

Original Research Article

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Exploration of Molecular/Antigenic Mimicry between *Trichuris ovis* and its Ovine Host

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ABSTRACT

Trichuris ovis is one of the prevalent and non-pathogenic nematode of sheep. The whole anterior part of *T. ovis* remains embedded in the caecal mucosa of sheep with any marked inflammatory reaction. Helminth parasites evade host immune response by acquiring some host proteins or by mimicry of host antigens. The present study was conducted to explore any molecular mimicry between the *T. ovis* and sheep. Crude somatic antigen of anterior and posterior part of male and female and excretory-secretory antigen of *T. ovis* and the caecal mucosal antigen of sheep (CSAg-Ms) were prepared and antigenic characterization was done by SDS-PAGE and subsequently by western blot analysis with a view to detect any shared as well as cross-reactive antigens between *T. ovis* and CSAg-Ms. Five antigenic peptides (57, 51, 31, 21 and 14 kDa) were common among the antigens of *T. ovis* and caecal mucosal antigen of sheep. Five immunogenic peptides (75.6, 55, 47, 37.8 and 24 kDa) of *T. ovis* showed cross-reactivity with the hyperimmune sera against CSAg-Ms raised in rabbits. Therefore the comparatively non-pathogenicity of *T. ovis* in sheep might be due to the presence of antigenic mimicry as well as cross-reactive antigens between *T. ovis* and its host.

Keywords

Antigens, Mimicry,
Trichuris ovis,
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Introduction

Trichuris ovis is one among the most prevalent nematode parasites infesting the caecum of small ruminants irrespective of age, gender, and breed of the host worldwide. *Trichuris ovis* occurs as a co-infection with other helminths and it rarely causes clinical disease in ruminants (Jas *et al.*, 2016). *Trichuris* sp. is generally considered as non-pathogenic and in heavy infection they may cause haemorrhagic colitis and/or a diphtheritic inflammation of caecal mucosa

(Taylor *et al.*, 2007). *Trichuris* sp. has a thick-broad posterior part and a long filamentous anterior part which contains the stichosome oesophagus. Stichosome oesophagus of *Trichuris* like that of *Trichinella*, is extremely narrow, embedded in a chain of large cylindrical cell, the stichocytes which collectively form the structure of stichosome (Urquhart *et al.*, 1996). The stichocytes of *Trichinella* is rich in a variety of membrane bound granules which are highly immunogenic (Wakelin, 1984). The entire anterior part (stichosome oesophagus) of

Trichuris ovis remains embedded in the mucosa without any marked inflammatory and/or immune response (Soulsby, 1982) though the mucous membrane is the major site for immune response against gut pathogens. There are many lymphoid (T and B lymphocytes) and non-lymphoid effector cells in the normal mucosa and their number increase during parasitic infection (Wakelin, 1984).

Studies of the immune response against helminths are of great interest in understanding interactions between the host immune system and parasites. Worms are able to persist in the host and are mainly responsible for chronic infection despite a strong immune response developed by the parasitized host. Helminths have developed several means of escaping these immune responses. Recently, Maizels *et al.*, (2004) called them “masters of immunomodulation”. Several proteins produced by helminths were involved in the regulation of cytokine production (Harn *et al.*, 2009, Hewitson *et al.*, 2009). Host immune response to helminths is generally hampered by two main factors namely the complexity of antigenic profiles and the presence of cross-reactive determinants on antigens (Gamble *et al.*, 1990; Cuquerella *et al.*, 1994) of parasites or the molecular mimicry between the host and parasites (Damian, 1987).

While some species of *Trichuris* such as *T. vulpis* (dog, fox), *T. suis* (pig) and *T. trichiura* (man) are pathogenic (Soulsby, 1982) the non-pathogenicity of *T. ovis* might be due to unresponsiveness of host immune system to the antigens of *T. ovis*. Therefore the antigenic characterization and cross-reactivity among the antigens of *T. ovis* and host mucosal antigen were carried out with a view to detect the presence, if any, molecular mimicry between the *T. ovis* and caecal mucosal protein of sheep.

Materials and Methods

Experimental animals

Healthy New Zealand white strain rabbits (n=14) were used for raising hyperimmune serum (HIS) against crude somatic antigens (CSAg) and excretory-secretory antigen (ESAg) of *T. ovis* and caecal mucosal protein of sheep. Rabbits were maintained under conventional conditions with the provision of feed and water *ad libitum* in the Institutional Animal House for laboratory animals. The animal experimentation was designed following the standard guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) and was approved by the Institutional Animal Ethical Committee, West Bengal University of Animal and Fishery Sciences, India.

