To control infestations in yards or under houses, dust or spray with a suspension of wettable powders of the same insecticides or lindane. Where these materials do not provide satisfactory control, malathion dust or spray is recommended.

Three species of lice may be found on dogs and one on cats, but they are not common in the United States. The sucking louse of dogs, *Linognathus piliferus*, is a bloodsucking species. It also infests some wild carnivorous animals. The biting louse of dogs, *Trichodectes canis*, has chewing mouth parts and feeds on dead epidermal tissue or secretions from the skin.

A second chewing species, *Heterodoxus longitarsus*, is normally parasitic on kangaroos, but has become established on dogs in several localities in North America. The cat louse is also a chewing species, *Felicola subrostrata*.

The sucking lice and biting lice are quite different in structure and feeding habits, but their life histories are similar. All pass through the egg stage, several nymphal stages, and the adult. The eggs are fastened to the hair of the host. The nymphs are similar to the adults in appearance except for size and lack of sexual organs. The entire life cycle may be completed in a few weeks, and is passed entirely on the host, other animals becoming infested by direct contact.

Lice on dogs may be controlled by the thorough application of dusting powders containing 10 percent of DDT or methoxychlor or 1 percent of lindane, and by washes containing 1 percent of DDT or methoxychlor as a wettable powder. DDT is not always fully effective in the control of sucking lice on dogs, however.

Commercial preparations containing pyrethrins or allethrin plus an activator may also be used on dogs, and should be used in preference to the other insecticides on cats, as they may lick off enough DDT or lindane to be harmful.

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**Infectious Diseases of Dogs and Cats**

J. E. Greene

Distemper in dogs, like influenza of the human family, is an acute, Infective disease caused by a filterable virus usually complicated by many bacterial secondary invaders.

Distemper occurs throughout the world—even in Iceland and Greenland.

Few unimmunized dogs reach 1 year without having contracted distemper. It is most common at about 7 months of age, less common after 2 years, and practically unknown in suckling pups. Unconfirmed diagnoses have been reported in dogs as old as 9 years.

A young dog usually begins to show the first symptoms about 5 days after it is exposed to the disease. The eyes be-
come sensitive to light, as shown by squinting and the presence of a clear discharge. The rectal temperature usually rises to about 103° or 105° F. Swelling usually can be detected at that time in the lymph nodes of the throat. Death can occur during convulsions within a few days.

The fever reaches a peak in about 5 to 7 days and begins to drop to nearly normal until the 7th to 10th day. Then it begins to rise again. The temperature chart is irregular throughout the rest of the disease.

The animals become languid. The coat roughens. Loss of appetite develops. Usually rhinitis—inflammation of the lining of the nasal cavities—begins 1 to 2 days after the first fever, as shown by sneezing, rubbing the nose with the forepaws, and a nasal discharge, which at first is watery but later becomes thicker and whitish and sometimes streaked with blood.

Catarrh of the respiratory tract, as manifested by a short, soft, spasmodic cough and rapid breathing, inflammation of the eyes, a discharge of tears mixed with pus, and a tendency to avoid light, develops almost simultaneously with the rhinitis.

Digestive symptoms begin early. Loss of appetite, vomiting, constipation, diarrhea, extreme thirst, dehydration, and coating of the tongue are signs of that.

Nervous symptoms may begin with the other initial symptoms, or they may occur as late as the fifth or sixth week. They occur as rhythmic, brief spasms of the muscles that control the lips, cheeks, ears, and the fore or hind limbs, or in any group of skeletal muscles.

Early nervous symptoms often are manifested by epileptiform fits. Paresis (partial paralysis) usually begins in the hind limbs and progresses forward. Death occurs when any group of vital muscles is affected by the paralysis.

Some cases are affected by eruption of the skin, which begins as small pimples, which may contain pus and later become encrusted and emit a repulsive odor. The urine may contain bile pigment, indican, acetone, and albumen. Significant changes usually occur in the white blood cells. The disease usually lasts 10 days to 6 weeks.

Exposure to cold, parasites, inbreeding, malnutrition, and unhygienic conditions are believed to make dogs more susceptible to distemper.

From 30 to 80 percent of the dogs that develop distemper die.

As is true of most virus diseases, present-day antibiotics, biologicals, and drugs seem limited in their ability to alter the course of the disease once it has become well established. Careful nursing is necessary. Particular attention should be paid to forced oral or intravenous feeding of the essential food elements.

A number of different methods have been developed through the years for protecting dogs from this disease by vaccination. They include formolized tissue vaccine, followed by attenuated or unattenuated virus, serum and live or unattenuated virus, and modified live virus.

The vaccine and virus method is based on increasing the animal's resistance to the virus by one or more injections of the formolized (formalin-treated) vaccine before one introduces the live virus.

