CHAPTER 04

DIAGNOSIS, TREATMENT AND CONTROL OF CANINE TICK DISEASE

Pei Liu[2], Ximei Pan[1], Dongxian He[1], Yali Huang[1], Hongfang Mo[1] and Xiaolu Hou[1*]

[1]Guangxi Agricultural Vocational University, Nanning 530007, China
[2]Jiangxi Agricultural University, Nanchang 330045, China
*Corresponding author: xlh155567@163.com

INTRODUCTION

With the change in China's social and demographic structure, the number of empty nest groups is increasing, and pets have gradually become a new emotional sustenance. The number of pet families has increased dramatically, especially the number of pet dogs. Dogs have become one of the most exposed and closely related animals with humans. Dog diseases, especially those shared by humans and dogs, have also drawn attention in public health and become a key epidemic prevention topic of public health (Harrus et al. 2007; Dobler 2010; Dantas-Torres 2010). Ticks and tick-borne diseases seriously endanger the health of dogs. People have paid more and more attention to this disease in recent years. Canine tick disease is a common ectoparasitic disease in dogs. It is an insect-borne infectious disease caused by ticks in dog skin sucking blood. Cases of canine tick infection have been reported all over the country, but the infected tick species are different. The distribution of tick species is related to different climates, soils, vegetation and hosts. Ticks are mainly parasitic on the surface of the dog and the inside of its limbs. Feeding by sucking the blood of the dog will not only cause redness, swelling and itching of the skin of the parasitic part and cause anemia symptoms of the dog, but also secrete the toxin into the blood circulation of the dog when sucking blood, affect the release of acetylcholine, and lead to motor nerve dysfunction, muscle paralysis, and even death. In addition, ticks carry a variety of pathogenic microorganisms, such as bacteria, viruses, rickettsia and protozoa, which can spread a variety of animal diseases, including some zoonotic diseases. Therefore, how to make a rapid and accurate diagnosis of canine tick disease, how to effectively prevent tick infection and avoid the harm of ticks, which are particularly important to protect dogs and people's health.

Pathogen and its Biological Characteristics

Species Classification of Ticks

Tick is also known as wall lice, flat lice commonly known as dog turtle, grass, cattle tick, grass tick, dog bean and cattle turtle. The most harmful species are Ixodes, Argasidae and Nuttalliellidae, but they belong to Arachnida, Acarida, Acari suborder, and Acaricoidea. More than 800 species of ticks have been found all over the world, including more than 700 species of Ixodidae, 150 species of soft ticks and 1 species of nanotick (only in southern Africa). There are 117 known species of ticks in China, among which hard ticks are also the most widely distributed. About 100 species have been found. Soft ticks are less distributed in China, with only slightly more than 10 species. At present, the species of ticks parasitic on the body surface of dogs in China, mainly include Haemaphysalis, sickle-shaped Haemaphysalis, *Haemaphysalis longicornis*, *Haemaphysalis campanulatus*, grassland leather tick, and bovine tick, all of which belong to the family Ixodes (Zhang et al. 2013; Zhang et al. 2017).

Morphological Characteristics of Ticks

The tick's body is oval. The ventral back is flat when not sucking blood. The back is slightly raised, and the adult body is 2 to 10mm long. The tick swells after full blood, such as red bean or castor seed, which can be up to 30mm. Epidermis leathery, abaxially, or with a crustaceous shield plate. The insect body is divided into two parts: false head and body. The false head is located in the front of the body, visible from the back of the body. The false head of soft tick is located at the front of the body and invisible from the back.

The false head of Ixodes is composed of jaw base, claw limb, suboral plate and whisker limb. The jaw base is connected with the front end of the body. It is a well-defined ossification area, which is hexagonal, rectangular or square. There is a pair of pore areas on the back of the jaw base of female ticks, which can sense and secrete body fluid to help lay eggs. One pair of claw limbs, extending from the center of the back of the jaw base, are important stabbing and cutting devices. One suboral plate is located on the ventral surface of the claw limb and forms an oral cavity when it is closed with the claw limb. There are inverted teeth on the ventral surface of the suboral plate, which are attached organs fixed in the host skin during blood suction. The two sides of the claw limb are whisker limbs, which are composed of four segments. The fourth segment is short and embedded in the small depression on the ventral surface at the end of the third segment. The body is bag shaped, mostly brown, symmetrical on both sides. The shield plate of male ticks covers almost the whole back, while the shield plate of female ticks only accounts for a part of the front of the back. Some ticks form different flowers on the trailing edge of the shield plate, which is called festoon. There are 4 pairs of feet on the ventral surface, and each foot has 6 sections, namely the basal section, rotator section, femoral section, tibial section, posterior tarsal section, and tarsal

How to cite this chapter: Liu P, Pan X, He D, Huang Y, Mo H and Hou X, 2022. Diagnosis, treatment and control of canine tick disease. In: Abbas RZ, Khan A, Liu P and Saleemi MK (eds), Animal Health Perspectives, Unique Scientific Publishers, Faisalabad, Pakistan, Vol. I, pp: 23-29. https://doi.org/10.47278/book.ahp/2022.04

section. There is usually a gap on the base node. There is Haller's organ at the proximal end of the dorsal edge of the tarsal joint of foot I, which has an olfactory function. At the end, there are a pair of claws and a pad shaped claw process. The genital pore is located in the front half of the ventral surface, often in the horizontal line of the second and third pair of foot basal ganglia. The anus is located at the back of the body and often has the anal groove. A pair of valves are located at the rear and outer side of foot Ⅳ base joint, and the valve plate is wide. The male tick has a chitin plate on the ventral surface, and its number varies according to the genus and species of the tick.