Collection of *T. ovis* and preparation of their crude somatic antigens

For collection of *T. ovis* the caecum and colon of slaughtered sheep were collected from local abattoir. The male and female worms from the excised organs were separately collected with the help of a forceps in 0.15M phosphate buffer saline (PBS, pH 7.2). The worms were then washed 4-5 times in 0.15M PBS (pH 7.2) Then the anterior and posterior portion of each worm both male and female were separated by cutting with the help of a fine scissors. Finally, the anterior and posterior portion of male and female worms were homogenized separately in 10 ml of chilled 0.15M PBS (pH-7.2) containing Phenyl methyl sulfonyl fluoride (PMSF) @ 25mM and Ethelene diamine tetra acetic acid (EDTA) @ 24mM in a homogenizer (IKA^R T10 basic Homogenizer, Germany). Then the homogenized materials were centrifuged in a cold centrifuge (Hermle centrifuge, Germany) at 4°C at 10000 r.p.m. for 45 minutes. Then the supernatant was

collected as a crude somatic antigen (Klesius *et al.*, 1986). Crude somatic antigens (CSAg) of anterior portion of both male and female worms were concentrated with the help of Centriprep Centrifugal Filter Device (Millipore). At first 10 ml distilled water (D. W.) was put inside the apparatus and centrifuged at 3000 r.c.f. for ten minutes. After centrifugation D.W. was discarded and the crude somatic antigens of anterior portion of both male and female (10 ml) was poured separately in two devices and again centrifuged at 3000 r.c.f. for forty minutes.

After centrifugation the filtrate was collected as a concentrated antigen. Protein concentration of CS Ag was estimated by the method of Lowry *et al.*, (1951). The protein content of CS Ag of anterior portion of male (CSAg-TMa) and female (CSAg-TFa) *Trichuris* were 2.58mg/ml and 2.69mg/ml, respectively. The crude somatic antigen of posterior portion of male (CSAg-TMp) and female (CSAg-TFp) had the protein concentration of 3.66 mg/ml and 6.7 mg/ml, respectively.

Preparation of Caecal mucosal antigen (CSAg-Ms) of sheep

For preparation of caecal mucosal antigen at first caecum of slaughtered sheep was excised and faecal material from the caecum was cleaned properly in running tap water. Then the mucosal surface was washed two times with normal saline solution (NSS) and then washed three times with PBS (pH-7.2). The mucosal surface was scrapped with the help of a scalpel from different areas of caecum and kept in a petri dish.

About 5gm of mucosal tissue was washed five times with PBS (pH-7.2) containing 1000 IU/ml penicillin, 1mg/ml streptomycin and fluconazole. After washing 5gm of caecal tissue in 15ml of PBS (pH-7.2) was

homogenized in tissue homogenizer (IKA^R T10 basic Homogenizer, Germany) and the homogenized materials was centrifuged at 10000 r.p.m. for 45 minutes at 4°C. Then the supernatant was collected as caecal mucosal antigen. The protein content was estimated by the method of Lowry *et al.*, (1951) and the protein concentration was 5mg/ml and the antigen was preserved at -20°C for further use.

Preparation of Excretory- Secretory Antigen (ESAg) of *T. ovis* (ESAg-T)

The excretory-secretory antigen of *Trichuris ovis* (ESAg-T) was prepared according to the method described by Prasad *et al.*, (2008). The worms were collected from the caecum and colon of slaughtered sheep by the process stated as above and washed in the PBS for three times. Then the worms were washed three times in PBS (pH-7.2) containing 1000 IU/ml penicillin and 1 mg/ml streptomycin and Fluconazole. Then the adult worms were put in RPMI 1640 supplemented with 2% glucose and incubated at 37°C for overnight in an atmosphere of CO₂. After overnight incubation worms were removed from the medium.

Then the medium was centrifuged at 10000 rpm for 30 min at 4°C. The supernatant was collected and concentrated with the help of Centriprep Centrifugal Filter Device (Millipore) as stated above. After centrifugation the filtrate was collected as excretory-secretory antigen (ESAg-T).

Then the concentrated antigen was filtered through 0.2µm filter membrane (Corning Sterile Syringe Filter, Germany). Phenyl methyl sulfonyl fluoride (PMSF) @ 25mM was added to the filtrate and stored at -20°C for further use. Protein concentration of ESAg-T was estimated by the method of Lowry *et al.*, (1951) and the protein concentration was 1.75 mg/ml.

The raising of HIS against the prepared antigens

Hyper-immune sera against the parasitic antigens (CSAg-TMa, CSAg-TFa, CSAg-TMp and CSAg-TFp) and caecal mucosal protein of sheep were raised in New Zealand White strain rabbits (Hudson and Hay, 1989). The antigen (0.5 mg antigenic protein) thoroughly emulsified with equal volume Freund's complete adjuvant was injected intramuscularly and followed by four booster doses (1.0, 1.5, 2.0, and 2.5 mg) in equal volume of Freund's incomplete adjuvant at weekly intervals. Blood from the hyper-immunized rabbits was collected 7 days following the last booster and then the separated serum was preserved at -20°C till further use.