The simultaneous use of immune serum and unmodified virus, a method that was popular in the early 1930's, is not widely used today because of the apparent instability of the virus.

The modified-virus methods are based on cultivating the virus in an unusual host, such as ferrets or egg yolk, in order to render it incapable of producing the disease in dogs while maintaining its ability to stimulate resistance to disease.

It seems advisable to use occasional booster injections to maintain immunity regardless of the method of vaccination used.

**Infectious Canine Hepatitis** is one of the specific viral diseases of dogs. It affects primarily the endothelial and
liver cells. It often includes symptoms of acute shock, followed by coma and death.

Infectious canine hepatitis has been miscalled fox encephalitis and infectious canine encephalitis.

Since most of the investigators credit Sven Rhubarth, of Sweden, with the original observations and differentiations, the virus usually is known as the virus of Rhubarth.

Transmission is usually by means of virus-carrying urine, which is passed by healthy carriers or by nonclinical cases. The disease usually is transmitted from dog to dog, although it may be carried indirectly by the hands, clothing, and implements of the handlers. James A. Baker, of Ithaca, N. Y., has shown that the disease is not carried across enclosures as narrow as 2 feet.

The virus withstands heat of 133°F, is stable at 4°F, and will withstand repeated thawing and refreezing. H. B. Parry and N. M. Larin, of the Canine Research Station, Newmarket, England, detected the virus in lice collected from sick dogs and were able to transmit a mild infection with inoculations of suspensions of such lice. This is not conclusive proof that the dog louse is a vector, but it may be accepted as circumstantial evidence that such a possibility exists.

Some investigators believe that the best way to destroy the virus is to use plenty of hot water, soap, and detergents and to follow that with a harsh disinfectant, such as the phenols (carbolic acid) and phenol-containing products, and a very caustic one, such as sodium hydroxide (caustic soda).

According to the studies of Parry and Larin, when the disease is introduced into a susceptible kennel or community, the percentage of sick dogs usually approaches 70, but the mortality rate usually is 12 percent or even less.

The more susceptible animals are apt to die within the first 24 hours.

Others may run a very mild course for 2 weeks or longer and show only hemorrhage of the urinary mucous membranes and the membranes of the eye and mouth, severe tonsillitis, and some loss of weight. They usually maintain their appetite throughout the course of the disease. Most of the affected animals will recover with supportive treatment.

A hyperimmune serum is available that seems to be effective in preventing the disease and slightly effective in treating the disease. A vaccine for immunizing dogs has been available since 1952. Statistics on the effectiveness of this vaccine are limited, but evidence does indicate its effectiveness in controlling the hepatitis.

Some investigators believe that the incubation period is 5 to 10 days, at the end of which time a rise in temperature can be expected, the white blood count may decline, and the development of tonsillitis and hemorrhagin visible mucous membranes occur. However, the appetite is rarely affected as is the case in canine distemper.

The more susceptible animals develop severe and rapid enteritis (inflammation of the intestines) which may be accompanied by massive bleeding from the rectum and end in sudden death.

The least susceptible animals develop tonsillitis and lesions of the mucous membrane, usually become jaundiced, have a loss of energy and sometimes soreness over the area of the gallbladder, and may develop opacity of the cornea (white eye).

Infectious canine hepatitis is difficult to differentiate from leptospirosis and canine distemper. Differentiation often is possible only by examination of tissues microscopically for inclusion bodies (tiny bodies that are in cells).

This disease is diagnosed by finding inclusion bodies in the cells of the blood vessels lining the liver, in contrast to inclusion bodies of distemper (which are found in cells lining the urinary bladder and the respiratory tract), and to leptospirosis (which produces no inclusion bodies).
The primary physical difference in the symptoms of hepatitis and distemper seem to be in the maintenance of appetite in hepatitis and the loss of appetite in distemper. A fairly common late symptom of hepatitis is inflammation of the cornea of the eye, giving it a bluish appearance. Because the virus may be shed in urine for 6 months or longer, recovered animals should be considered as carriers. It is advisable to use immune serum liberally in kennel outbreaks and to keep careful daily records of the temperatures.

**Leptospirosis** is produced by a spirochete, a bacterial organism, *Leptospira icterohemorrhagiae* or *Leptospira canicola*. It has been known as Weil's disease or Stuttgart's disease and sometimes has been called blacktongue, sore mouth, or canine typhus. These spirochetes are shed in the urine of infected animals and healthy carriers. The brown rat is a carrier of *L. icterohemorrhagiae*, but it is not a carrier of *L. canicola*, which is the commoner species in dogs.