The jaw body of soft tick is on the ventral side of the body and cannot be seen from the back. There is no hole area on the back of the jaw base. There is no shield plate on the back of the body, and the body surface is mostly granular verruca, or wrinkled and discoid depression. The valve plate is small and is located above the front of base joint IV. The genital foramen is located in the front of the ventral surface, and the sexual characteristics are not significant. The anus is located in the middle or later on the body, and some soft ticks still have anterior anal sulcus, posterior middle anal sulcus and posterior transverse anal sulcus, which are located in the front and back of the anus respectively. There is no spur at each basal joint. Although the tarsal joint has claws, it has no claw pad. There is an opening of basal gland between the foot basal ganglia I - II of adults and nymphs. The secretion of basal gland fluid can regulate water, electrolyte and hemolymph. When sucking blood, pathogens also pollute the host wound with the secretion of basal gland fluid, such as some species of blunt edged ticks.

Development of Ticks

From the development process from egg to adult, tick is an incomplete metamorphosis insect, including egg, larva, nymph and adult. After sucking blood, the mature ticks mate and land, crawl in the soil, grass roots, tree roots, corners of livestock houses, etc., and lay their eggs in the cracks on the surface. One to two weeks after laying eggs, the female ticks die, and the male ticks can mate several times in their life. Ticks lay eggs only once in their life and can produce thousands or even more than 10000 eggs. The eggs are small, spherical or oval, about 0.5-1mm in size, light yellow to brown in color, and often piled into clusters (Sun 2011). Under suitable conditions, eggs can hatch larvae within 2-4 weeks. The larvae look like nymphs, but they are small and have three pairs. The larvae fall to the ground after sucking blood for 2-7 days, molt and become nymphs, and then wait for the opportunity to invade various animals. Hard tick nymphs only have one stage, and soft tick nymphs go through 1-6 stages. Nymphs have 4 pairs of feet and no reproductive pores. Nymphs fall to the ground after 3-9 days of full blood, and can degenerate into adults after dormant for several dozens of days. The life cycle of ticks ranged from 2 months to 3 years. Most soft ticks take six months to two years. The life span of Ixodes ranged from one month to tens of months. The adults of soft ticks can generally live for 5, 6 years to decades due to multiple blood sucking and oviposition.

Living Habits of Ticks

Ticks are sensitive to sunlight, temperature and humidity, dryness and rainfall. Ticks generally begin to appear at 1℃, although they can survive at 6-11℃, their development is stagnant, and they begin to be active at 10-15℃, so the peak season of tick activity is in spring, summer and autumn, which is cold resistant. Ticks are more active in the early morning and evening. At this time, they often climb to the tip of grass leaves to wait and find the host. When other animals or people pass and stay, they climb to animals and people to sting and suck blood. At noon, when the temperature is high and the light is strong, they climb under the dead branches and leaves and remain dormant. The litter and grass vegetation in the forest area can form a micro environment suitable for tick activities. Therefore, the occurrence of tick disease has obvious seasonal and regional characteristics, and has strong regular adaptability to the periodic changes of the environment.

Most Ixodes live in forests, shrubs, open pastures, grasslands and mountain soils. For example, *Haemaphysalis sanguinalis*, *Haemaphysalis longicornis* and *Haemaphysalis biconicus* mainly live in agricultural areas and fields, and the activite season is from April to September. Gamasid ticks mainly live in grassland. Overwintering adults begin to appear in late February or early March of early spring, peak period in April and gradually decrease in May. The tick mainly lives in agricultural areas, and its active season in North China is from April to November. Soft ticks mostly inhabit in livestock pens, wildlife caves, bird nests and gaps in houses. Although the activity range of ticks is small, usually tens of meters, the activities of the host, especially the seasonal migration of migratory birds, play an important role in the spread of ticks.

Host Characteristics of Ticks

The hosts of ticks are widely distributed, including reptiles, birds and mammals, with a total of more than 130 species of 3 classes, 20 orders and some species will also invade humans. Ticks find their host in a very special way, mainly relying on their keen sense of smell, especially sensitive to animal sweat and CO2. When they are 15m away from the host, they can sense it and change from passive waiting to active attack. Once they contact the host, they climb up and turn on the parasitic mode. The larvae, nymphs and male and female adult ticks suck blood. After being full, they leave the host and return to the environment. But only adults can parasitize on animals, and other stages live in the environment. Most Ixodes invade the host during the day, and the blood sucking time is long, which generally takes several days. Soft ticks mostly invade the host at night, and the blood sucking time is short, usually from a few minutes to an hour. Ticks absorb a large amount of blood, which can swell several times to dozens of times after full blood in each development stage, and female Ixodes can even reach more than 100 times (Wang et al. 2013). Ticks are often selective in the host parasites, usually preferred areas that are sparse and not easy to disturb, such as auricle, periocular, neck, armpit, inner thigh, pudenda, femoral sulcus, perianal and caudal root.

