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Changes in serum biochemistry and acute phase proteins in canine mammary tumor affected dogs

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Abstract
The present study was aimed to study the variations in certain serum biochemical parameters and acute phase proteins in canine mammary tumor affected dogs in comparison to those of apparently healthy dogs. The dogs that were presented to various veterinary clinics with canine mammary tumors were subjected to various biochemical tests and estimation of acute phase proteins to notice any deviation from the apparently healthy dogs. Positive acute phase protein (CRP) showed significant increase in tumor affected dogs. Non-significant decrease was noticed in the negative acute phase protein (Albumin) in the dogs affected with mammary tumors. Biochemical parameters like Alanine Transa-minase (ALT), Aspartate Transaminase (AST), Blood Urea Nitrogen (BUN) and Creatinine showed insignificant variations in canine mammary tumor affected dogs when compared to the control group.

Keywords: canine mammary tumors, acute phase proteins, biochemical parameters

1. Introduction
Canine mammary gland tumors (CMTs) are the most common tumor type in intact female dogs [1, 2] and are still one of the leading causes of death among canines [3]. Tissue damage and inflammatory response will alter the concentrations of the acute phase proteins in the serum of the subject [4]. Three types of acute phase proteins exist in the serum of dogs *viz.*, major positive, moderate positive and negative acute phase proteins. Major positive acute phase proteins show marked rise and rapid decline; moderate positive acute phase proteins show less magnitude increase; in contrast, negative acute phase proteins decrease in response to the inflammatory stimulus [5]. Also, certain clinical biochemical parameters have been estimated to notice the alterations, if any, in the canine mammary tumor affected dogs.

2. Materials and Methods
Blood samples were collected from the dogs affected with mammary tumors that were presented to various clinics in Bangalore, Hyderabad, Visakhapatnam and Gannavaram and also from apparently healthy dogs that were brought for routine examinations. Serum was separated and stored at -20 ^{o}C until further use.

2.1 Acute Phase Proteins
C-Reactive Protein: C-Reactive protein was estimated using Canine C-Reactive Protein (CRP) ELISA kit from BD biosciences following the procedure given by the manufacturer and was expressed in µg/ml.
Albumin: Estimated by BCG dye method using Erba kit and expressed in g/dl

2.2 Biochemical parameters
ALT, AST, BUN and Creatinine were estimated using Erba kits and Erba semi auto biochemical analyzer.
ALT (U/l) and AST (U/l) were estimated by kinetic method, BUN (mg/dl) was estimated by GLDH – Urease method and Creatinine (mg/dl) was estimated by Jaffe's method.

3. Results
Serum acute phase proteins were estimated in the dogs affected with CMTs (n=30) and apparently healthy dogs (n=10) and were presented in Table-1. Serum C-Reactive Proteins mean value in dogs effected with CMTs (54.21±6.95 µg/ml) was significantly higher than the

mean CRP value (0.66±0.10 µg/ml) in apparently healthy dogs. Serum Albumin mean value in CMT affected dogs (2.96±0.05 g/dl) is non-significantly lower than that of the mean value of apparently healthy dogs (3.1±0.07 g/dl).

Serum Biochemical parameters were also estimated in the dogs effected with CMTs (n=30) and compared with apparently healthy dogs (n=10) and were presented in Table-2. The mean values (18.91±0.92 mg/dl) of blood urea nitrogen in the CMT affected dogs showed no significant difference compared to that of the BUN mean (18.1±1.97 mg/dl) of healthy dogs. Serum creatinine of CMT dogs (0.93±0.06 mg/dl) and healthy dogs (0.82±0.11 mg/dl) showed no significant difference. Serum ALT in CMT affected dogs (52.22±3.86 U/l) showed no significant difference from that of the healthy dogs (48.59±8.06 U/l). Mean serum AST in CMT affected dogs was (47.31±1.85 U/l) and showed no significant difference from the mean serum AST (43.57±3.85 U/l) of healthy dogs.

Table 1: Means of Acute phase proteins in CMT affected dogs and apparently healthy dogs.

Parameter	CMT affected Dogs (n=30)	Apparently Healthy Dogs (n=10)
C-Reactive Protein (µg/ml)	54.21±6.95[a]	0.66±0.10[b]
Albumin (g/dl)	2.96±0.05	3.1±0.07

Different superscripts [a,b] indicate significant difference at P<0.05.

Table 2: Means of biochemical parameters in CMT affected dogs and apparently healthy dogs.

Parameter	CMT affected Dogs (n=30)	Apparently Healthy Dogs (n=10)
BUN (mg/dl)	18.91±0.92	18.1±1.97
Creatinine (mg/dl)	0.93±0.06	0.82±0.11
ALT (U/l)	52.22±3.86	48.59±8.06
AST (U/l)	47.31±1.85	43.57±3.85

Different superscripts [a,b] indicate significant difference at P<0.05.

4. Discussion

The dogs affected with canine mammary tumors showed significant increase in the CRP levels compared to the apparently healthy dogs. Similar findings were reported by [5]. CRP is a strongly positive acute phase protein whose serum levels increase in response to inflammation and tissue injury [5]. Insignificant decrease in the levels of albumin concentration was noticed in the present study in the dogs effected by CMTs when compared to the apparently healthy dogs. Since albumin is a negative acute phase protein, the concentration of the albumin decreases in response to inflammation or tissue injury [5]. Similar findings were noticed by [5, 6]. BUN, serum creatinine, ALT and AST values showed no significant difference between CMT affected dogs and the apparently healthy dogs. Similar findings were observed by [6,7005D

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