TO EVALUATE THE EFFICACY OF DIAGNOSTIC TESTS FOR CANINE SARCOPTIC MANGE IN DOGS

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ABSTRACT

Canine sarcoptic mange is caused by mite \textit{Sarcoptes scabiei var. canis}. It is an important veterinary disease engendering significant morbidity and mortality in wild, domestic, and farmed animals. During present study, 45 stray dogs suspected for sarcoptic mange along with 10 pet dogs as control were selected to evaluate the efficacy of diagnostic tests used for diagnosing sarcoptic mange. All subjects were subjected to three different diagnostic tests: Pinnal-pedal reflex test, Potassium hydroxide slide test and Potassium hydroxide centrifugation test. 86.67% of stray dogs and 20% of pet dogs responded to Pinnal pedal reflex test, 71.1% of stray dogs and 10% of pet dogs responded to Potassium hydroxide slide test and 88.89% of stray dogs and 10% of pet dogs responded to Potassium hydroxide centrifugation test. The efficacy of Potassium hydroxide centrifugation test was maximum followed by Pinnal pedal reflex test and Potassium hydroxide slide test. Nutrition and hygiene are the major factors for interacting sarcoptic mange.

KEYWORDS: Sarcoptic mange, Pinnal pedal reflex test, Potassium hydroxide (KOH) slide test, Potassium hydroxide (KOH) centrifugation test

Ectoparasites are the common and pivotal cause of skin diseases in dogs. They can transmit various diseases and cause hypersensitivity disorders in animals. They may also cause life threatening anemia in young and debilitated animals (Araujo et al.; 1998). They may lead to the development of dermatitis. The most common canine ectoparasites reported were \textit{Demodex canis}, \textit{Sarcoptes scabiei var. canis} and \textit{Otodectes cynotis} (Park et al.; 1996). \textit{Sarcoptes scabiei var. canis} causes sarcoptic mange which is highly contagious non-seasonal and pruritic skin condition, transmitted by direct contact between dogs (Curtis 2004). Sarcoptic mange is considered as a major cause of mortality among red foxes (Bates et al.; 2003), coyotes and common wombat (Martin et al.; 1998).

\textit{Sarcoptic scabiei} is an obligate ectoparasitic arthropod taxonomically grouped in class Arachnida, subclass Acari, order Astigmata and family Sarcoptidae (Fain; 1968). The members of Astigmata are relatively slow moving mites with thinly sclerotized integuments and no detectable spiracles or tracheal systems. Sarcoptid mites are all burrowing skin parasites of mammals and are host specific. Over 100 species have been described (Bochkov; 2010). The genus \textit{Sarcoptes} consists of a single heterogenous species genotypically. The sarcoptic infection in dogs and in humans is morphologically indistinguishable from each other. As in man, the disease is extremely pruritic, but mites are difficult and sometimes impossible to find, so called scabies in cognito. As in man, lesions in dogs usually start in less densely haired regions of the integument, such as the ear margins and elbows, although secondary hair loss due to excoriation allows the mites to spread to an increasing proportion of the integument (Morris and Dustan; 1996, Scott et al.; 2001).

Puppies and older debilitated dogs may be at increased risk for developing severe infestation as the disease is very contagious within populations of dogs (Walton et al. 2004). In previous studies, it was stated that dogs less than 1yr old are more susceptible to ectoparasite infestations (Nayak et al.; 1997, Kwochka; 1987), owing to their constant exposure to carrier mothers (Foreyt; 2001). The prevalence of ectoparasites is equally frequent in male and female dogs (Nayak et al.; 1997, Rodriguez-Vivas et al. 2003).

Sarcoptic mange is an important emerging disease of wildlife throughout the world and there is lack of definitive diagnostic test. Therefore, the present study has been undertaken to evaluate the efficacy of the diagnostic tests.

MATERIALS AND METHODS

During the present studies 45 stray dogs suspected for canine scabies and 10 pet dogs taken as control have been observed from Patiala city. All the 55 dogs were subjected to three different diagnostic tests for the diagnosis of sarcoptic mange and to evaluate the efficacy of each test.

Pinnal-pedal reflex test (Mueller et al.; 2001)

It is a simple way to diagnose the sarcoptic mange in dogs. Since almost all the dogs with scabies will have mites along the ear flap called the pinnal margins. The dog will reflexively use back leg in a...
scratching motion if pinna is scratched gently by a person testing his reflex.