Ticks change their hosts in their life cycle. It can be divided into four types according to the number of host changes:

(1) Single host tick: each stage of development is on a host, and the female lays eggs when she is full of blood. An example is *Boophilus microplus*.

(2) Two host ticks: larvae develop into nymphs on one host, while adults parasitize on the other host. An example is residual glass eye tick (*Hyaloma detritum*).

(3) Three host ticks: larvae, nymphs and adults parasitize on three host bodies respectively. Examples include whole ditch Ixodes and grassland leather tick. More than 90% of hard ticks are three host ticks, and most of the important vectors of tick-borne diseases are three host ticks.
(4) Multi host ticks: larvae, nymphs and adults of various instars and female ticks need to look for the host to parasitize and suck blood before laying eggs, and leave after being full of blood every time. About the size of mung bean before blood sucking. After sucking full blood, it can reach the size of a thumb. Usually, soft ticks are multi host ticks.

Hazards of Ticks

Tick-borne infectious diseases are an important part of insect-borne infectious diseases. They are a kind of diseases transmitted by ticks. Most of them are natural focal diseases, which have the characteristics of wide distribution, great harm and being easy to cause outbreaks. Countries all over the world attach great importance to the research and control of tick-borne diseases. China has a vast territory and complex geographical climate, which is suitable for the natural reproduction of many vector ticks. Tick borne infectious diseases are very popular in China and seriously affect the health of the people. Therefore, the prevention and control of tick-borne infectious diseases are becoming more and more important in the work of health and epidemic prevention.

Direct Harm

Both hard ticks and soft ticks fed by blood sucking and obtain nourishment through parasitism. They are usually painless when biting and sucking blood. However, in order to protect themselves, ticks will completely embed their mouthparts into the host skin, which will make animals itchy and fidgety. They often rub, scratch or bite the skin, resulting in congestion, bleeding, edema, horny hyperplasia and acute inflammatory reaction at the parasitic site, or secondary wound maggot disease. When the number of parasites reaches a certain amount, it can cause anemia, emaciation and dysplasia of diseased animals (Fan et al. 2016). If a large number of parasites are on the hind limbs of animals, it can cause hind limb paralysis; if parasitic between the toes, it can cause claudication. For working dogs such as police dogs, tick parasitism will distract their attention during training and work, resulting in reduced training and operational ability (Liu et al. 2013).
In the process of biting and sucking blood, the neurotoxin secreted by some hard ticks will enter the host with saliva, which can inhibit the release of muscle neurocholine, lead to the conduction disorder of the motor fibers in the host, cause ascending muscle paralysis, and lead to respiratory failure and death, which is called tick paralysis (Shao et al. 2017).

Disseminate Infection

Ticks can have a variety of pathogenic microorganisms in their bodies. They are carriers and communicators of many animal pathogens. They are the most important vector of human and animal diseases except mosquitoes. They can spread a variety of diseases. It is known that ticks can carry 83 kinds of viruses, 14 kinds of bacteria, 17 kinds of regressive fever spirochetes and 32 kinds of protozoa, most of which are important natural foci diseases and zoonotic diseases. So far, 18 kinds of tick borne infectious diseases have been found at home and abroad, namely Scottish encephalitis, Powassan encephalitis, kesanu forest disease, jaw musk hemorrhagic fever, Rocky Mountain spotted fever, button fever, Queensland tick borne typhus, paroxysmal rickettsiasis, human Babesia Forest encephalitis, Crimean Congo hemorrhagic fever, tick borne spotted fever in North Asia, Q fever, tulafellosis, Lyme disease, tick borne relapsing fever, human Ehrlichia disease and tick paralysis. The last 10 diseases are also distributed in China, which can directly or indirectly cause human and animal death (Dong et al. 2011).
The biggest and most common hazard to dogs is babesiosis (Wang et al. 2013). In the process of biting and sucking blood from dogs, ticks inhale the red blood cells parasitized with Babesia into the body, and Babesia can be transmitted through eggs or metamorphosis. With the process of biting and sucking blood again, they transmit the new insect with the infectious ability to healthy dogs. Babesia parasitized in the red blood cells of dogs, causing the destruction of red blood cells, resulting in the symptoms of anemia in dogs. In addition to the symptoms of anemia, the affected dogs also showed symptoms such as elevated body temperature, depression, loss of appetite, hematuria and brown urine. With the development of the disease course, the affected dogs also showed hemolytic jaundice and progressive weight loss. If they were not treated in time, they would eventually lead to the death of the affected dogs (Bao et al. 2013).

