



Research paper

Sarcoptic mange in dogs: Its effect on liver, oxidative stress, trace minerals and vitamins

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ABSTRACT

The present study was aimed to determine the effect on liver, associated oxidative stress, trace element and vitamin alteration in dogs with sarcoptic mange. A total of 24 dogs with clinically established diagnosis of sarcoptic mange, divided into two groups, severely infested group (n=9) and mild/moderately infested group (n=15), according to the extent of skin lesions caused by sarcoptic mange and 6 dogs as control group were included in the present study. In comparison to healthy control hemoglobin, PCV, and TEC were significantly (P<0.05) decreased in dogs with sarcoptic mange however, significant increase in TLC along with neutrophilia and lymphopenia was observed only in severely infested dogs. The albumin, glucose and cholesterol were significantly (P<0.05) decreased and globulin, ALT, AST and bilirubin were significantly (P<0.05) increased in severely infested dogs when compared to other two groups. Malondialdehyde (MDA) levels were significantly (P<0.01) higher in dogs with sarcoptic mange, with levels highest in severely infested groups. Activity of superoxide dismutase (SOD) (P<0.05) and catalase were significantly (P<0.01) lower in sarcoptic infested dogs when compared with the healthy control group. Zinc and copper levels in dogs with sarcoptic mange were significantly (P<0.05) lower when compared with healthy control group with the levels lowest in severely infested group. Vitamin A and vitamin C levels were significantly (P<0.05) lower in sarcoptic infested dogs when compared to healthy control. From the present study, it was concluded that sarcoptic mange in dogs affects the liver and the infestation is associated with oxidant/anti-oxidant imbalance, significant alteration in trace elements and vitamins

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1. Introduction

Sarcoptic mange is a severe contagious disease and a major global health problem affecting humans and other mammals, caused by the burrowing mite *Sarcoptes scabiei* (Walton et al., 2008). Canine sarcoptic mange is a widespread, contagious, transmissible and debilitating skin disease of dogs cause by *Sarcoptes scabiei* characterized by intense pruritus, vesiculo-papular eruption and pinpoint crusts in combination with alopecia (Pin et al., 2006).

Some of the most important contributing factors for the development of sarcoptic mange in dogs include the immune status of animal, nutritional status and oxidative stress (Camkerten et al., 2009; De and Dey, 2010; Beigh et al., 2013a). Prolonged infestations with scabies, or infestations in already debilitated animals,

have effects on organs and affected animals often succumb to the infestation (Pence and Ueckermann, 2002).

Pro-inflammatory cytokines (IL-6, granulocyte-colony stimulating factor (G-CSF), IL-1 β, tumor necrosis factor- α (TNF α) and interferon- γ (IFN γ)) produced upon sarcoptic infestation appear to be the effectors in the pathogenesis of scabies (Arlan et al., 2003; Walton et al., 2008). Triggering of this pro-inflammatory cascade can lead to excessive generation of the reactive oxidants (ROS), which play a key role in host defense against the invading parasite (Bickers and Athar, 2006). However, their higher levels can result in metabolic dysfunction and biomolecular oxidative damage, which contributes to several pathological changes in the tissues (Valko et al., 2007).

Free radicals induce or contribute to in the pathogenesis of skin diseases expressed as erythema, edema, wrinkling, hypersensitivity, keratinization abnormalities and skin cancer (Bickers and Athar, 2006). To combat oxidative damage, organisms developed antioxidative mechanism triggered by an increased ROS

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production. Minerals such as iron, copper and zinc are components and co-factors of numerous enzymes and proteins necessary to ensure proper body functions. Cytoplasmic superoxide dismutase (SOD) enzyme contains copper and zinc metals as cofactors; glutathione peroxidase (GSH-Px) enzyme contains selenium and catalase contains iron (Chow, 1988). It is now well recognized trace element concentrations are subject to change in several disease problems. The present study was aimed to evaluate liver function, trace minerals and oxidant and anti oxidant status of canines with sarcoptic mange.

2. Material and methods

2.1. Selection of animals

The dogs enrolled in the study were recruited among the patients presented for clinical and dermatological examination to the referral hospital of the faculty. Dogs diagnosed with sarcoptic mange were included in the present study only when the presence of other dermatological conditions, diseases, or other problems were found to be absent. A total of twenty four sarcoptic mange-infested dogs (19 intact males and 5 intact females) of age ranging from 6 to 24 months (mean \pm std: 17.12 ± 3.77) with mean body weight (19.66 ± 6.38) were selected for the study. According to severity of lesions dogs were divided in two groups. Dogs with less than 25% of skin ($n=15$) involvement were categorized as mild/moderately affected and the dogs with more than 25% of skin involvement were categorized as severely affected group ($n=9$). Another 6 dogs (four intact males and two intact females) clinically healthy, free of any ectoparasites and gastrointestinal parasites, age matched (15.45 ± 7.28) dogs with mean body weight (21.15 ± 5.15) were used as control. The control dogs included dogs which came to the clinic for routine health checks, vaccination and deworming.

