The Pharma Innovation Journal 2022; SP-11(7): 601-603

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(7): 601-603

www.thepharmajournal.com
Received: 13-05-2022
Accepted: 16-06-2022

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Pathology of some miscellaneous conditions related to heart of sheep (*Ovis aries*)

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Abstract
The study was conducted to elucidate the pathology of miscellaneous conditions i.e. cardiac hypertrophy and atrophy of cardiac muscles related to heart of sheep *(Ovis aries)*. Cardiovascular system was examined with total 587 samples, irrespective of age, breed and sex. Out of these, suspected 147 specimens of heart with pathological abnormalities were processed for histopathological examination. Miscellaneous conditions i.e. cardiac hypertrophy and atrophy of cardiac muscles were recorded in 13 cases with occurrence of 8.84 per cent. In cases of cardiac hypertrophy, grossly, abnormal thickening of heart walls and enlargement of heart were found. On microscopic examination, increased size of cardiocytes in ventricular wall was observed. The sections showed hypertrophied appearance. In case of atrophy of cardiac muscles, macroscopically heart was small in size and necrosed. Microscopically, cardiocytes decreased in size with necrocis of cells and the space between the myocytes increased due to decrease in size of cardiocytes.

Keywords: Sheep, heart, cardiac hypertrophy, atrophy of cardiac muscles, histopathology

Introduction
India is an agriculture based country and livestock plays important role in world agriculture sector. It contributes 40 per cent of the global value of agricultural output and support the livelihood. Small ruminants i.e. goat and sheep represent significant part of world livestock industry and more than 78 per cent of total annual global production comes from Africa and Asia. Sheep (*Ovis aries*) is one of the oldest animals in the world, which was domesticated by man. Sheep had originated from their ancestors *Ovis orientalis* and *Ovis vignei* (Ensminger, 1970) [3]. The total livestock population in the country is 535.78 Million (20th livestock census). The total population of sheep in India is 74.26 Millions, with an increase by 14.1 per cent over previous census (20th Livestock census). Sheep contribute to the tune of 13.87 per cent to the total livestock population of the country. According to 20th livestock census, indigenous or non-descript sheep population is 70.17 Millions (94.49%) while exotic or crossbred sheep population is 4.09 Millions (5.51%). Rajasthan with 7.9 million sheep population is the 4th largest sheep rearing state of the country (20th livestock census).
The cardiovascular system is responsible for circulation of oxygenated and deoxygenated blood (pure and impure blood). It also helps in transporting nutrients i.e. amino acids, electrolytes and sugar and removing gaseous wastes from the body. Various endocrine hormones, excretory products are also transported by cardiovascular system. Therefore it becomes pertinent to study the cardiac affection i.e. cardiac hypertrophy and atrophy of cardiac muscles in heart of sheep.

Materials and Methods
Cardiovascular system was examined with total 587 samples, irrespective of age, breed and sex. Out of these, suspected 147 specimens of heart with pathological abnormalities were processed for histopathological examination. The samples were collected in 10 per cent formal saline and processed for histo-pathological examination. Processing of tissues was done by paraffin embedding using acetone and benzene technique (Lillie, 1965) [7]. The tissue sections of 4-6 micron thickness were cut with help of hand operated microtone and stained as per haematoxylin and eosin staining method (Luna, 1968) [9].

Results and Discussion
The incidence of cardiac hypertrophy and atrophy of cardiac muscles in heart of sheep in the

present study was recorded as 8.84 per cent.

Cardiac hypertrophy

This condition was found in 4 cases. The occurrence of this condition was recorded as 2.72 per cent. This is in close approximation to incidence recorded by Kumawat (2018) [5] as 2.46 per cent. Grossly, abnormal thickening of heart walls and enlargement of heart was found (Fig. 1). Macroscopic findings of this condition such as abnormal thickening of heart walls and enlargement of heart are in accordance with findings of Hussein and Staufenbiel (2014) [4] and Dawood and Alsaad (2018) [2]. On microscopic examination, increased size of cardiocytes in ventricular wall was observed. The sections showed hypertrophied appearance (Fig.2).

The microscopic findings in this condition such as increased size of cardiac muscles and hypertrophied appearance are in close conformity with the findings of Laus *et al.* (2010) [6] and Chitsazi and Shaghayegh *(*2015) [1]. In present investigation, cardiac hypertrophy may be due to various etiological agents like viral agents (Dawood and Alsaad, 2018) [2], in cases of congenital defects (Chitsazi and shaghayegh, 2015) [1] and in case of heart failure (Laus *et al.*, 2010) [6].

Atrophy of Cardiac muscles

This condition was found in 9 cases. The occurrence of this condition was recorded as 6.12 per cent. Higher incidence was recorded by Raji *et al.* (2010) [10] as 30.3 per cent in earlier study. Macroscopically heart was small in size and necrosed. Macroscopic findings such as atrophied heart and small size of heart are in accordance with findings of Raji *et al.* (2010) [10].

On microscopic examination cardiocytes decreased in size with necrosis of cells (Fig.3). The space between the myocytes increased due to decrease in size of cardiocytes (Fig.4). In present study, the microscopic findings of atrophied cardiac cells or decrease in size of cells are in close conformity with the findings of Seong *et al.* (2006) [11]. Atrophy of cardiac muscles may occur due to protozoal infection such as in balantidiasis in accordance with Seong *et al.* (2006) [11].