Causes of Canine Tick Disease

Negligence of Daily Protection

Because ticks mainly live in grassland and woods, people and dogs are easy to come into contact with ticks during outdoor activities. If the dog is not checked in time after going out and returning, it is easy to carry ticks and cause infection. In addition, the open kennel allows dogs to go in and out freely and lie down everywhere, which increases the chance of infection with ticks.

Poor Living Environment of Dogs

The kennel is old, the walls are covered with caves, the internal and external environment is rarely clean, feces and grass accumulate, and the dog excreta and open channels are not often cleaned, which provide conditions for the breeding and reproduction of ticks.

Improper Management of Kennel

The diet is insufficient or of poor quality, and the dogs are malnourished and emaciated. Without regular insect repellent immunity, the resistance of dogs decreased significantly. There is no seasonal environmental disinfection and pest control in the places where dogs often move, which increases the possibility of tick breeding. These loopholes in feeding management, once individual dogs are occasionally infected with ticks, will cause the outbreak and spread trend of tick disease in the whole kennel.

Symptoms and Diagnosis

Clinical Symptoms

When dogs are parasitized by a small number of ticks, most dogs do not show clinical symptoms, but with an increase in

the number, they often have local irritation, causing pain and itching in the parasitic parts, constantly shaking their heads and scratching their ears, and often trying to get rid of pests by friction, scratching and licking. However, this practice often leads to local bleeding, inflammation, swelling, erosion, ulcer or suppuration. Each female tick sucks an average of 0.14ml of blood each time. Therefore, when a large number of ticks parasitize, it can cause anorexia, anemia, emaciation and dysplasia, and the resistance decreases significantly. If the insect body is parasitic around the orbit, it will make the dog's eyelids red and swollen and the conjunctiva red. Parasitic on the auricle and external auditory canal. The dog's ears cannot stand up and are often scratched with claws. Parasitic on the hind limbs, which can cause hind limb paralysis (neurotoxin effect). Parasitism between toes (even if there is only one) can cause claudication. Even after catching ticks, claudication will last for 1-3 days (Lin 2015).

In addition, ticks are also an important vector of other blood parasitic diseases, which can indirectly cause dogs to suffer from other diseases, such as eperythrozoonosis, babesiosis and other blood protozoan diseases. Sick dogs will have anemia, high fever, jaundice, dyspnea and other symptoms, and severe cases will die of exhaustion (Li et al. 2016).

Diagnosis

Clinical Examination of Dogs

A spherical protrusion is found attached to the skin in the mouth, eyelids, head, ears, inner sides of front and rear limbs and toes of the sick dog. A closer look will show that some insects drill into the skin, some oval insects stay outside the skin, and the whole body is brown. The size of insects varies, as shown in Fig. 1 and 2. The smallest insects are the size of millet, and the larger ones are the size of soybeans and even fingernails. At the same time, the affected dogs show pain, itching and agitation. They often rub the wall and the ground with their body, or scratch and bite a certain part of the body. The affected part has skin edema, inflammation, local bleeding or bleeding points and some have partial skin ulcers. Affected dogs have decreased appetite, rough coat, depressed spirit, malnutrition, emaciation and lack of activity. Individual dogs may also have a high fever.

Laboratory Inspection

Ticks were collected from the sick dog and soaked in 70% alcohol and brought back to the laboratory for treatment. The species were identified according to the morphological characteristics, as shown in Fig. 3 and Fig. 4. Under the microscope, the shape of the whole tick is long oval, with false head and body. There is a hard shield plate on the back of the insect body. The false head is in front of the body. The base of the false head is short and looks like a hexagon; There is a germinal hole in the middle of the front of the abdomen, and its anus is located in the middle of the rear, showing a hemispherical shape of the longitudinal fissure. The insect body has a pair of valve plates, on the posterior side of the fourth pair of foot basal ganglia, a pair of claws at the end of the foot, and a hastellar apparatus at the dorsal edge of the end of the first pair of foot tarsal ganglia (Zou et al. 2016). The diagnosis can be made through the comprehensive diagnosis of typical clinical symptoms and laboratory test results.

Auxiliary Diagnosis of Complications

Ticks are the transmission vector of babesiosis in dogs. Dogs infected with ticks are prone to secondary babesiosis. Therefore, collect the blood of sick dogs for blood smears, and check whether there is babesiosis infection in red blood cells with a microscope. It can also be diagnosed with babesiosis rapid detection test paper or PCR detection.

Treatment

Manual Removal

Once a tick is found attached to the dog's body surface, it shall be taken out with tweezers. It is forbidden to pull it out by hand, so as to prevent secondary skin damage caused by tearing tissue or broken mouthparts. Put a drop of iodine tincture, alcohol or vaseline oil on it, or scald it gently with cigarette butts and incense sticks. After the tick suffocates, it will naturally fall from the skin. Do not pull it (Zhang 2016), also anesthetize the ticks with a high concentration of alcohol to relax or kill the tick head. When pulling out the tick, clamp the head of the tick with tweezers close to the front end (including mouthparts) as far as possible, keep the hand stable, and pull out the body of the tick completely in a vertical state. Pay attention not to exert too much force, but the speed should be fast, so as to prevent the tick mouthparts from falling into the body and causing local inflammation. The captured ticks should be killed immediately and can be collected in closed containers and burned to death (Wang et al. 2016). After tick removal, the bitten wound should be disinfected with iodine tincture or alcohol immediately, and the physical condition should be observed at any time (Zhang et al. 2010).