The infested dogs had a history of dermatological problem for at least 3–5 weeks in severely infested dogs and 2–3 weeks in mildly/moderately infested dogs before presentation and none of the dogs were subjected to any medication for at least 30 days prior to collection of blood samples. The faeces of the dogs were microscopically examined to rule out any gastrointestinal parasites. The nutritional condition of dogs was assessed on a five-scale body condition score (BCS) (1 = very thin; 2 = underweight; 3 = ideal; 4 = overweight; and 5 = obese)

2.2. Dermatological examination

For parasitological examination glycerin was applied to the edge of the skin lesion which was scraped with a sterile scalpel blade. Scraps were collected in 10% potassium hydroxide solution for microscopic examination and the parasite was identified according to its morphological characteristics (Soulsby, 1982). The dogs were clinically examined for any fleas, lice, ticks or any other ectoparasites and dogs positive for these ectoparasites were excluded from the study.

Dogs' positive for *S. scabiei* mites on microscopic examination of material taken from up to three skin scrapping, free from fleas, lice and ticks and with skin lesions of alopecia, severe itching, excoriation, scabs on pinnae, neck, brisket, elbow and around root of tail were diagnosed as suffering from sarcoptic mange.

2.3. Blood sample collection

Ten ml of blood sample was collected in acid washed heparinized vials from diseased and control dogs for the estimation of zinc, iron, copper, β -carotene and vitamin C and assay of oxidative stress. The un-clotted blood was used for the hematology estimation and the rest of blood sample was centrifuged at 3000 rpm in

10 min to harvest plasma for the estimation of biochemical parameters, trace elements and vitamins. The red blood cells (RBCs) were used for the preparation of 33 percent packed erythrocyte for estimation of lipid peroxidation and 1 percent erythrocyte lysate for the activity of antioxidant enzymes catalase and superoxide dismutase.

2.4. Laboratory analysis

Un-coagulated blood was tested, shortly after collection, for hemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC) and total leukocyte counts (TLC) (Jain, 1986). Plasma samples were analysed for biochemical parameters by using commercially available reagent kit (Erba Mannheim, Transasia biomed, Daman, India).

The extent of lipid peroxidation was estimated in 33% of erythrocytes lysate as the concentration of thiobarbituric acid reactive product malondialdehyde (MDA) by the method described by Shafiq-ur-Rehman (1984). The amount of lipid peroxidation was expressed as nmol MDA formed/ml of RBC's using molar extinction coefficient of pure MDA as 1.5×10^5 . The activity of superoxide dismutase (SOD) in 1% erythrocyte lysate was determined by method of Marklund and Marklund (1974). The assay is based on the ability of SOD to exhibit the auto-oxidation of pyrogallol in presence of EDTA. The activity was expressed as SOD units/mg Hb.

The activity of catalase was determined as per the method described by Aebi (1983). The activity was expressed as μ mol of H_2O_2 decomposed/min/mg Hb using 36 as molar extinction coefficient of H_2O_2 .

For mineral analysis 2 ml of each plasma sample was analysed for trace elements viz. Zinc (Zn) and copper (Cu) using Polarized Zeeman Atomic Absorption Spectrophotometer (Z-2300, HITACHI) by method described by Kolmer et al. (1951) with little modification.

Plasma Vitamin A was estimated by the method bases on care-price reaction and plasma vitamin C was estimated by 2,4-dinitrophenylhydrazine (DNPH) method (Baker and Frank, 1968).

2.5. Statistical analysis

All the statistical analysis was processed using statistical program of Social Science (SPSS) for windows, Version 10.0. Values of the measured parameters were expressed as mean value \pm S.D. After testing data for normal distribution, difference between the groups was determined by using one-way analysis of variance (ANOVA). Significance was considered at p values <0.05 .

3. Results

All dogs were fed mainly commercial dry-food along with some home-cooked food containing mostly eggs, bread and chicken. On body score assessment of dogs with sarcoptic mange, in severely infested dogs 3 dogs were found to be underweight (BCS=2), 6 optimal (BCS=3) and in mild/moderately affected group 12 were found to be optimal (BCS=3), 2 overweight (BCS=4), and 1 obese (BCS=5). All the control dogs had an optimal BCS (BCS=3). Clinical examination of dogs' revealed intense pruritus associated with vesiculo-papular eruptions and pinpoint crusts in combination with alopecia. Pedal pinnal reflex was positive in all cases. In severely infested dogs, lesions covered more than 25% of skin surface, however, in 6 animals more than 50% of skin was involved. In mil/moderately infested dogs, 2 dogs had less than 10% skin involvement (mild case) and 13 dogs had 10–25% skin involvement. This was the reason to combine moderately infested and mildly infested together in this study.

The mean values of different parameters of hemato-biochemical profile between groups were compared and presented in Table 1.

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