Determination of peptide profiles of the antigens

Protein profile of crude somatic antigen of *T. ovis* and caecal mucosal protein of sheep were determined by Sodium dodecyl polyacrylamide gel electrophoresis (SDS-PAGE) in 10% gel as per the method of Laemmli (1970). Broad range molecular weight marker (10.0 to 250 kDa, Thermo Scientific, Lithuania) was used. After completion of the run, the separating gel containing different antigenic proteins were stained by Coomassie brilliant blue. The molecular weight (MW) of the unknown polypeptides of the test protein mixtures was determined by the Gel Documentation System, (BioRad, Japan).

Antigenic characterization

Antigenic characterization of the prepared antigens was done by western blotting technique using HIS raised in rabbits against the antigens under the present study. After separating the antigenic polypeptides by SDS-

PAGE, the gel lane having the marker was stained by Coomassie brilliant blue. The electrophoretic transfer of parasitic antigens resolved by SDS-PAGE was done by blotting onto a nitrocellulose membrane (BioRad, Mini-Size Nitrocellulose TransBlot Turbo) and immunoreactions development was carried out as per the standard method (Towbin *et al.*, 1979). For the western blot analysis the dilution of HIS and the goat anti-rabbit IgG-horse radish peroxidase (HRPO) conjugates (GeNei, Bangalore) were 1: 50 and 1: 500, respectively. The molecular weight (MW) of the antigenic polypeptides was determined by the Gel Documentation System, (BioRad, Japan).

Results and Discussion

Polypeptide profiles of the antigens

The polypeptide profile of the six antigens under study was analyzed by SDS-PAGE and their polypeptide profiles are presented in Table 1. The CSAg-TMa revealed 7 polypeptides with the molecular weight (MW) ranging from 115 – 14.0 kDa of which 57, 51, 39.5 and 31 kDa polypeptides were found as dominant (Fig. 1). Ten polypeptides with the molecular weight (MW) ranging from 115 – 12.6 kDa were detected in CSAg-TFa by SDS-PAGE (Table 1) and the dominant polypeptides were of 63, 59, 55, 31 kDa (Fig. 1).

SDS-PAGE analysis of CSAg-TMp revealed 11 polypeptides MW ranging from 224.2 – 10.2 kDa (Table 1) and four polypeptides having the MW of 47, 29.3, 15 and 12 kDa were recorded as dominant (Fig. 2). Eleven polypeptides (MW ranging from 224.2 – 10.2 kDa) were detected by SDS-PAGE in CSAg-TFp (Table 1). Five polypeptides (107, 75.6, 60.3, 47 and 35.2 kDa) in CSAg-TFp were detected as dominant polypeptides in SDS-PAGE analysis (Fig. 2). Out of eleven

polypeptides of ESAg-T (MW ranging from 250 – 10.4 kDa) four polypeptides (250, 31, 24 and 17.2 kDa) were identified as the dominant polypeptides (Table 1) by SDS-PAGE analysis (Fig. 3).

The Caecal mucosal protein of sheep revealed 9 polypeptides (MW ranging from 116.2 – 14.3 kDa) in SDS-PAGE analysis (Table 1), out of which five polypeptides (65.2, 51, 41.2, 31 and 14 kDa) were recognized as dominant polypeptides (Fig. 1).

Antigenic characterization of *T. ovis* and host caecal mucosal protein

Western blot analysis using homologous antisera detected 6 immuno-reactive polypeptides (MW ranging from 57-14 kDa) in CSAg-TMa (Table 2) of which 3 polypeptides with the MW of 51, 39.5 and 14 kDa were detected as the major immunoreactive polypeptides (Fig. 4). Out of 10 polypeptides of CSAg-TFa, 5 polypeptides (MW ranging from 63 -16.7 kDa) were found immunogenic by western blot analysis using homologous antisera (Table 2) and the immunodominant polypeptides were of 55, 39.5 and 16.7 kDa (Fig. 4).

Out of 11 polypeptides of CSAg-TMp four polypeptides were detected as immunogenic in western blot analysis against the homologous antiserum raised in rabbit (Table 2). The polypeptides in CSAg-TMp having the MW of 75.6, 47, and 15 kDa were found as immunodominant (Fig. 5). Seven out of 11 polypeptides in CSAg-TFp were detected as immuno-reactive using homologous HIS (Table 2). The polypeptides having the MW of 159.1, 107, 60.3 and 47kDa were found as immuno-dominant in CSAg-TFp (Fig. 5).

Out of 10 polypeptides of ESAg-T five polypeptides (MW ranging from 250 - 24 kDa) were detected as immunogenic against

the homologous HIS (Table 2). The polypeptides in ESAg-T having the MW of 51 and 31 kDa were found as dominant immunopeptides (Fig. 6). Four polypeptides (MW; 65.2, 51, 31 and 14 kDa) out of 9 polypeptides in CSAg-Ms reacted with homologous HIS in western blot analysis (Fig. 7). The immunodominant polypeptides were of 65.2, 51 and 31 kDa (Table 2).

