

# Bovine and Equine Onchocerciasis in Eastern North America with a Discussion on Cuticular Morphology of *Onchocerca* spp. in Cattle

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## ABSTRACT

Skin sections and/or the ligamentum nuchae and ligamentum gastrolienale were examined from twelve bovine carcasses obtained from southern and eastern Ontario and from Quebec. Of these, seven were shown to be infected with *Onchocerca gutturosa* and/or *Onchocerca lienalis*. The morphology of the adult female cuticle is discussed.

Skin sections from 43 equine carcasses from a slaughter house in Grenville, Quebec were examined and microfilariae of *Onchocerca* sp. were recovered from 32 (74%). These are probably referable to *Onchocerca cervicalis*.

## RÉSUMÉ

Cette étude visait à examiner des segments de la peau et/ou des ligaments nuchal et gastro-splénique de 12 carcasses bovines provenant du sud et de l'est de l'Ontario, ainsi que du Québec. Ces examens révélèrent la présence d'*Onchocerca gutturosa* et/ou d'*Onchocerca lienalis* dans sept de ces carcasses. Les auteurs commentent la morphologie de la cuticule des adultes femelles.

L'examen de segments de la peau de 43 chevaux abattus à Grenville, Québec, permit de démontrer la présence d'*Onchocerca* sp., chez 32, i.e. 74% de ces chevaux. Ces microfilaries correspondent probablement à *Onchocerca cervicalis*.

Although both bovine and equine infections by *Onchocerca* spp. have been widely reported from the United States, there is a paucity of information on the distribution of members of this genus in domestic animals in Canada. Marcoux *et al* (6) reported three cases of equine onchocerciasis from Quebec. Webster *et al* (8) reported bovine onchocerciasis from Manitoba and Saskatchewan. Ali-Khan (1) reported on the occurrence of zoonotic onchocerciasis in a human, possibly acquired in Ontario.

Tissues became available to us from animals received at this Institute from various areas of southern and eastern Ontario and the eastern townships of Quebec. Although these animals were used in other studies the opportunity was taken to examine them for the presence of *Onchocerca* spp.

Areas of skin were removed from the umbilical region of both bovine and equine carcasses, cut into strips approximately 3 x 15 mm and placed in small vials containing buffered physiological saline. Left overnight at room temperature the skin strips were removed from the saline the following day and 10% buffered formal-saline was added to the tubes. The contents were allowed to settle and the sediment was examined for microfilariae as a wet-mount preparation using phasecontrast microscopy.

The ligamentum nuchae and ligamentum gastrolienale from bovine carcasses were examined using a low power dissecting microscope. Adult nematodes were fixed in hot alcohol-glycerol-formalin solution and cleared in alcohol-phenol which was gradually replaced with glycerin.

Tissues from twelve bovine carcasses collected from December 1977 through March 1978 were examined. Eleven were from widely scattered areas of southern and eastern Ontario and one from the eastern

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townships of Quebec. Of these, seven were shown to be infected with *Onchocerca* sp. (Table I) either by the isolation of microfilariae from umbilical skin tissues, by the recovery of adults from ligaments or by a combination of both methods. The finding of bovine *Onchocerca* spp. in Ontario and Quebec extends the known distribution of this genus in Canada. It had previously been reported from Manitoba and Saskatchewan (8).

The general morphology of the adults and the dimensions of the microfilariae from bovines is consistent with descriptions of these species by other workers (2, 4). Although the nematodes found in the ligamentum nuchae and the ligamentum gastrolienale are considered by some to belong to a single species (4) we regard them as distinct, *O. gutturossa* from the former habitat and *O. lienalis* from the latter. Because complete adult nematodes are often difficult to extract from the tissue the morphology of the cuticle is an important diagnostic character. The structure of the adult female cuticle differs depending upon the habitat, i.e. ligamentum nuchae or ligamentum gastrolienale. In those specimens from the ligamentum nuchae, the cuticle is generally thicker, approximately 12  $\mu\text{m}$  excluding the height of annulations with well-defined layering. External annulations (present only in the female) are absent in the oral region and become prominent, approximately 4700  $\mu\text{m}$  from the anterior end. They begin as low, rounded structures and develop into typical annulations 6  $\mu\text{m}$  in height with spacing of 35-37  $\mu\text{m}$  (Fig. 1). The number of striae in the middle layer of the cuticle varies from three to five between each external annulation. These striations appear to form divisions or "cells" in the middle layer which generally tend to be in width equal to or less than their height.