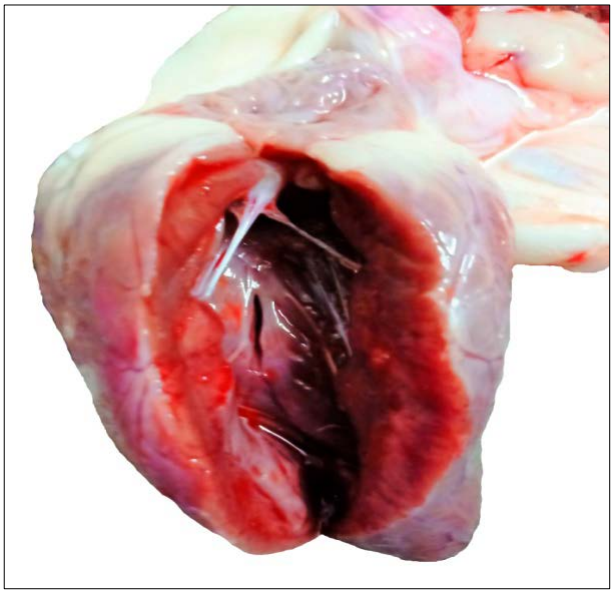

Fig 1: Gross photograph of heart of sheep showing thick ventricular walls.

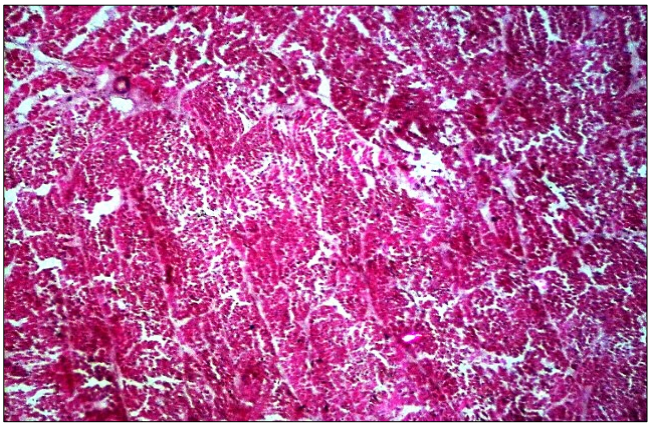

Fig 2: Microphotograph of heart of sheep showing increased size of cardiocytes in ventricular walls. (H&E, 100X).

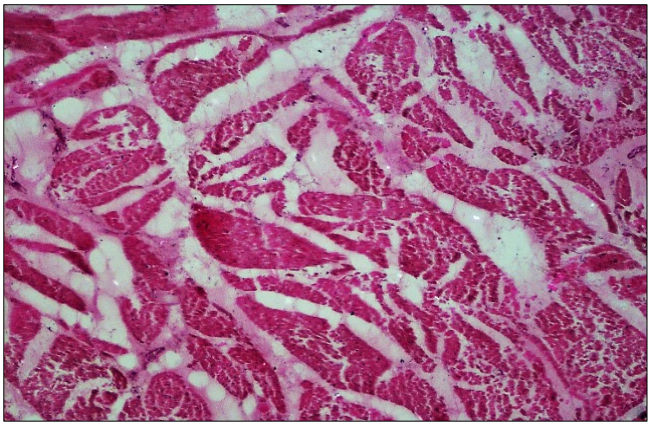

Fig 3: Microphotograph of heart of sheep showing atrophied myocardial cells along with necrosis. (H&E, 100X).

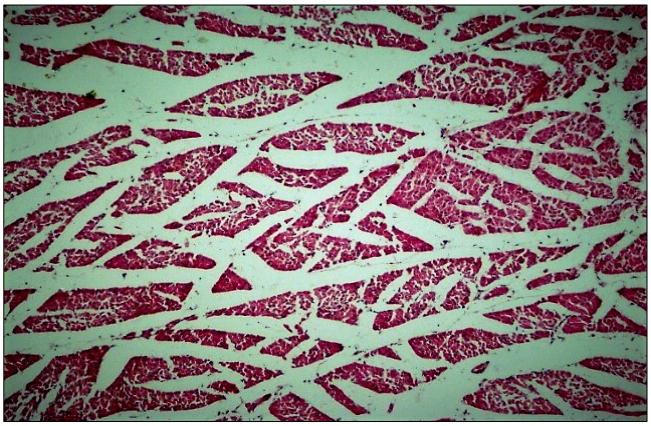

Fig 4: Microphotograph of heart of sheep showing atrophy of cells in myocardium. (H&E, 100X).

Conclusion

It is concluded that the cardiac hypertrophy and atrophy of cardiac muscles are pathological abnormalities in domestic animals resulting in weakness of animal with poor performance which inturn leads to economic losses to the rural and urban farmer.

Acknowledgement

We acknowledge the support and facilities provided by faculty of the department of Veterinary Pathology and Dean, College of Veterinary and Animal Science, Bikaner for present research work.

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