Cross-reactivity between the antigens of *T. ovis* and host caecal mucosal antigen

The results of cross-reactivity between the antigens (CSAg-TMa, CSAg-TFa, CSAg-TMp, CSAg-TFp, ESAg-T) of *T. ovis* and host caecal mucosal protein as determined by western blot analysis using HIS against caecal mucosal protein of sheep under study were presented in Table 3. In case of CSAg-TMa, two dominant immunogenic polypeptides (MW; 51 and 21kDa) cross-reacted with the HIS against CSAg-Ms (Fig. 7). Two immunogenic polypeptides (MW; 55 and 21 kDa) of CSAg-TFa cross-reacted with the HIS against CSAg-Ms (Fig. 7) and both the polypeptides were recognized as immunedominant by the heterologous antisera.

Two immunogenic polypeptides (47 and 21 kDa) of CSAg-TMp cross-reacted with the HIS against CSAg-Ms (Fig. 7) and only one polypeptide (47 kDa) was the dominant cross-reacting polypeptide and in case of CSAg-TMp. Three immunogenic polypeptides (MW; 75.6, 47 and 21 kDa) of CSAg-TFp revealed cross-reactivity with the HIS against CSAg-Ms (Fig. 7) and out of these two polypeptides (MW; 75.6 and 47 kDa) were recognized as immune-dominant polypeptides.

Four immunogenic polypeptides (MW- 37.8, 31, 24 and 21 kDa) of ESAg-T out of five showed cross-reactivity with the HIS against CSAg-Ms (Fig. 8) and the cross-reacting dominant polypeptides were of 31 and 21 kDa.

Fig.1 Comparative polypeptide profile of ovine caecal mucosal protein (L-1), CSAg-TMa (L2) and CSAg-TFa (L3)

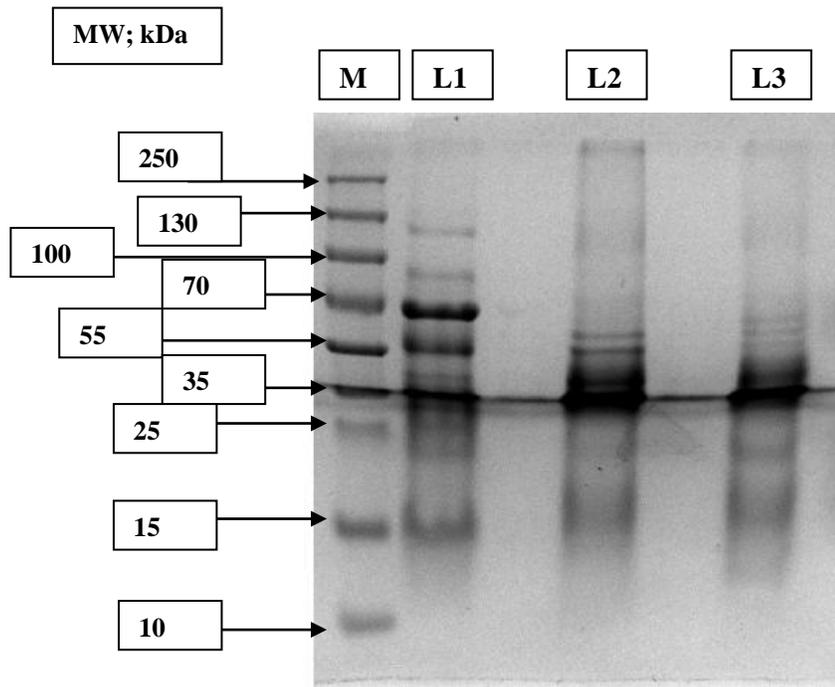


Fig.2 Comparative polypeptide profile of ovine caecal mucosal protein (L-1), CSAg-TMp (L2) and CSAg-TFp (L3)

