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## Histopathological studies on gout in poultry

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### Abstract

In the current study, Gout was recorded in 5 poultry birds out of 210 affected cases giving an incidence of 2.38%. Grossly, the affected kidney was swollen with chalky white deposits on the surface. Microscopically, the kidneys were characterized by tophi formation/urate granulomas in the interstitium containing central area of caseous necrosis with impaction of urates (H & E stained sections) in the interstitial, intertubular and intraglomerular spaces as a result of dissolution of urate crystals surrounded by epithelioid cells. In duplicate sections stained with DeGalantha's method the urate particle seen as black masses as needles or acicular crystals present in radiating pattern. On the basis of present study, it can be concluded that gout in birds might be due to various reasons including various infections, nutritional disorders, dehydration and post renal lesions.

**Keywords:** Gout, histopathology, poultry, kidney, uric acid

### 1. Introduction

The poultry industry is one of the most profitable ventures of agriculture and provides nutritious meat and eggs for human consumption (Rai *et al.*, 2012) [13]. In India livestock wealth has a great impact on Indian economy. India is a land of agriculture where most of the population depends upon agriculture for their livelihood. The predominance of agriculture and livestock rising as a source of income is both a boon and a bane (Mitra, 2021) [9]. Poultry has shown remarkable growth ever since its inception and is presently emerging with a growth rate of 8.51 and 7.52% in egg and broiler production, respectively (Anonymous, 2019) [1]. The poultry industry in the arid and semiarid region of Rajasthan is not well developed, because of the adverse climatic conditions. Kidneys are vital organs which are directly or indirectly linked with multiple body system. Therefore, renal diseases may be root cause of many other diseases. Nowadays, poultry birds are genetically engineered for fulfilling the demand of meat and eggs. In the process to achieve the goal, the birds are subjected to stress and as a result of this health of the vital organs are compromised, this leads to increased incidence of metabolic and production related disorders. Avian urolithiasis or gout, is caused by kidney damage by many potential causes *viz.*, infectious or nutritional disease, ingestion of toxins, or a combination of factors. The gout may be of two types, first visceral gout (Deposition of white chalk-like material on the surface of various abdominal organs as well as the pericardial sac) or second articular gout (white chalk-like deposits in joints of the limbs). Higher incidence of gout in summer and winter than in autumn has been reported in chicken by (Karasawa *et al.*, 1991; Singh *et al.*, 2013; Wideman and Cowen, 1987) [6, 16, 20]. The present study in text describes histopathological studies of gout in poultry in arid zone of Rajasthan.

### 2. Materials and methods

The samples were properly preserved in 10% formalin after cutting the affected parts. The parts of affected tissue presenting the lesions with normal tissue were used for fixation and further histopathological examination. For histopathological examination, processing of tissues was done by paraffin embedding using acetone and benzene technique (Lillie, 1965) [8]. The tissue sections of 4-6  $\mu$  thickness were cut and stained with haematoxylin and eosin staining method as a routine. As far as possible, results were recorded by gross observations and microphotographs.

## 2.1 Processing of tissues

1. All the tissue samples in size of 1 cm x 0.5 cm were trimmed properly and fixed for 24 hours or more. To remove the fixative, the tissues were kept in running tap water for overnight.
2. The tissues were dehydrated in ascending grades of alcohol using 50%, 70%, 80%, 95% and absolute alcohol. The tissues were kept in each solution for 1 hour.
3. The tissues were cleared by two changes in chloroform, one and half an hour for each change.
4. The tissues were embedded in molten paraffin wax at 56 °C: Two changes one and half an hour for each. Paraffin blocks containing tissue pieces were made using templates.
5. The tissues were sectioned with a rotary microtome at 5 µm thickness. Then the sections were allowed to spread on a warm water bath (45 °C) and taken on an oil and grease-free glass slide. A small amount of gelatine was added to the water bath for better adhesion of the sections to the slide. The slides containing sections were air dried and kept in a cool place until staining.