Chemicals Applications

Spraying, bathing or washing the body surface of animals with liquid medicine can kill ticks on moving objects. Pyrethroids and formamidine with low toxicity and safety can be selected. For example, the effect of medicine bath with 1% trichlorfon, 0.5% malathion and 7.5% phoxim is very good (Zhang et al. 2013). It was reported that 0.04-0.08% cypermethrin bath has an obvious insecticidal effect, and there is no obvious adverse reaction in dogs. It can also be used as environmental insecticidal (Wen 2013). Chulanling medicine bath combined with subcutaneous injection of ivermectin has a good feedback effect (Li et al. 2015). 0.5% deltamethrin emulsion, or use 0.04-0.08% metoclopramide (saffron) and other solutions to bath for 15 minutes, and the insects can fall off by themselves (Yang et al. 2009); Dichlorvos with high toxicity and high efficiency can also be selected, and the tick killing effect is also very good, but we must pay attention to safety to prevent dogs from poisoning and death.

Environment Control

At the same time of sterilizing dogs, it is necessary to spray 0.003% deltamethrin emulsifiable concentrate (also known as betamethasone and diphtheria) or 0.75% DDT on kennels, dog training grounds, lawn activity sites and other places to jointly kill ticks. Single site and environmental tick control can be incomplete and will have potential hazards (Yang 2015).

