

THE COMMON SHEEP LIVER FLUKE AND THE CAMPAIGN TO CONTROL IT.

By L. E. Swanson, Junior Zoologist, Zoological Division, Bureau of Animal Industry, U. S. Department of Agriculture, Salt Lake City, Utah.

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In areas where conditions are favorable for the propagation of liver flukes, the activities of these parasites have resulted in heavy losses to livestock owners. All cloven-footed animals are hosts to these parasites but sheep are the most susceptible to injury from them. Actual deaths in flocks occur in from a small per cent to the entire flock. Infestations in calves sometimes result in death, but older cattle survive the infestation in spite of great destruction of the liver tissue, although the animals become less thrifty.

The mature fluke is a pale brown, flat, leaf-like worm, which lives in the bile ducts of the liver. The flukes usually remain in the liver from 9 to 10 months, but they have been reported as remaining there from 3 to 5 years. Each fluke is said to lay approximately 100,000 eggs. These are passed with the feces, and upon reaching water incubate in 3 to 6 weeks in warm weather, each egg ultimately liberating a ciliated larva, known as a miracidium, which attacks certain small, amphibious, fresh-water snails. The miracidium lives only 1 to 3 hours if unable to find a suitable snail host. The snail hosts are small right-handed snails, the shell opening being on the observer's right when the peak of the shell is uppermost and the opening faces the observer. They are found in ditches, springs, lakes and sloughs, and show a marked preference for mud. In 49 to 80 days after becoming infected, the snail host will liberate into the water numerous, free-swimming, minute, tadpole-like young flukes known as cercariae. As these swim about they form figure

8's, and upon striking any of various objects, such as grass, leaves, etc., they encyst on them, or they may encyst in the water and float free on the surface. These cysts, which resemble tiny pearls, are the infective stage.

Cattle and sheep grazing on recently flooded fields and sloughs, or along the banks of streams and ponds, swallow the cysts along with the grass or water. Upon reaching the digestive tract the cyst wall is dissolved, liberating the young fluke which burrows through the intestine into the body cavity, finds its way to the liver, penetrates the capsule into the liver tissue, and finally comes to rest in the bile ducts where it reaches sexual maturity. It takes 6 months from the time the egg hatches until the mature flukes are producing eggs.

The first symptom noted by the owner is that his lambs fatten readily; this is due to the increased secretion of bile caused by the stimulation of the liver by the flukes. This fattening is only temporary, as later the sheep fall off rapidly in flesh, lag behind the flock, and graze very little. The wool is harsh, brittle and patchy; an edematous swelling, commonly known as a "water bag," appears under the jaw, and with a heavy infestation the sheep may show a distended abdomen; the visible mucous membranes are pale, diarrhea may be evident, and pronounced emaciation may develop and be followed by death.

In cattle the symptoms are not so pronounced and may be entirely overlooked, except that there is a lack of response to feeds. There is an annual loss from condemned livers under the federal meat inspection of \$300,000 and probably a much larger loss in meat inspection outside of the federal service. The indicated total loss in livers under normal economi

conditions is about \$1,000,000. Milk cows show a lessened milk flow, the flukes making an inferior cow out of a good one; the coat is starey and harsh, digestive disturbances are manifested by loss of appetite, diarrhea and tympanitis; very rarely there are edematous swellings in the dependent parts of the body. Fatalities are rare among cattle; when they do occur it is usually among calves which have reached the stage of emaciation. Flukey cattle are hard to fatten and require more feed per pound of gain.

The treatment for sheep is safe, reliable and inexpensive. Carbon tetrachloride is used in a one c.c. dose repeated in 3 to 4 weeks. Sheep should be treated whenever necessary, but as a routine treatment is advisable in November and December. At the present time there does not appear to be a treatment for flukes in cattle which combines efficacy, safety and cheapness, although there are some drugs which are effective and reasonably safe.

As snails are essential in the life cycle of the fluke, their destruction means the destruction of the fluke. Copper sulphate has proved very effective for killing snails. This chemical will kill snails in a dilution of 1 part of copper sulphate to 1,500,000 parts of water. In this or much stronger solutions a copper sulphate solution is not harmful to livestock that drink it, but it will kill such non-flowering plants as algae and mosses. Dry copper sulphate may be broadcasted in powder form, mixed with 6 to 8 parts of lime, land-plaster or sand, over sloughs, ponds and other waters, or placed in sacks in running waters at a slight cost to each farmer, and will kill snails quite dependably. In too strong solutions it will kill fish, and this possibility should be kept in mind.

Veterinarians should take an active part in organizing control campaigns against liver flukes, especially in sheep. Cooperative arrangements may be made under the auspices of the State Veterinarian, under which treatments are administered by the veterinarians and the snails destroyed under the supervision of the veterinarian or the county agent. The Federal Bureau of Animal Industry will assist and cooperate in such campaigns whenever possible. In the past three years, livestock organizations have given splendid cooperation, as have county agents. The veterinarian should not neglect this opportunity to assist a livestock industry which is in serious straits.

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conditions is about \$1,000,000. Milk cows show a lessened milk flow, the flukes making an inferior cow out of a good one; the coat is starey and harsh, digestive disturbances are manifested by loss of appetite, diarrhea and tympanitis; very rarely there are edematous swellings in the dependent parts of the body. Fatalities are rare among cattle; when they do occur it is usually among calves which have reached the stage of emaciation. Flukey cattle are hard to fatten and require more feed per pound of gain.

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