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Research Article

ANALYSIS OF MINERAL COMPOSITION OF CANINE UROLITHS - A RETROSPECTIVE STUDY

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ABSTRACT: Twenty six cases were studied for analysis of uroliths surgically retrieved from canine of different age, sex, body weight, geographical location and nutritional status. The uroliths were quantitatively analyzed by atomic absorption spectrophotometric analysis (AAS), Flame photometry and calcium and phosphorus estimation. The struvite stones were found to be more predominant in number, than other type of uroliths.

Key words: Canine uroliths, Struvite, Atomic absorption spectrophotometry.

INTRODUCTION

Uroliths are aggregate of crystalline and occasionally non-crystalline solid substances which used to form at one or more locations of urinary tract. When urine become oversaturated with lithogenic substances, the uroliths may form and may cause anuria, dribbling or frequent voiding of urine. For proper identification of mineral composition of uroliths, quantitative analysis is must, which in turn help to alter the urine pH and as a consequence, medicinal dissolution of urinary calculi can be achieved (Kim-chae *et al.* 2004, Rinkardt *et al*. 2004). In the present study 26 canine urolithiasis patients were taken for analysis of uroliths by different physical methods and so also biochemical methods to identify their chemical components.

MATERIALS AND METHODS

The uroliths were retrieved from different breeds of dogs by surgical method in different seasons from various geographical regions of Odisha. The chemical analyses of urinary stones collected form urinary bladder and different parts of urinary tract were carried separately by wet chemical methods using AAS model AA6300 (SIMADZU) and Flame photometer after digestion in Hydrochloric acid (HCl). All the trace minerals like copper, cobalt, lead, cadmium, chromium, manganese, iron, nickel, zinc, strontium, molybdenum, lithium, aluminium and tiatnium were analyzed in AAS. Other metals like calcium, phosphorus and sodium were analyzed with Flame photometer (Systronic model-MEDIFLAME 127) and colored glass filters were used to measure the energy intensity of selected band. The calcium estimation was done by the standard method adapted by Talapatra *et al.* (1940) and phosphorus by AOAC (1995).

RESULTS AND DISCUSSION

In the study it was found that, male suffer more (80.7%) than female (19.3%). The canine uroliths analyzed having 65.38% (17/26) magnesium ammonium phosphate (MAP), 15.38% (4/26) calcium oxalate with calcium phosphate, 7.69 % (2/26) silica, 7.69% (2/26) urate, 11.53% (3/26) as calcium hydroxyl appetite and 3.84% (1/26) as ammonium urate (Table 2). The MAP found to be more (66%) in male dogs while rest (34%) was in females. Among the total number of struvite analyzed the pure struvite was found to be 41.17% (7/17) Calcium oxalate monohydrate mix 23.53% (4/17), Calcium oxalate dihydrate 11.76% (2/17), Calcium phosphate, Magnesium ammonium monohydrate and hydroxyl appetite 5.88% (1/17) each (Table 1).

Urolithiasis is a disease of multi-factorial origin.

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Table 1. Showing types of calculi in different breeds of dogs.

Sl. No.	Breed	No. of animals	Sex wise distribution	Calculi Composition
1	German Shepherd	6	2 (M)	Struvite
			1 (F)	Struvite + hydroxyappatite
			3 (M)	Calcium oxalate + calcium phosphate
2	Doberman	7	3 (M)	Struvite+ calcium oxalate monohydrate
			1 (F)	Struvite+ calcium oxalate monohydrate
			1 (M)	Silica
			2 (M)	Calcium hydroxyappatite + ammonium urate
3	Dalmatian	2	2 (M)	Urate
4	Boxer	3	1 (M)	Struvite+ammonium urate+calcium oxalate dihydrate
			1 (M)	Silica
			1 (F)	Struvite+magnesium ammonium monohydrate
5	Spitz	6	3(M)	Struvite
			1 (F)	Struvite
			1(M)	Struvite+calcium oxalate dihydrate
			1(M)	Calcium oxalate+calcium phosphate
6	Dachshund	2	1(M)	Struvite
			1(F)	Struvite+calcium phosphate

Table 2. Showing number of occurrence and percentage of different calculi.

Sl. No.	Calculi component	Total occurrence	
		In number	Percentage (%)
1	Magnesium ammonium phosphate	17/26	65.38%
2	Calcium oxalate with calcium phosphate	4/26	15.38 %
3	Silica	2/26	7.69 %
4	Urate	2/26	7.69 %
5	Calcium hydroxyl appetite	3/26	11.53 %
6	Ammonium urate	1/26	3.84 %

Factors like age, sex, breed, genetic makeup, season, feeding, source of water, mineral and infection play major role in the genesis of urolithiasis (Osborne *et al.* 1986). The super saturation of urine in calculogenic substances has been reported to be an important driving force behind urolith formation (Bartges and Lane 2003). Components of calculi in urinary bladder were reported to be struvite and that in the urethra was calcium oxalate (Kim Chaewook *et al.* 2004). In the reported study, the maximum mineral component was struvite 65.38% (17/26) collected from urinary bladder of different breeds of dogs from different localities of Odisha, which correlates with the above findings.The identification of rare components such as xanthine, dihydroxyadenine, ammonium urate, calcium carbonate, silica and drug metabolites were also found with the analytical approach (Rebecca *et al.* 1996, Low *et al.* 2010). In this study, there were also presence of ammonium urate, urate and silica found to be 3.84% and 7.69% each in later two components respectively. As per previous report, the small breeds of dog are prone to formation of uroliths (Jones *et al.* 2001). This may be attributed to their smaller size of their urinary tract and also greater confinement in the house/flat, which may favor urine retention and consequently urinary infection (Escolar *et al.* 1990, Rebecca *et al.* 1996). Here in small breeds like Spitz and Dachshund dogs, the occurrence of uroliths was found to be 30.7%. The trend identified in the study may assist in clarifying the groups at increased risk for developing urolithiasis.

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