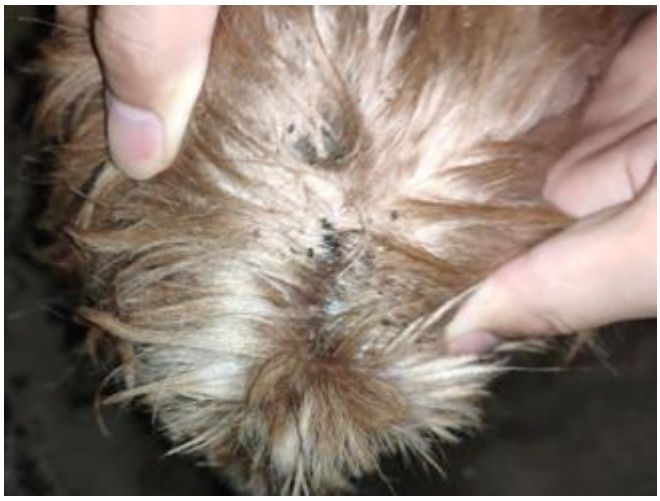

Fig. 1: Ticks on the dog's head

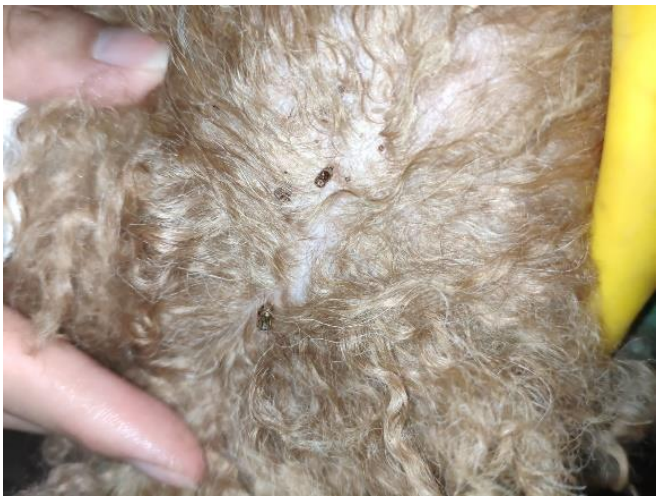

Fig. 2: Ticks on the back of the dog

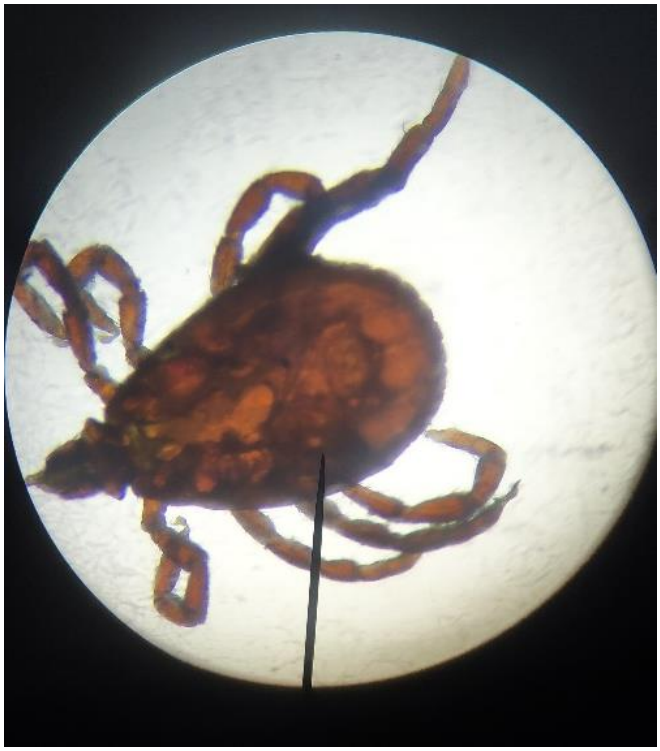

Fig. 3: Adult canine tick

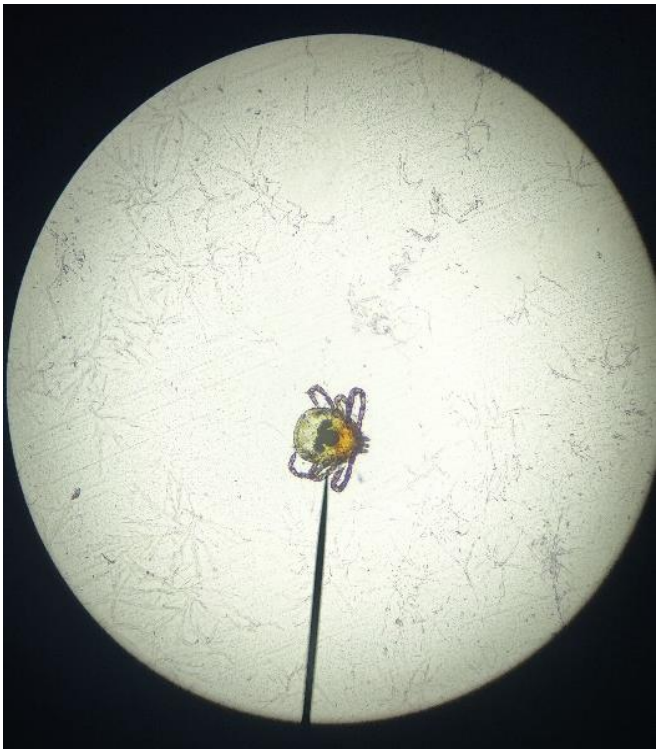

Fig. 4: Nmph of canine tick

Symptomatic Treatment

For local bleeding, edema, inflammation and other symptoms, "Wujigao (Compound beclomethasone camphor cream)", "Piyanping (Compound Dexamethasone Acetate Cream)", "Ailuosong (Mometasone Furoate Cream)" and other creams may be used for external use. In case of suppuration and other infection symptoms, antibiotic ointment such as ciprofloxacin and mupirocin can be used together. If there are neurological symptoms such as hind limb paralysis and claudication, you can take "cyproheptadine" and "vitamin C" orally and inject "vitamins B1 and B12" and other drugs, but most affected dogs will gradually reduce their symptoms with the removal of ticks (Chen et al. 2008; Chen et al. 2016). It is reported that veterinary acupuncture combined with drugs can also effectively to cure tick induced paralysis in dogs (Zhang 2010). If the symptoms of tick infection are serious, supplement body fluids (sugars and vitamins, etc.) to expand blood volume, and select anti-anemia drugs such as iron preparation to prevent serious dehydration and failure and maintain normal metabolism (Bao et al. 2010). Apply broad-spectrum antibiotics (such as ceftiofur) or antiviral drugs to prevent secondary or concurrent infection, and timely give Sodium bicarbonate to correct metabolic acidosis. At the same time, strengthen nutrition, feed easily digestible food to affected dogs, and do a good job in post-treatment care such as cold prevention and warmth preservation, so as to enhance the physique of sick dogs and recover as soon as possible.

Prevention and Control Measures

Prevention and Control Measures for Family Pet Dogs

Regular insect repellent: Parasitic infection is one of the important factors causing pet dog diseases. Many parasites can also infect humans and pose a threat to human health. Therefore, pet owners should do a good job of regular insect

repelling and clean up the parasites in and out of the pet dog. In addition, regular cleaning of the bad environment in pet living and activity areas, timely cleaning of excreta and keeping the feeding environment clean can effectively reduce the chance of pet dogs infected with parasites (Bai 2021). For example, Quanchongjing (Ivermectin) spray or Freon drops can be used to spray or drip on the ventral side of the dog's neck (Wang et al. 2014).

Fixed Pet Dog Rest Place

Since the date of purchase, pet dogs have established a close relationship with humans and have been favored by many pet owners. Many pet owners are used to eating and sleeping with their pets. However, such living habits are not healthy. Some pathogens (such as parasites) will sneak into people in the close contact between dogs and people, resulting in indirect infection of people (Yang et al. 2018). Therefore, in order to protect the health of pet dogs and people, it is necessary to set up a fixed rest place for pet dogs. On the one hand, an independent space can allow dogs to spend time alone and avoid behavioral problems such as separation anxiety due to excessive dependence on people. On the other hand, the fixed rest place is easier to clean, reduce the breeding of pathogens and ensure the sanitary quality.