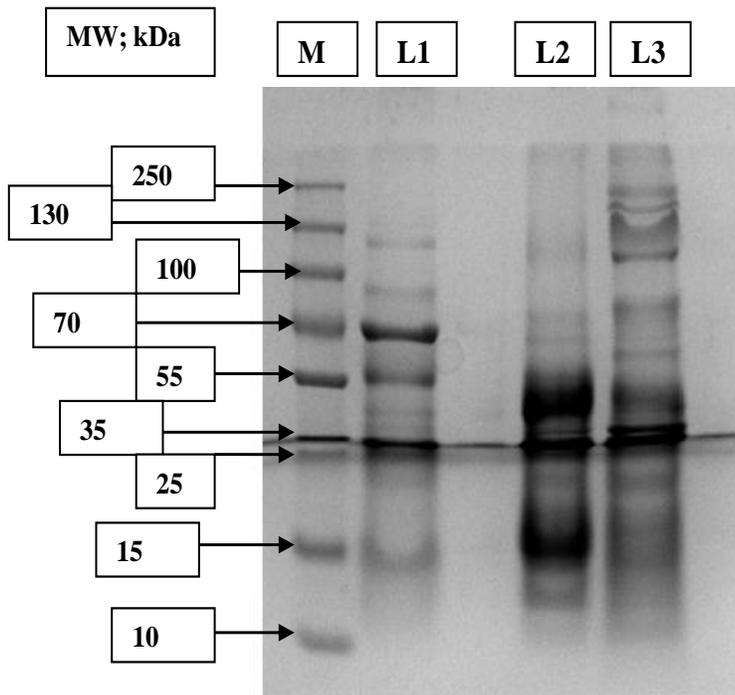


Fig.3 Comparative polypeptide profile of ovine caecal mucosal protein (L-1), and ESAg-T (L-3)

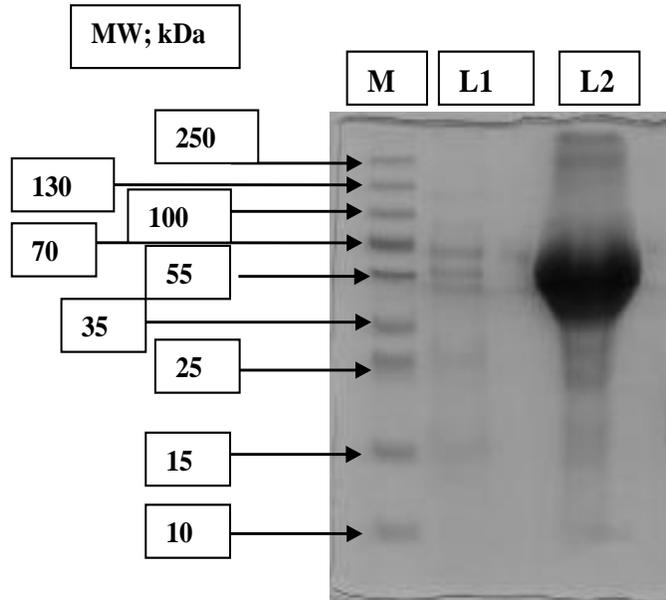


Fig.4 Western blotting Pattern of CSAg-TMa (L-1) and CSAg-TFa (L-2) against the homologous HIS

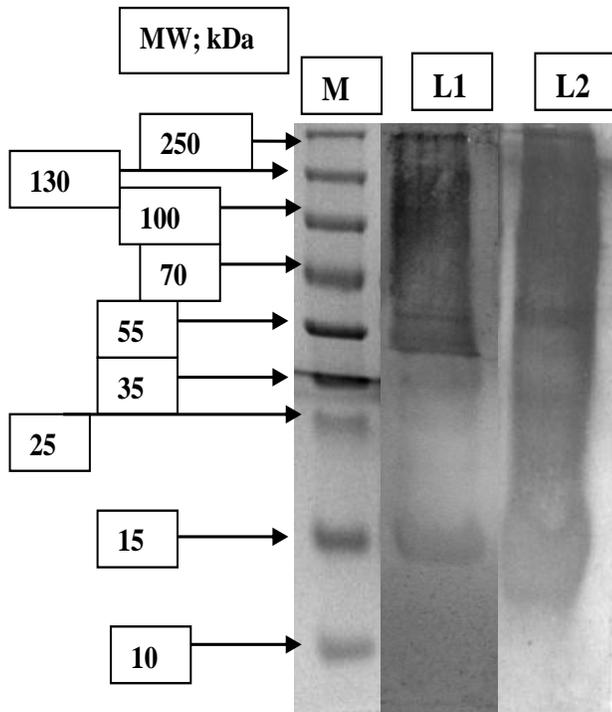


Fig.5 Western blotting Pattern of CSAg-TFp (L-1) and CSAg-TMp (L-2) against the homologous HIS

