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De plus, cette multiplication anisotypique, s'intriquant avec les phénomènes de lyse, fausse les pourcentages d'immobilisation et constitue très vraisemblablement une des causes des résultats paradoxaux auxquels nous avons fait allusion à la fin du paragraphe « Evaluation de la survie ».

D'une façon pratique, il semble qu'en dehors de la méthode classique de congélation, le procédé le plus simple et le plus efficace pour conserver la mobilité des *Borrelia* consiste à diluer le sang richement infesté au 1/8 en eau physiologique, à se débarrasser des globules rouges par décantation ou centrifugation à très faible pression ( $\leq 1.000$  tours/minute) et à maintenir ce milieu à  $+ 4^{\circ}$  sans anaérobiose.

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From the London School of Hygiene & Tropical Medicine.

## A Critical Survey of the Representation of the Genus *Trichuris* in Ruminants in Indo-Pakistan.

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SPREHN (1927) examined whipworm material from sheep and goats from slaughterhouses in Germany and from the Berlin Museum and found that *Trichuris globulosa*, which was previously only known to occur in camels, was quite common in sheep and goats.

BAYLIS (1932), on finding a single female of *Trichuris globulosa* amongst material collected from a bull at Uganda, examined other material lying in the collection of the British Museum (Natural History), previously determined as *T. ovis*, and discovered another five sets of specimens of *T. globulosa* originating from cattle, sheep and goats from Uganda, Zululand and Natal. BAYLIS (1932) concluded on the basis of these observations that *T. globulosa* is probably as common as *T. ovis* in domestic ruminants in Uganda and Zululand and probably East and South Africa.

The observations by ORTLEPP (1937) on whipworms of ruminants in South

Africa were very interesting in that he did not find a single example of *T. ovis* in the *Trichuris* collection of Onderstepoort Institute of Animal Industry, and all the whipworm collections had previously been identified as *T. ovis*. He, however, stated that "... materials from various localities in South Africa in the collections of this institute which had been identified as *T. ovis*, have, on re-examination, proved to belong practically all to the species *T. globulosa*, most striking, however, is that among this material there is not a single example of *T. ovis* as redescribed by BAYLIS (1932) and by CHANDLER (1930)".

It was primarily due to ORTLEPP's observations in South Africa that the present survey was undertaken. The material, examined, comprised the following collections:

1. Two collections from sheep from Darjeeling, India, deposited in the British Museum (Natural History) by LANE in 1916.
2. Four collections from sheep by H. S. GAIGER, lying in the Parasitology Section of the College of Animal Husbandry.
3. Four collections lent to the author by Dr. H. D. SRIVASTAVA.
4. Two collections from sheep from East Pakistan received through the courtesy of Officer-in-Charge, Pakistan Institute of Animal Husbandry, Comilla.
5. Two collections from British Museum labelled by Dr. H. A. BAYLIS as originating from *Ovis vignei* (India) dying in the London Zoological Gardens and determined by Dr. BAYLIS as *T. ovis*.
6. Two collections from chinkara deer (*Gazella benetti*) from the Lahore Zoological Gardens.
7. Twenty two collections from cattle and buffaloes by the author from the slaughterhouses at Sheikhpura and Lahore.
8. Collections from twenty two sheep and goats by the author from slaughterhouses at Lahore and Choa Saidan Shah.
9. Collections (of which a precise record is not available) at the Indian Institute of Veterinary Research, Izatnagar, labelled as *T. ovis* by Dr. G. D. BHALERAO.

The striking fact that emerged out of these studies was that not on a single occasion was any example having a resemblance to *T. ovis* detected in the collections. In all the collections from sheep and goats *T. skrjabini*, alone or in combination with *T. globulosa*, was found to occur. On the other hand, *T. discolor*, alone or in combination with *T. globulosa*, was found to occur in collections from cattle and buffaloes. The two collections determined by Dr. BAYLIS as *T. ovis* (originating from *Ovis vignei*, India) were found to belong entirely to the species *T. skrjabini* and there was not a single example conforming to the description of *T. ovis* in either of the two collections. The results of a thorough examination of 28 sheep and goats have been tabulated. The table contains information on worm burden, sex ratio and incidence of the species of *Trichuris*. From the table and from the other sources quoted elsewhere in the text, it is clearly borne out that *T. skrjabini* is the dominant *Trichuris* species in sheep, goats, *Gazella benetti* and *Ovis vignei* in India. THAPAR and SINGH (1954) described the life history of *T. ovis* from sheep and goats in India. THAPAR and SINGH (1954) have offered a very brief and unsatisfactory account of the morphology of the material and though not quite plain but evidently it is a mixed account of the species *T. globulosa* and *T. skrjabini*. The spicular sheath in their drawing has a close resemblance to that of *T. globulosa* and not *T. ovis*. Their account of vulva and vagina is, on the other hand, suggestive of *T. skrjabini*. By far the most important reason for suspecting the identity of the material studied by THAPAR and SINGH (1954)

TABLE

Showing the Sex Ratio, Worm Burden and Incidence of the Species of the Genus *Trichuris* in Sheep and Goats in the Punjab-Pakistan.

Locality of examination	Date of examination	Species of animal	Total number of worms collected	Number of worms of different species collected			
				T. globulosa		T. skrjabini	
				Male	Female	Male	Female
Choa Saidan Shah (2,500 feet above sea level)	10. 7. 55	goat, young	—	—	—	—	—
	11. 7. 55	goat	82	1	1	33	47
	12. 7. 55	goat, old	170	—	—	53	117
	13. 7. 55	sheep, young	14	—	—	4	10
	14. 7. 55	sheep, young	110	3	3	26	78
	14. 7. 55	sheep, young	42	—	—	17	25
	15. 7. 55	goat, old	—	—	—	—	—
	15. 7. 55	goat, young	51	—	—	17	34
	16. 7. 55	sheep, young	24	—	—	6	18
	Lahore (alluvial plain)	18. 7. 55	goat	35	3	1	15
19. 7. 55		goat	23	4	2	4	13
20. 7. 55		goat	—	—	—	—	—
20. 7. 55		goat	23	4	3	4	12
28. 7. 55		goat	—	—	—	—	—
1. 8. 55		goat	85	20	20	11	34
2. 8. 55		goat	—	—	—	—	—
4. 8. 55		goat	3	1	2	—	—
5. 8. 55		sheep	33	—	—	14	19
8. 8. 55		sheep	34	—	8	15	16
10. 8. 55		sheep	9	—	—	4	5
11. 8. 55		sheep	8	—	1	3	4
14. 8. 55		sheep	4	1	2	1	—
18. 8. 55		sheep	5	—	2	2	1
19. 8. 55		sheep	54	5	4	23	22
20. 8. 55		sheep	—	—	—	—	—
21. 8. 55	sheep	23	1	1	6	15	
26. 8. 55	sheep	23	1	2	13	7	

appears to lie in the fact that throughout their account which also includes the incidence of *Trichuris* in sheep and goats collected over a period of two years, there is no mention at all of any other species, except *ovis*, as occurring in India.

The author feels convinced that *T. ovis* must either be an extremely rare parasite or it may not at all occur in Indo-Pakistan.

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