Strengthen Daily Health Care

The health of animals mainly depends on the quality of feeding and management. Therefore, pet owners should strengthen the feeding and management of pet dogs and strengthen the daily health care of pet dogs in order to improve the body's resistance, including the following aspects: (1) reasonably match the diet and provide clean water to make the pet dogs grow healthily; (2) Regular outdoor exercise, control the amount of daily exercise and maintain the health of pet dogs; (3) Protect yourself before going out (e.g. wear an insect collar), do not go to the overgrown land when walking, and check and clean your body surface when returning (Chen 2017); (4) Wash and protect the whole body regularly to ensure that the dog is clean and refreshing; (5) Pay attention to the status of pet dogs, find abnormalities in time and deal with them as soon as possible.

Prevention and Control Measures for Kennels and Training Institutions

Environmental Protection

Regularly trim the grass in the scattered training site, and try to eradicate shrubs and weeds within the scope of dog activities. Clean up all supplies, utensils and insects in the sick kennel and burn them to completely eliminate pathogens and prevent secondary infection. The inside of the kennel can be fumigated with dichlorvos, and then it needs to be fully ventilated and smoke exhaust (Li 2010). Use soil mixed with 0.005% deltamethrin emulsion to block all gaps and cracks in the kennel, and then paint with lime milk to minimize the hiding place of ticks in the kennel.

Chemical Protection

Spray trichlorfon, malathion, phoxim and other anti-tick drugs on the inside and outside of the kennel, up and down, and the surrounding environment (including drainage ditch, dog cage, etc.). Pay attention to thoroughly remove the dirt on the ground and wall before spraying drugs in the kennel. Ticks in the gaps of walls and railings shall be sprayed with flame blowtorch after spraying drugs. In addition, some ticks have strong tolerance, so they can seize the favorable opportunity that ticks are in dormancy in winter and increase the work of tick killing and disinfection in winter, which can effectively prevent the outbreak of ticks in the coming year (Bao et al. 2013).

Drug Protection

Regular external insect repellent, especially for those dogs who like to go in the grass and shrubs, regular body surface insect repellent every month. "Compound non prednisolone drops","Fulaien", "baichongshuang" and "Miechongning drops" can be used to spray or drop on the neck and abdomen of the dog (Dong et al. 2022), which can effectively prevent tick bites, but do not let the animals lick them. Therefore, in the season of vigorous tick activity, drug tick control work should be more regular, comprehensive and meticulous (Yu et al. 2004).

Biological Protection

Because ticks mainly inhabit in grassland and forest, biological pesticides are used to spray the ground where ticks mainly occur, which has a long duration and is harmless to humans and livestock. It can be physically prevented and treated with "Algaecidal" (0.12% propylene glycol alginate). The drug is colorless and tasteless and harmless to human elements (Wang et al. 2013).

Strengthen the Management of Dog Breeding

Provide dogs with qualified feed and keep drinking water clean to improve their resistance and reduce disease (Shi et al. 2002). Optimize the kennel design, try to achieve one kennel for each dog as much as possible, and reduce the feeding density to reduce the opportunity of tick transmission (Liu et al. 2013). Conduct environmental sanitation and disinfection. Conduct a good job in the daily grooming of dogs, and maintain the health of dogs. In particular, during the grooming process, careful observation should be made to facilitate the timely detection of insect infection (Chen 2018). Ensure a certain outdoor exercise time, control the appropriate amount of exercise and enhance the dog's physique. Strictly control the entry and exit of dogs, strictly quarantine and conduct epidemic prevention, and carry out dog body inspection (brushing and swabbing of fur) and tick killing for dogs introduced or sold to prevent bringing in or bringing out ticks. Regular environmental tick control shall be included in the daily management work to achieve drug prevention in advance, especially the outbreak period of ticks is from June to October every year. During this period, the number of insecticides should be strengthened, and training in the main habitats of ticks such as grassland and forest shall be avoided as far as possible (He et al. 2005). In addition, often monitor the health status of dogs, and achieve early detection, early diagnosis and early treatment for dogs infected with tick disease. Once this tick disease occurs, appropriate drugs should be selected for treatment, and attention should be paid to the adjuvant treatment of nutritional supporting therapy.

Summary

With the rapid development of the pet industry, more and more people keep pet dogs, and pet dogs often go to the lawn and other outdoor environments, which are more vulnerable to ticks. Ticks have superior adaptability to the natural environment and have the ability to preserve pathogenic microorganisms and spread diseases. Therefore, the diagnosis, treatment and prevention of tick disease are related to the health of people and pets. In this chapter, the biological characteristics of ticks are discussed in detail, the common causes, clinical symptoms and diagnostic methods of dog infection with ticks are analyzed, and the specific prevention and control measures applicable to family pet dogs, kennels and training institutions are put forward, which is of great significance to the identification, diagnosis, treatment and prevention of canine tick disease, and provides reference for the prevention of human and canine co diseases.

REFERENCES

Bao XI et al., 2010. Diagnosis, prevention and control of canine tick infection and public health. China Working Dog Industry 9: 22-23.

Bao XI et al., 2013. The harm and prevention of canine tick infection. China Working Dog Industry 12: 63-64.

Bai GI, 2021. Disease prevention and health care of pet dogs. Veterinary Guide 05: 62.