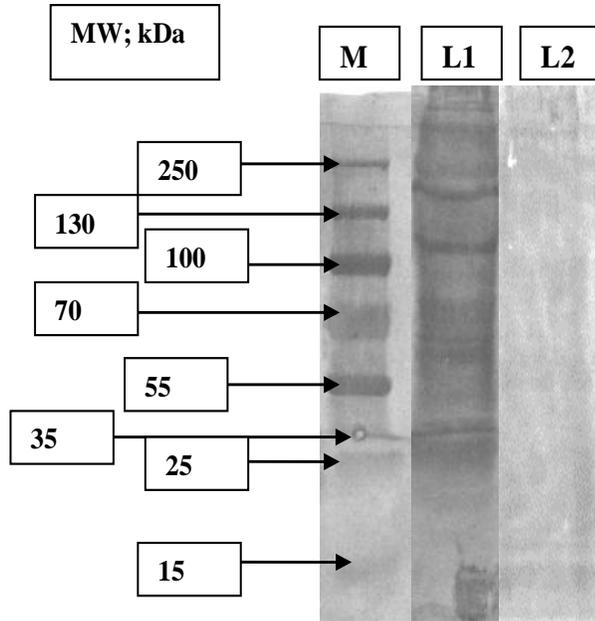


Fig.6 Western blotting Pattern of ESAg-T (L-1) against the homologous HIS

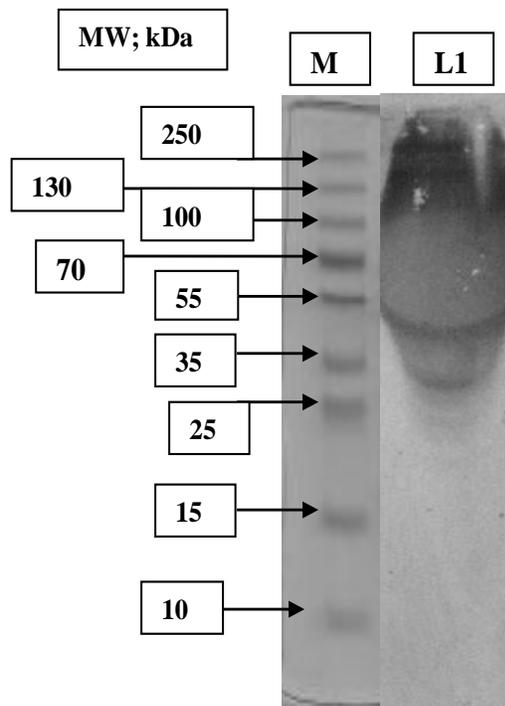


Fig.7 Western blotting pattern of CSAg-TFp (L-1), CSAg-TMp (L2), CSAg-TFa (L3), CSAg-TMa (L4), and CSAg-Ms (L-5) using HIS raised against caecal mucosal protein

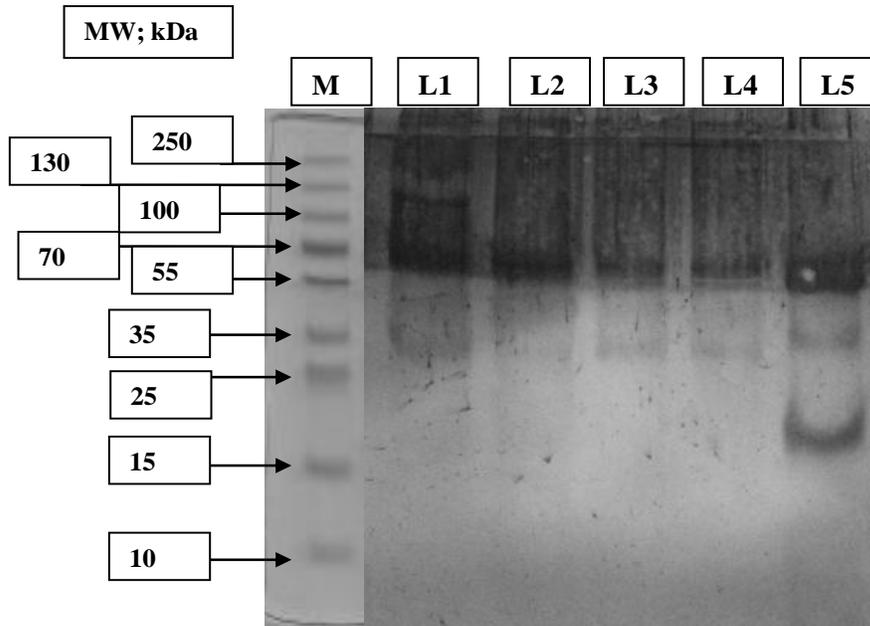


Fig.8 Western blotting pattern of ESAg-T (L-1) and CSAg-Ms (L-2) using HIS raised against caecal mucosal protein

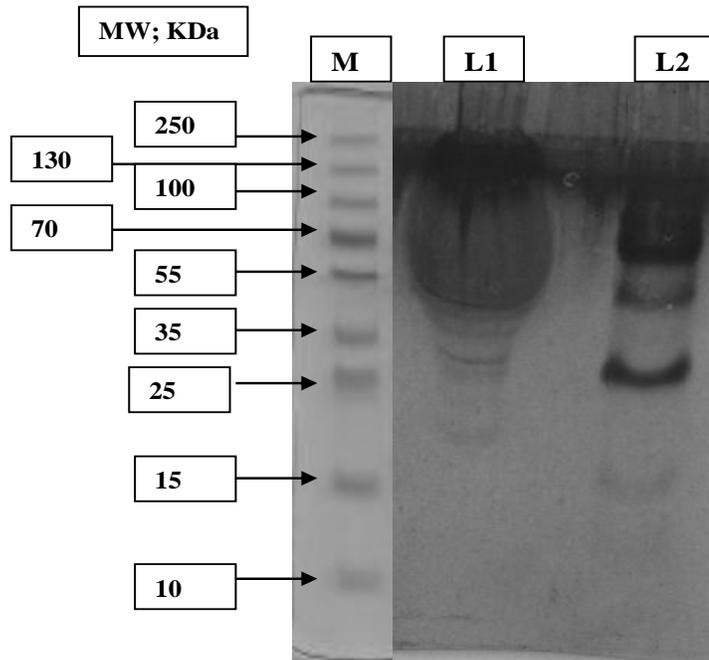


Table.1 Polypeptide profile of the various antigens as resolved by SDS-PAGE analysis