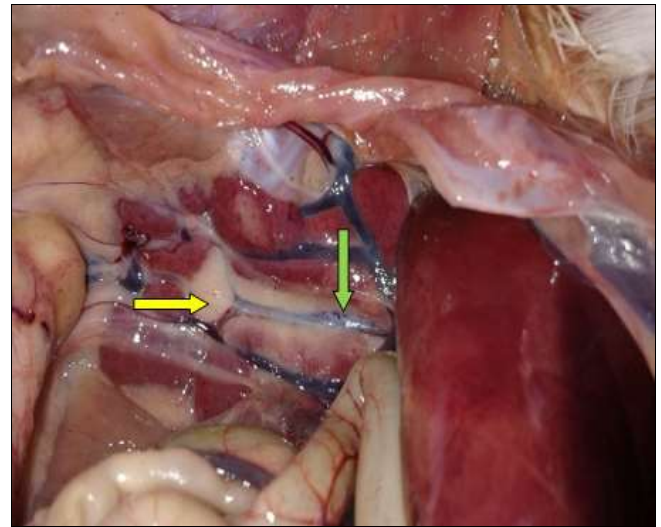
## 2.2 DeGalantha's stain for uric acid

1. Deparaffinized the sections with xylene and brought them to water level.
2. Place the slides in 20% silver nitrate solution and expose to strong sunlight for 2 to 4 hours.
3. Poured freshly prepared developing solution (Gelatin 3% in hot water 10 ml, 20% silver nitrate solution 3 ml and 2% hydroquinone solution 2 ml) until the urates turned black and connective tissues were yellow.
4. Wash in hot water (58 °C).
5. Dehydrated, cleared and mounted in DPX. Urate crystals appears in black colour, while connective tissues in yellow colour.

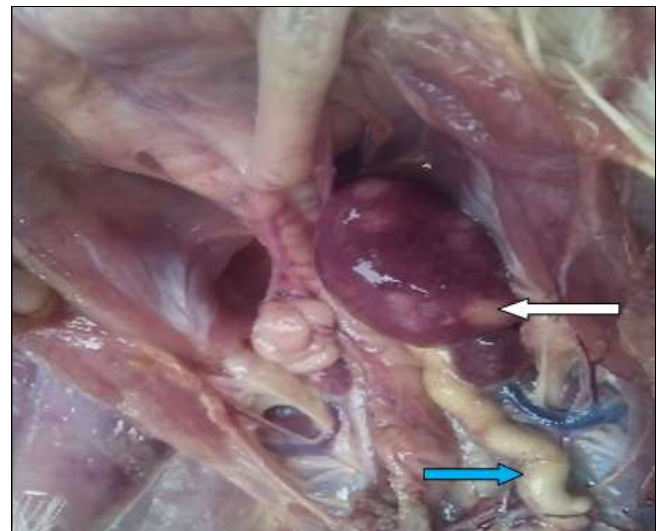
## 3. Results and Discussion

Gout was recorded in 5 poultry kidneys out of 210 affected cases giving an incidence of 2.38%. Grossly, the affected kidney was swollen with chalky white deposits on the surface (fig. 1 and 2). Microscopically, the kidneys were characterized by tophi formation/urate granulomas in the interstitium containing central area of caseous necrosis with impaction of urates (H & E stained sections) in the interstitial, intertubular and intraglomerular spaces as a result of dissolution of urate crystals surrounded by epithelioid cells (fig. 3). In duplicate sections stained with DeGalantha's method (fig. 4) the urate particle seen as black masses as needles or acicular crystals present in radiating pattern. The findings of present investigation fall in line with the results of (Shirai, 1991) [15], observed lymphocytic infiltration and tophi (gouty nodules) histopathologically. Dense amorphous urate deposits on serosal surface of kidneys in cases of gout found in the present study were also observed by (Nayak *et al.*, 1988; Sonmez, 1992 and Uma *et al.*, 1999) [12, 17, 18]. The histopathological lesions of gout observed in the study were in agreement with those of (Brown *et al.*, 1987; Kaur 2006; Mouli and Mohiuddin, 1983; Valsala *et al.*, 1980) [4, 7, 10, 19]. The deposition of uric acid crystals in the kidneys causing gout may be due may causes of the renal damage including nutritional *viz.*, excess dietary calcium, sodium bicarbonate and protein (Mouli and Mohiuddin, 1983; Nayak *et al.*, 1988; Beckman, 1995) [10, 12, 3]; water deprivation (Sahu and Rao, 1973) [14], chronic viral (infectious bronchitis virus); persistence (Chandra, 1987; Mohapatra, 1992) [5, 11];