Chen G, 2017. Prevention and treatment of parasitic skin diseases in pet dogs. Guizhou Animal Husbandry and Veterinary 41(6): 41.

Chen IQ et al., 2016. Occurrence and comprehensive control of canine tick disease in Fujian Province. China Working Dog Industry 04: 17-18.

Chen X et al., 2008. Diagnosis and treatment of canine tick paralysis. Guangxi animal Husbandry and Veterinary 05: 308-309.

Chen I, 2018. Prevention and treatment of common parasitic skin diseases in dogs. Farm Staff 09: 142.

Dobler G, 2010. Zoonotic tick-borne flaviviruses. Veterinary Microbiology 140: 221-228.

Dantas-Torres F, 2010. Biology and ecology of the brown dog tick, Rhipicephalus sanguineus. Parasite Vectors 3: 1-11.

Dong ZF et al., 2011. The causative factors and preventive measures of ticks. Hebei Forestry Science and Technology 5: 47-49.

Dong YM et al., 2022. Treatment of canine tick infection with compound non prednisolone drops. Advances in Animal Medicine 43(02):129-133.

Fan XS et al., 2016. Investigation and control measures of tick infection in working dogs in Guangzhou. Proceedings of 2016 National Working Dog Technology Seminar 2016: 133-136.

Harrus S et al., 2007. Rickettsia conorii in humans and dogs: a seroepidemiologic survey of two rural villages in Israel. American Journal of Tropical Medicine and Hygiene 77: 133-135.

He GS et al., 2005. Study on integrated control technology of police dog tick Proceedings of the 11th National. Academic Seminar on Dog Breeding. 2005: 23-25.

Lin BF, 2015. Comprehensive control technology of canine tick disease. Chinese Animal Husbandry and Veterinary Abstracts 31(07): 200.

Li LR, 2010. Four measures for tick disease control. Frontline of Planting and Breeding 11: 3.

Li J et al., 2015. Control techniques of canine tick disease. Shandong Animal Husbandry and Veterinary 36(11): 40.

Li HH et al., 2016. Treatment of canine tick bite anemia with integrated traditional Chinese and Western veterinary medicine. Contemporary Animal Husbandry 26: 81-82.

Liu ZB et al., 2013. Epidemiological investigation of tick disease in police dogs. China Working Dog Industry 2013: 16-17.

Sun ML, 2011. Prevention and treatment of canine tick disease. New Agriculture 2011(03): 32.

Shi DM et al., 2002. Common parasitic skin diseases in dogs and their prevention and treatment. Henan Animal Husbandry and Veterinary 23(07): 24.

Shao LX et al., 2017. A case of tick bite in a Scottish shepherd dog. Special Economic Animals and Plants 20(04): 13.

Wang ZQ et al., 2013. Treatment and protection of canine tick disease. Aquaculture Technical Consultant 2013: 95.

Wang WB et al., 2013. Experimental study on acute toxicity of Chlorpyrifos in mice by oral and transdermal administration. Proceedings of the 15th National Academic Conference on dog breeding and the 7th National Academic Conference on small animal medicine 2013: 106-108.

Wang PL et al., 2014. Diagnosis and treatment of canine tick disease complicated with parvovirus disease. Shandong Animal Husbandry and Veterinary 35(09): 46.

Wang SL et al., 2016. Treatment and prevention of canine tick disease. Friends of Farmers Getting Rich 2016(8): 282.

Wen B, 2013. Treatment and prevention of canine tick disease. Proceedings of the 15th National Academic Conference on dog breeding and the 7th National Academic Conference on Small Animal Medicine 2013: 358-389.

Yang ZD, 2015. Diagnosis and treatment of canine tick disease. Animal Husbandry and Veterinary Science and Technology Information 2015(11): 117-118.

Yang WH et al., 2009. Comprehensive control of canine tick infection. Proceedings of the 13th National Academic Seminar on Dog Breeding 2009: 424-426.

Yang KN et al., 2018. Prevention and health care of pet diseases. Animal Husbandry and Veterinary Science and Technology Information 2018(4): 116.

Yu C et al., 2004. Prevention and treatment of canine tick infection. Police Dog 2004(09): 20.

Zhang HC, 2010. Acupuncture combined with medicine in the treatment of canine tick paralysis. Heilongjiang Animal Husbandry and veterinary 22: 69-70.

Zhang YY, 2016. Prevention and control of canine tick disease in pets. Animal Husbandry and Veterinary Science and Technology Tnformation 2016(10): 117.

Zhang HD et al., 2010. Prevention of ticks and tick borne diseases in working dogs. China Working Dog Industry 2010(11): 14-15.

Zhang IW et al., 2017. Investigation on species and distribution of pet dog ticks in central and eastern. China Animal Husbandry and Veterinary 49(07): 126-129.

Zhang SZ et al., 2013. Investigation and control of canine parasitic ticks in Fuzhou area. Fujian Animal Husbandry and Veterinary 35(2): 12-13

Zou IZ et al., 2016. Diagnosis and treatment of a case of canine tick disease infection. Special Economic Animals and Plants 19(04): 9-10.