Despite the known ability of leptospirosis to invade and attack the skin, the dermis of the dog probably offers an impenetrable barrier, except in the very tender places joining the footpads. Most investigators believe the disease is transmitted directly from the contaminated genitals of one animal to another animal. Like hepatitis, this disease is not airborne. It must be transmitted by direct contact and it can be controlled by practical hygiene. Because the spirochete is susceptible to heat and drying, the disease seems to be most prevalent during the wet, cool months. Because of the less resistant nature of these spirochetes in comparison with the virus of hepatitis, however, the disease does not seem to assume the epidemic proportions of hepatitis.

It is hard to differentiate between this disease and distemper and hepatitis; the general course usually is milder and more chronic than in the others. The sudden and dramatic death that occurs from hepatitis does not occur in outbreaks of leptospirosis.

The onset of the disease usually follows constipation and lameness in the hind legs and tenderness around the groin. In the early stages, the kidney region is extremely tender and the rear legs are lame. In that stage the animal loses its appetite and may begin vomiting and develop a fever of 103° to 106°, which may last 1 day to 3 weeks. The visible mucous membranes of the eyes and mouth usually look congested. The temperature may drop to normal or subnormal within a short time, and signs of severe dehydration may develop. During this stage the affected dogs may die within 5 to 10 days, or convalescence may begin in the second week and extend to the sixth week. The tonsils remain unchanged. Jaundice may occur.

The tenderness in the abdomen is less pronounced and is centered usually in the region of the kidney, rather than in the liver region. The white blood count is high. Mouth lesions may be severe, with ulcerations and sometimes actual sloughing of the tongue. Nosebleed occurs occasionally.

No inclusion bodies are found in this disease, but spirochetes can be demonstrated in the liver tissue by staining with silver nitrate and on examination may be found in the concentrated urine and blood serum by dark-field examination. A serological test has been used in detecting animals that at one time have been exposed to this spirochete. This test is difficult to use as a clinical aid, however, because as many as one-third of the animals may react positively to it, although they show no clinical symptoms of the disease.

Inoculation of hamsters helps in reaching a diagnosis. M. K. Heath, who conducted research at Alabama Polytechnic Institute, found that the antibiotics, par-
ticularly streptomycin, offer an excellent means of treatment if started early.

In contrast to virus diseases, animal serum does not seem to be of any particular value in preventing or treating leptospirosis, except that it may be of value in adding normal blood constituents when needed.

The tissues attacked are primarily the kidney and liver, but the clinical symptoms are difficult to tell from those of canine distemper and those of hepatitis.

Because surveys show that 11 to 30 percent of the dogs are temporary or permanent carriers of leptospirosis, the disease apparently is mild and is unrecognized in most cases.

**Babesiosis** is caused by *Babesia canis*, a parasite in the blood cells. It occurs almost everywhere.

Many species of ticks transmit it. The incubation period is 7 to 10 days. It is accompanied by fever, lassitude, anemia (later cyanosis), jaundice, loss of appetite, extreme thirst, and bile-stained urine.

It may be diagnosed by finding the parasites in the blood cells.

Trypan blue given intravenously in a 1-percent solution is a useful treatment.

**Tularemia** is caused by *Bacterium tularenses*. It has been reported occasionally in at least 46 States and the District of Columbia.

Rabbits and other rodents are reservoirs of the disease. Ticks or insects that have fed on infected animals may transmit tularemia to dogs. It may be contracted by eating uncooked infected meat, by drinking infected water, or by having infected materials come in contact with the skin.

The clinical signs are nausea, fever for 10 to 15 days at 104° to 106°, loss of appetite, anemia, and an increased white blood cell count. In the cutaneous (skin) type, the lymphatics may abscess. The ophthalmic (eye) type is characterized by itching, discharge of tears, severe inflammation of the eyes, punched-out ulcers, and sensitiveness to light.

Because this disease is transmissible to people, dogs with tularemia should be handled only by those who are familiar with the precautions that should be taken.

**Nocardiosis** is a rather rare disease of dogs. Symptoms include generalized weakness, lameness of hind legs, edema of the extremities, rapid breathing, generalized soreness, and fever. A pathologic examination discloses small nodules in the heart, liver, lymph nodes, lungs, and kidneys.

Nocardiosis is either acute or chronic. The general symptoms are like those of influenza, with rapid loss in weight and general emaciation. Abscesses are present in most of the lymph nodes in the chronic cases. Enlarged spleen, accumulation of pus around the lungs, and catarrhal enteritis are rather common.

**Histoplasmosis**, caused by the fungus *Histoplasma capsulatum*, is an infection characterized by diarrhea, chronic cough, weakness, anemia, and general emaciation.

Cases of canine histoplasmosis have been reported all over the world. Most cases reported in the United States have been in the East Central States. The mortality rate in the acute cases is high.

No definite proof has been found to indicate that histoplasmosis is transmitted from one animal to another. Because the fungus has been isolated from soil, it is probable that the infection is airborne.

No successful treatment for canine histoplasmosis was commonly available in 1956.

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