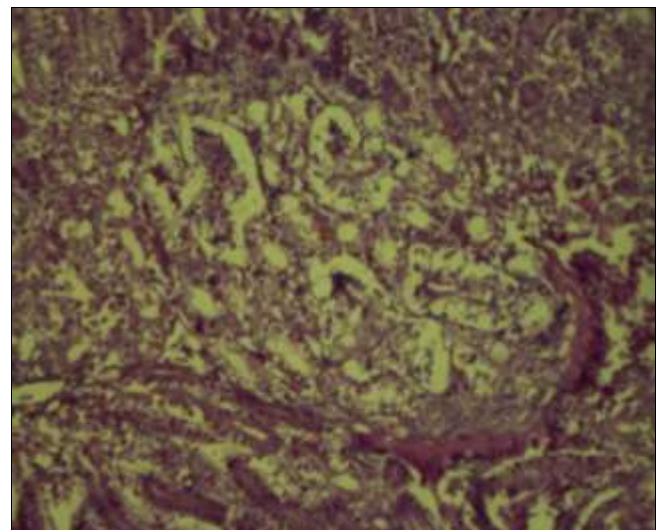
consumption of various agents like sulfas and aminoglycoside antibiotics, vitamin D3, disinfectants and insecticides (Beckman, 1995) [3] and mycotoxins (Balachandran and Ramakrishnan, 1987) [2].



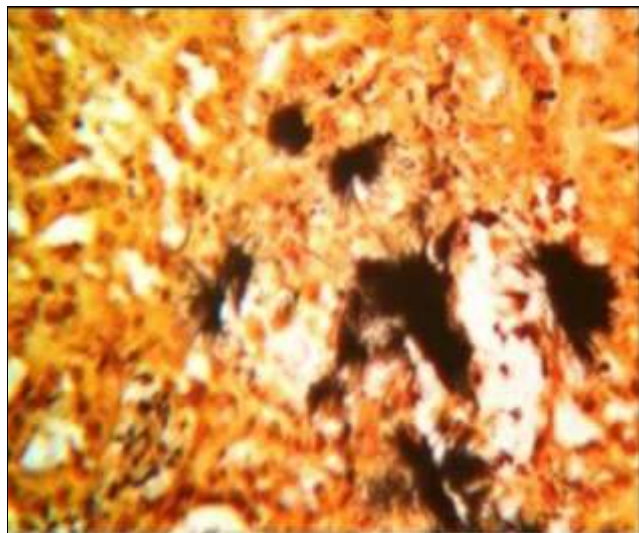
**Fig 1:** Gross photograph showing chalky deposition on cranial (Green arrow) and middle lobe (Yellow arrow) of kidney



**Fig 2:** Gross photograph showing chalky deposition in ureter (Blue arrow) and cranial lobe of kidney (White arrow)



**Fig 3:** Microphotograph of kidney showing urate deposition in tubules in form of needle pattern. H & E-200x



**Fig 4:** Microphotograph of kidney showing black coloured radiating urate crystal deposition. DeGalantha's-400x

#### 4. Conclusion

On the basis of present study, it can be concluded that gout in birds might be due to various reasons including various infections, nutritional disorders, dehydration and post renal lesions. Further, gout affected kidney seems swollen with chalky white deposits on the surface on gross examination and needle shaped masses seen on gross examination.

#### 5. Acknowledgement

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