Sl. No.	Antigens	Range of M.W. (kDa)	No. of peptides	M. W. (kDa) of the peptides	Dominant peptides
1	CSAg-TMa	14.0-115	7	115, 57, 51, 39.5, 31, 21 and 14	57, 51, 39.5 and 31
2	CSAg-TFa	12.6-115	10	115, 63, 59, 57, 55, 39.5, 31, 21, 16.7 and 12.6	63, 59, 55 and 31
3	CSAg-TMp	10.2-224.2	11	224.2, 159.1, 107, 75.6, 65.2, 47, 29.3, 21, 15, 12 and 10.2	47, 29.3, 15 and 12
4	CSAg-TFp	10.2-224.2	11	224.2, 159.1, 107, 75.6, 60.3, 47, 35.2, 21, 17.2, 14 and 10.2	107, 75.6, 60.3, 47 and 35.2
5	ESAg-T	10.4-250	11	250, 173.5, 57, 51, 37.8, 31, 24, 21, 17.2, 15 and 10.4	250, 31, 24 and 17.2
6	CSAg-Ms	14-116.2	9	116.2, 85.2, 65.2, 57, 51, 41.2, 31, 21 and 14	65.2, 51, 41.2, 31 and 14

Table.2 Immunogenic polypeptide profile of the various antigens as determined by western blot using homologous hyper immune sera

Sl. No.	Antigens	HIS	Immunogenic Polypeptides	Dominant peptides
1	CSAg-TMa	HIS against CSAg-TMa	57, 51, 39.5, 31, 21 and 14	51, 39.5 and 14
2	CSAg-TFa	HIS against CSAg-TFa	63, 55, 39.5, 31 and 16.7	55, 39.5 and 16.7
3	CSAg-TMp	HIS against CSAg-TMp	75.6, 47, 21 and 15	75.6, 47 and 15
4	CSAg-TFp	HIS against CSAg-TFp	224.2, 159.1, 107, 75.6, 60.3, 47 and 21	159.1, 107, 60.3 and 47
5	ESAg-T	HIS against ESAg-T	250, 51, 37.8, 31 and 24	51 and 31
6	CSAg-Ms	HIS against CSAg-Ms	65.2, 51, 31 and 14	65.2, 51 and 31

Table.3 Cross-reacting polypeptide profile of the various antigens as determined by western blot using hyper immune sera against caecal mucosal protein of sheep

Sl. No.	Antigens	Cross-reacting Immunogenic Polypeptides	Dominant peptides
1	CSAg-TMa	51 and 21	51 and 21
2	CSAg-TFa	55 and 21	55 and 21
3	CSAg-TMp	47 and 21	47
4	CSAg-TFp	75.6, 47 and 21	75.6 and 47
5	ESAg-T	37.8, 31, 24 and 21	31 and 21

Antigenic similarity or shared antigens between *T. ovis* and caecal mucosal antigen

Three polypeptides (57, 31 and 21 kDa) were common among the CSAg-TMa, CSAg-TFa, ESAg-T and CSAg-Ms (Table 1). One polypeptide of 31 kDa was found immune-reactive against the HIS raised against all the four antigens. Besides the above three, one polypeptide having the MW of 51 kDa was shared among the CSAg-TMa, ESAg-T and CSAg-Ms and 14 kDa polypeptide was common between CSAg-TMa and CSAg-Ms and both the polypeptides (51kDa and 14 kDa) were immunogenic. One polypeptide of 21 kDa was shared among all the six antigens under study and this polypeptide showed immuno-reactivity with the HIS against CSAg-TMa, CSAg-TMp and CSAg-TFp (Table 2). Therefore a total of five antigenic polypeptides (57, 51, 31, 21 and 14 kDa) were shared between *T. ovis* and host caecal mucosal protein (Table 1).

Antigenic complexity is a major challenge for immunological approaches to diagnosis and control of parasitic infections, especially for the helminths, which are metazoan organisms. Different antigens of *Trichuris ovis* of sheep *viz.*, anterior and posterior part of both male and female parasite and also their excretory-secretory products were characterized to have an idea about the complexity of different antigens of *T. ovis*.