To perform this test the pinna was taken between thumb and forefinger and underside of pinna was vigorously scratched with the forefinger. Dogs with sarcoptic mites mostly demonstrated an involuntary scratching motion with the back leg while scratching. Dogs with no mites seldom move back leg in a scratching motion.

Potassium Hydroxide slide test (Smith; 1988)

The potassium hydroxide test is the most commonly used diagnostic test. The alkaline potassium hydroxide solution separates and eventually destroys cells of stratum corneum, permitting the disease agents to become more clearly visible. 10% to 20% potassium hydroxide solution is most commonly used.

To perform this test, one or two drops of mineral oil are applied to the lesion, which is then scraped or shaved and the specimens are examined after clearing in 10% potassium hydroxide with a light microscope under low power. For thick specimen, gentle heating was done for the dissolution of the epidermis. This was done gently because drying the potassium hydroxide may cause crystal formation which makes identification of mites more difficult.

Potassium Hydroxide centrifugation test (Kettle; 1995)

To perform this test, animal skin scrapings were taken from the infected areas, the thick scrapings were boiled for few minutes in 10% potassium hydroxide. The boiling was done to clear the debris so that the mites may become visible in solution. The fluid was then centrifuged at 2000 rpm for five minutes. The supernatant was discarded and the sediments were separated out in the cavity blocks. 2-3 drops of potassium hydroxide were again added to the cavity block so that it may not get dry up as drying of potassium hydroxide may lead to the crystal formation which makes the recovery of mite more difficult in the solution. The material in the cavity block was then observed under the binocular microscope for the recovery of mites (Kettle; 1995). The mites were washed in water for two to three times to remove the potassium hydroxide completely. The properly washed mites were dehydrated and mounted in Hoyer’s medium (Krantz; 1978).

OBSERVATIONS

During present studies 45 stray dogs suspected for canine scabies and 10 pet dogs as control group were assessed (photo 1-4). They were subjected to pinnal-pedal reflex test, potassium hydroxide slide test and potassium hydroxide centrifugation test.

Pinnal-pedal reflex test (Table-1 and Fig-1)

Forty-five stray dogs suspected for canine scabies were subjected to pinnal-pedal reflex test. Out of 45 stray dogs thirty-nine i.e. 86.67 % gave positive response. The reflex was assessed by vigorously rubbing the margin of the ear for five seconds and it was considered positive if the ipsilateral hind leg made a scratching movement. Of the ten pet dogs taken as control only 2 i.e. 20 % gave positive response.

Potassium hydroxide slide test (Table-1 and Fig-1)

Forty-five stray dogs suspected for canine scabies were subjected to potassium hydroxide slide test. Out of them thirty-two i.e 71.11% gave positive response. The potassium hydroxide slide test was performed by the skin scrapings collected from the infected area by putting a drop or two of glycerin on the skin surface. The scrapings were taken by the help of the edge of slide or scalpel. The scrapings were transferred to the other slide and were observed under the microscope by adding one or two drops of potassium hydroxide. It is added to clear the debris. Only the parts of the body of mite i.e. legs were observed. Of the ten samples of skin scrapings taken from control group of pet dog’s only one sample i.e. 10% gave positive response.

Potassium hydroxide Centrifugation test (Table-1 and Fig-1)

Forty-five stray dogs suspected for canine scabies were subjected to KOH centrifugation test. Their skin scrapings were put in KOH, which were heated for three to five minutes then centrifuged for five minutes at 2000 rpm. Out of forty-five samples of skin scrapings forty samples i.e. 88.89% were found to be infected with Sarcoptes scabiei. From the ten samples of skin scrapings taken from control group of pet dogs only one sample i.e. 10% were found positive.

Table 1: Showing the efficacy of diagnostic tests for canine sarcoptic mange

<table>
<thead>
<tr>
<th>Dogs</th>
<th>Pinnal-pedal reflex test (%)</th>
<th>KOH slide test (%)</th>
<th>KOH centrifugation test (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pet dogs</td>
<td>20</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Stray dogs</td>
<td>86.67</td>
<td>71.1</td>
<td>88.89</td>
</tr>
</tbody>
</table>
Sarcoptic mange affects larger areas of skin or a dog's entire body. Secondary bacterial infections make this a very itchy and often smelly skin. The sarcoptic mite tends to cause hair loss, bald spots, scabbing sores and intense itching. The most commonly affected area is dog’s ears, elbows, face and legs. The mites prefer to live on areas of the skin that have less hairs. Small red pustules often develop along with yellow crust on the skin. In severe cases the skin soon becomes traumatized and variety of sores and infections can develop.

