and disinfecting pens and kennels, ordinary lye solution is an effective and economical disinfectant. One can of lye, which contains 13 ounces, is enough to make 15 gallons. If large areas must be covered, the lye can be bought as caustic soda and each pound will make about 20 gallons of solution. The solution does not have to be heated.

Besides acting as a disinfectant, lye solutions cut grease and partly dissolve and penetrate fecal material, but lye has some disadvantages.

Concentrated lye is a poison. It is destructive to aluminum, paints, and clothing. It does not harm wood or iron in the dilute concentration recommended. The dilute solution as recommended is not harmful to the animals in the amounts which might remain in the pens. Quantities of the solution should not be left unguarded where the animals might drink it. The solution may be slightly irritating to the hands and face of the operator. Since exposure to the air soon converts lye
into a relatively inactive substance, containers should be tightly covered.

**Salmonellosis**, an important bacterial disease of foxes, causes many losses in the pups during the late spring and early summer. The feeding of calves infected with salmonella organisms has brought the malady to the fox ranch.

Adult foxes may harbor the bacteria in their intestines. The bacteria pass out in their feces, which convey the infection to the young.

The disease is marked by such signs as lack of appetite, dullness, rough coat, a humped-up appearance, and eyes that appear sunken and show a discharge. Diarrhea is only occasionally noticed. Autopsy reveals an enormous enlargement of the spleen. Depending upon the circumstances of the outbreak, the veterinarian may use streptomycin, Aureomycin, Terramycin, or sulfa drugs. Often combinations of sulfa drugs and antibiotics are employed.

Distemper in foxes is caused by the same virus that causes distemper in dogs, minks, ferrets, and raccoons. It is transmitted through the air from fox to fox or by indirect contact by caretakers, who carry the virus on their shoes among pens or who handle healthy foxes after handling affected ones.

The first signs include a marked thirst and a dry, hot nose—signs of a high temperature. Foxes that usually are active at feeding time show no interest in their food and stay in their kennels. Next, a purulent discharge appears from the eyes and nose. The eyes may become glued shut with discharge. A diarrhea and pneumonia often occur. The fox either dies at that time or may seemingly recover and later die in a convulsion—barking fits.

Vaccination of the weaned pups before they are placed on the range or pens is advocated. The living egg-adapted vaccine seems to be superior to older methods of vaccination. The sulfonamides and antibiotics can prevent secondary complications of distemper but do not act specifically against the virus.

Fox encephalitis (infectious hepatitis) is found wherever foxes are raised and remains a disease problem for long periods of time on large fox farms. The death rate is 2 to 40 percent of the foxes on a ranch.

About 6 days after infection has taken place, the illness begins with a violent convulsion. Then the animal appears to be "walking as though asleep." A period of apparent normality follows, but convulsions occur again, followed by a somnolent state. Flaccid paralysis is another common sign.Recovered foxes are apparently immune for life.

For prevention, the killed-tissue vaccine used for immunization of dogs against infectious hepatitis should be administered shortly after weaning. Because the resultant immunity is not permanent, revaccination at yearly intervals is recommended.

Salmon disease, a rickettsial disease of foxes caused by the consumption of infected salmon, is a common malady where salmon, trout, and steelhead of the Pacific Northwest are fed. The affected fox loses its appetite, is severely depressed, and has a fever of 104° to 106°. Near the terminal stages, a yellowish or a bloody diarrhea is apparent.

The most striking finding at autopsy is a generalized enlargement of the lymphoid tissue. The veterinarian will confirm the diagnosis by finding the rickettsia in microscopic sections.

There is no vaccine for this condition. Penicillin, broad-spectrum antibiotics (Aureomycin, Terramycin), and some sulfa drugs (sulfanilamide, sulfamerazine) have been used successfully to treat the condition.

Rickets and Chastek paralysis are nutritional diseases of foxes. Both conditions are also reported in mink.

Rickets is a disease of young animals and is usually noticed a short time after weaning. It is caused by a deficiency of vitamin D, which upsets
calcium and phosphorus metabolism. The usual source of this vitamin for foxes and mink is in fish oils or it may be formed by the action of the ultraviolet rays of sunlight on the skin.

Foxes with rickets have an enlargement of the ribs at their attachment to the sternum and a grotesque enlargement of the face bones. Affected animals with their short bodies and curved leg bones often have a difficult time getting around.

When rickets is suspected, the condition should be corrected by including high-potency vitamin D fish oils, together with a supplement containing calcium and phosphorus. All affected pups should have plenty of sunlight.

Chastek paralysis occurs on ranches where certain types of fish are fed in excess of 10 percent of the total ration. Fish such as fresh-water carp, Atlantic-coast whiting, Pacific-coast mackerel, quillbacks, mullets, suckers, northern pike, and Great Lakes herring have been found to cause the disease. There seems to be a factor in these fish that inactivates vitamin B₁ (thiamine).

After several weeks on such rations, the foxes lose their appetite. Next, some of the foxes appear stiff and exhibit nervous signs—spasms, paralysis, and convulsions. If symptoms have appeared, daily injections of thiamine should be given. Most foxes recover if treatment is begun early.

The fish should be cooked, because heat destroys the thiamine destroying factor. If cooking of fish is not possible, one should alternate fish feeding with rations containing no fish. Ample vitamin B₁ in the form of brewer's yeast will also help control the disease. Treatment is as for roundworms.

Roundworms, or ascarids, are common intestinal parasites in young foxes. The infection is seldom as heavy in adults. Affected pups are restless, have a poor appetite, and have a potbellied appearance. Diarrhea and convulsions are rather common. The worms are occasionally passed in the droppings or may be vomited from the stomach.

Prevention depends on rigid sanitary practices. Portable kennels, wire-bottomed runs, and frequent removal of feces will help in control. Tetrachlorethylene—capsules, to be had from a veterinarian or a drugstore, are used for treatment. The veterinarian will also give instruction for using a capsule "gun"—a convenient instrument for administering worm pills.

On ranches where these roundworms are prevalent, the treatment of pups 4 to 5 weeks old, followed by another administration 2 weeks later, is a routine practice. Pregnant females should not be wormed. Tetrachlorethylene should be given to the adult breeders as soon as freezing temperatures prevail. Cold weather seems to retard the development of hookworm and roundworm eggs while they are in the soil, thus reducing reinfection.

Hookworms cause damage by embedding their heads in the lining of the intestine. By sucking blood they cause injuries and hemorrhages that lead to severe anemia.

Hookworms are difficult to see in the feces, as they are slender and about three-fourths inch long.

Fox pups heavily infected with hookworms are very thin and have dry, harsh fur and pale mucous membranes. The droppings are dark and blood streaked.

Good sanitation and treatment with tetrachlorethylene are used for control. Treatment is as for roundworms.

Lungworms may be found in the larynx, windpipe, bronchial tubes, and lungs. A few worms cause no trouble, but large numbers lead to chronic bronchiitis or pneumonia in young foxes.

Because of the location of the parasite in the lungs, treatment is ineffective. The enforcement of strict sanitary measures, such as raised wire pens, is the best safeguard.

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