Earlier report on characterization of polypeptide profile of *Trichuris ovis* is very rare. Eight polypeptides (107, 59, 51, 47, 39.5, 31, 21 and 12 kDa) of crude somatic antigens of *T. ovis* recorded in the present study have been reported earlier by Jas *et al.*, (2016). The crude somatic antigen of anterior part of male *T. ovis* showed six immunogenic polypeptides whereas the posterior part showed four immunopeptides against the homologous rabbit antisera. In female *T. ovis*

the anterior part revealed five immunogenic polypeptides and seven immunopeptides were recorded in the posterior part. Excretory-secretory (ES) product of helminth parasites have also attracted the attention of researchers as they display immunogenic properties and their nature of antigens are less complex compared to somatic antigens (Arunkumar, 2012).

In the present study excretory-secretory antigen of *Trichuris ovis* showed 11 polypeptides (MW; 250-10.4 kDa) of which 5 peptides (57, 51, 31, 21 and 15 kDa) were shared with the different somatic antigens of *Trichuris* and six peptides (250, 173.5, 37.8, 24, 17.2 and 10.4 kDa) were specific for excretory-secretory products of *Trichuris ovis*. Sharing of antigens between the somatic and ES antigen of helminths has been reported earlier by Jas (2008) who reported that 3 peptides of 78, 73 and 50 kDa were shared between the CSAg and ES antigen of *Oesophagostomum*.

The interaction of host immune system and parasites is an emerging topic of research among the immunologists and molecular biologists all over the world. The nature of many parasitic worms is to modulate the host immune response and thereby conciliating some diseases and aggravating others in their host (Kamal and Khalifa, 2006). Immunogenic properties of caecal mucosal protein (CSAg-Ms) of sheep have not been recorded earlier. In the present study out of 9 peptides in CSAg-Ms four peptides were identified as immunogenic against HIS raised in rabbits. Five polypeptides caecal mucosal antigen of sheep were shared with the different somatic and ES antigens of *Trichuris*. Presence of shared antigens or epitopes among the helminth parasites have been reported widely (Jasmer *et al.*, 1993). In the present study several shared antigens/immunogens have been detected.

Antigenic cross-reactivity or cross-antigenicity among the helminth parasites is one of the major limitations for developing a reliable tool for immunodiagnosis or for immunoprophylaxis against parasitic diseases. Cross-reactivity among the antigens of helminth parasites have been reported from all over the world (Cuquerella *et al.*, 1994; Jas *et al.*, 2016). Cross-reactivity between the somatic antigen of *Trichuris* and sheep caecal mucosal antigen has been observed in the present research. Two antigenic peptides (37.8 and 24 kDa) of ES_{Ag}-T cross-reacted with the HIS against the host caecal mucosal protein. One immunogenic peptide of 55 kDa in CS_{Ag}-TF_a was recognized by the antibody against sheep caecal mucosal protein. Cross-reacting antigens between the *T. ovis* and host caecal mucosal protein might be playing some role in the unresponsiveness of host immune system to the *T. ovis* antigens and hence no marked inflammatory reaction at the site of attachment.

The immunological relationships between the parasites and their vertebrate host are complex and imperfectly understood. In this direction the sharing of antigens between parasite and host i.e. the molecular mimicry helps in understanding a little about the host-parasite immunological relationship (Damian, 1964). In the present study molecular mimicry between *Trichuris ovis* and sheep has been explored by demonstration of shared antigens/immunogens between *Trichuris ovis* (somatic and ES) antigens and caecal mucosal protein of sheep using electrophoresis and immunoblotting technique. Five immunogenic peptides (57, 51, 31, 21 and 14 kDa) were shared between the antigens of *Trichuris ovis* and caecal mucosal protein of sheep. Molecular mimicry between parasites and their host is rare except few studies in *Schistosoma*. Host immune evasion by the schistosomes might be due to molecular mimicry and the parasite shared some

antigens with the host (Damian, 1964) as observed sharing of antigens between *T. ovis* and its ovine host in the present study. Whole of the anterior part of *Trichuris* remains embedded in the mucosa and sub-mucosa of sheep without any gross severe local immunological or inflammatory response at the site of attachment though the mucosa and sub-mucosa of intestine is rich in cells of immune system (Wakelin, 1984). The site of attachment at the caecal mucosa does not reveal any gross immuno-pathological lesions and this might be due to the presence of shared immunogenic peptides between *Trichuris ovis* and its host. As a result of this some potent immunogens of *T. ovis* might be recognized as self by the host immune system which would not evoke any immune reaction against the parasite. The present study indicates the presence of shared antigens or molecular mimicry between *T. ovis* and its ovine host.

Antigenic nature of *Trichuris ovis* is complex. Antigenic mimicry has been recorded between the *T. ovis* and sheep, in which *T. ovis* shares some host caecal proteins. Therefore comparatively non-pathogenicity of *Trichuris ovis* might be due to the sharing of immunogenic peptides and cross-reactivity with the host caecal mucosal protein.

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