Sarcoptic scabiei var. canis (photo5-6)

In potassium hydroxide centrifugation method, mites were taken out from the sediment and were preserved in 70% alcohol. Few drops of picric acid were added to give color to the transparent body of mite. Morphologically, the mite was easily identified on the dorsal surface. There are three pairs of lateral spines almost in the middle of the body and six-seven pairs of spines posteromedially. Dorsally on the propodosoma behind the gnathosoma there is a pair of anterior vertical setae. The pre-tarsi of legs (1) and (2) bear empodial claws and stalked pulvilli which are sometimes referred to as suckers. The epimeres of 1st pair of legs are fused in the mid ventral line and legs (3) and (4) in the female end in long setae and lack stalked pulvilli. They are located on the ventral surface and are not visible in the dorsal view. In the female the ovipore is a transverse slit in the middle of the ventral surface.
It has been observed that all the stray dogs were living under very unhygienic conditions and were undernourished and underweight. Whereas of the 10 pet dogs selected, were well nourished and were living in hygienic conditions.

**DISCUSSION**

Definitive diagnosis is based on the identification of mites, eggs, eggshell fragments, or mite fecal pellets from skin scrapings (e.g., from scabietic papules or from under the fingernails) or by the detection of mite at the end of its burrow. The previous studies showed that 93.8% of subjects suffering from sarcoptic mange responded positive to pinnal-pedal reflex test (Mueller et al.; 2001). During present studies it has been observed that the 45 stray dogs suspected for canine scabies and ten pet dogs taken as control group were subjected to pinnal-pedal reflex test. From the forty-five stray dogs thirty-nine i.e. 86.67% were responding positive to this test. This accuracy value is confirmatory to the accuracy of this test given by Mueller et al.; the specificity of testing sarcoptic mange by pinnal-pedal reflex test was 93.8%. This method can be used for the preliminary diagnosis of canine scabies.

The potassium hydroxide slide test, applied over the forty-five stray dogs suspected for canine scabies and 10 pet dogs taken as control. The test gave about 71.1% accuracy showing only the parts of mite body e.g. legs etc could be isolated but not the whole mite. These results were in confirmation to the previous results (Smith et al.; 1988), this method was used for the recovery of mites for microscopic examination. This method provides excellent specificity but has low sensitivity for ordinary scabies, due to the low number of parasites.

The KOH centrifugation test was applied over the 45 stray dogs suspected for canine scabies and 10 pet dogs were taken as control. From 88.89% samples, the mites were recovered. These results were in confirmation with the previous observations (Kettle; 1995). It has been proved that this method is the most reliable method for the diagnosis of canine scabies. In practice, KOH centrifugation test has more accuracy than KOH slide test. With KOH centrifugation test complete mite bodies were recovered.

The evidences show that the male and female copulate on the skin surface and the male soon dies off. The female then burrows into the upper layer of skin (stratum corneum) and begins to form a honey comb of tunnels which are filled by the eggs laid by the female mite. After egg laying, the female dies at the end of the tunnel. The eggs soon hatch to form larvae and then molt to become nymphs (Kettle; 1995). This may be the reason that during present study more females were recovered than males.

*Sarcoptes scabiei* found more frequently on the sparsely-haired parts of the body where burrowing by the female mite is easier. It was found mainly on the areas like tail, head, ears, legs, back, etc. The young and poorly nourished animals were more susceptible to infections. It has been found that poorly nourished dogs who were suffering from malnutrition were easily susceptible to the sarcoptic mange. Unhygienic condition is also an important factor for the spread of sarcoptic mange according to present observations.

**CONCLUSION**

From the present study we conclude that potassium hydroxide centrifugation test is the most reliable test. Although all the dogs which responded positive to pinnal-pedal reflex test were having canine scabies. Therefore pinnal-pedal reflex test can be used for preliminary diagnosis of canine scabies where as KOH centrifugation can be used as a confirmatory test for canine scabies. It is further concluded that nutrition and hygiene are the important factors which interacting sarcoptic mange.

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