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REGULAR ARTICLES

Migratory Gaddi sheep and goats as potential carriers of *Theileria* infection: a molecular survey

Gopinath Devi[1] · Y. Ajith[2] · Gorakh Mal[1] · Umesh Dimri[3] · P. Preena[4] · Gauri Jairath[1] · Jobin Jose Kattoor[5] · Siju Susan Jacob[6] · Birbal Singh[1] · Jyoti Babu Dhar[1]

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Abstract

Theileriosis caused by parasites of the genus *Theileria*, is a vector-borne haemoprotozoan parasitic disease of critical concern in small ruminants. This study aimed to explore the infection status of migratory Gaddi sheep and goats with parasites from the *Theileria* genus in concurrence with ectoparasite infestations using molecular methods. Seventy three apparently healthy animals were randomly sampled from different flocks of migratory Gaddi sheep and goats and were systematically screened for ectoparasitic infestations. Molecular investigation for theileriosis was conducted using the genus wide polymerase chain reaction (PCR) technique. Out of 56 (76.71%) animals positive for the genus *Theileria*, 2 randomly selected amplicons were sequenced and subjected to BLAST analysis and were showing 99.71% identity with *Theileria luwenshuni*, a pathogenic *Theileria* species of small ruminants. To confirm the presence of *T. luwenshuni*, species-specific PCR was attempted to identify that 38 (52.05%) animals were infected by *T. luwenshuni*. On analysing the molecular prevalence data of *Theileria* to the ectoparasitism, it was evident that the infection existed in the animals irrespective of the type of ectoparasitic infestation and even *T. luwenshuni* was found in non-infested animals also. This is the first report of subclinical infections of *T. luwenshuni* in sheep and goats of Northern India and its potential carrier status. The asymptomatic carrier status of these nomadic animals is a matter possessing serious implications on the disease transmission rates and the production economics of small ruminant production in this region.

Keywords Ectoparasitism · Goat · Haemoparasites · Sheep · Small ruminants · Subclinical theileriosis

Introduction

Theileriosis caused by parasites of the genus *Theileria*, is an economically important vector transmitted haemoprotozoan disease affecting domestic and wild animals worldwide. Infection by *Theileria* organisms is described to cause clinical illness ranging from severe to subclinical forms, resulting in huge economic blight on livestock production (Bawm et al. 2018). High vector population and extensive grazing practices increase the risk of theileriosis among sheep and goats in tropical countries like India. Theileriosis in large ruminants' viz. cattle and buffaloes were intensively studied (Sivakumar et al. 2014; Pienaar et al. 2020) due to frequent reporting of the disease from all parts of the globe. However, there are several reports of caprine and ovine theileriosis from different countries (Hooshmand-Rad and Hawa 1973; Luo and Yin 1997; Tageldin et al. 2005; Altay et al. 2007; Fatima et al. 2015; Ringo et al. 2018); the number of reports from India is scarce (Velusamy et al. 2015; Mamatha et al. 2017; Begam et al. 2019; Nagaraj et al. 2019) implying the prospects of further

✉ Gopinath Devi
drdevigopinath@gmail.com

[1] Regional Station, ICAR-Indian Veterinary Research Institute, Palampur, Kangra Dist., Himachal Pradesh 176061, India

[2] Department of Veterinary Clinical Medicine, Ethics and Jurisprudence, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala 680651, India

[3] Division of Medicine, ICAR-Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh 243122, India

[4] Department of Veterinary Epidemiology and Preventive Medicine, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala 680651, India

[5] Animal Disease Diagnostic Laboratory, Purdue University, West Lafayette, IN 47907, USA

[6] National Institute of Veterinary Epidemiology and Disease Informatics, Bengaluru, Karnataka 560064, India