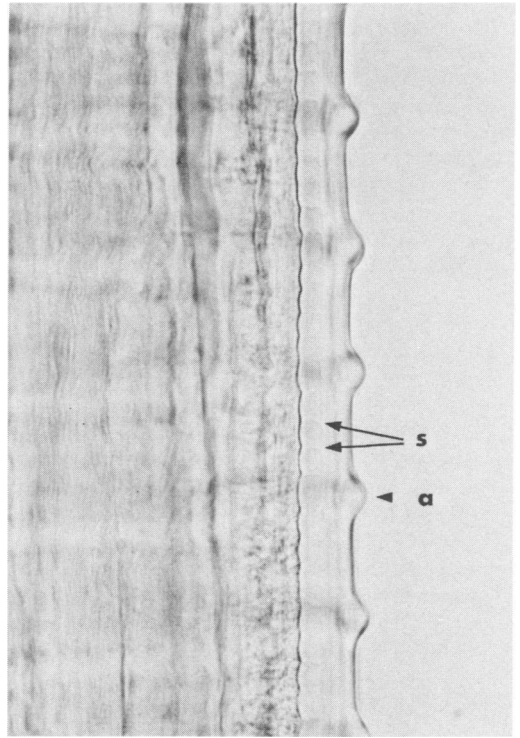


Fig. 1. Adult female *Onchocerca gutturossa*. Middle region of worm showing prominent annulations (a) in the external cuticle and internal striations (s) in the middle layer of the cuticle. The striations form "cells" which are roughly cuboidal in shape. X465. Bright-field illumination.

In those specimens from the ligamentum gastrolienale the cuticle of the female is 8-9  $\mu\text{m}$  thick and for the most part without recognizable annulations. In some areas of the middle region of the nematode, low annulations 2-3  $\mu\text{m}$  in height are present with irregular spacing up to 50-55  $\mu\text{m}$  between them (Fig. 2). The middle layer of these forms is ill-defined with internal striations forming "cells" wider than their height.

TABLE I. Tissues in which *Onchocerca* spp. were Demonstrated in Female Cattle from Ontario and Quebec

Location	Age (yrs)	Microfilariae	Adults from	
		from Umbilical Skin Snips	Ligamentum nuchae	Ligamentum gastrolienale
Richmond, Ontario.....	2	+	-	-
Mallorytown, Ontario.....	2	not done	+	-
Ayton, Ontario.....	5	+	-	+
Fingal, Ontario.....	5	+	-	-
Maxville, Ontario.....	8	+	-	-
Trenton, Ontario.....	10	+	+	+
Ste Marie de Blandford, Quebec.	6	+	-	-

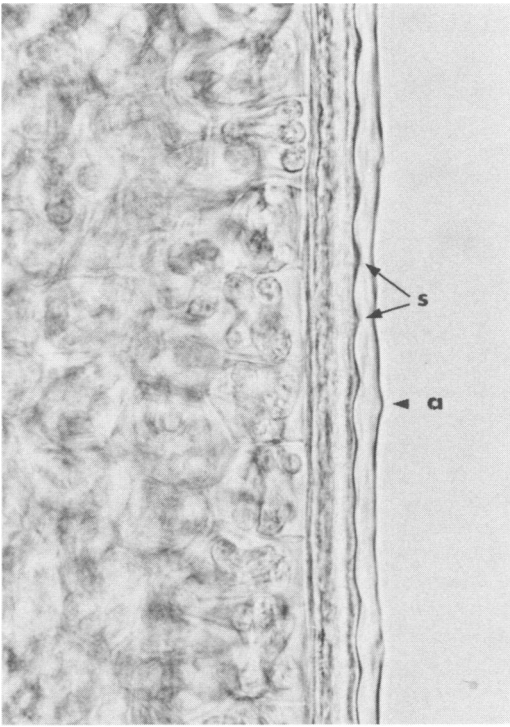


Fig. 2. Adult female *Onchocerca lienalis*. Middle region of worm showing low, widely spaced, indistinct external cuticular annulations (a) and internal striations (s) forming low, elongated "cells". X465. Bright-field illumination.

The number of internal striations between external annulations has been regarded by some to be of definite diagnostic value (3, 8). However Mellor (7) and Ali-Khan (1) caution against too much emphasis being placed on this feature and in this we now tend to agree. The number was found to vary considerably in the present specimens of *O. gutturosa*. Our finding of between three to five striations between annulations confirms the reports of Beaver *et al* (3) who described three (sometimes two) and Bain (2) who described four (sometimes five). Lichtenfels (5) noted that the number remained constant but that the striations were narrower at the extremities of *O. cervicalis*. It is now considered that the number *per se* may not be diagnostic but that the morphology of the whole cuticle should be considered.

Umbilical skin tissues from 43 equine carcasses slaughtered at a plant in Grenville, Quebec during September and October

1975 were examined. Microfilariae identified as *Onchocerca* sp. were isolated from 32 (74%) of these. Unfortunately, prior to being sent to this plant, they were gathered into groups and it was not possible to determine their exact origin. Probably most came from adjacent areas in Ontario and Quebec, although some may have come from the United States. The number found to be infected indicates that *Onchocerca* sp. is a common parasite of horses. The only previous report of equine onchocerciasis in Canada is that of Marcoux *et al* (6) who reported upon the recovery of microfilariae from three horses in Quebec. Beaver *et al* (3) and Lichtenfels (5) consider that the only *Onchocerca* present in North American horses is *O. cervicalis* in the ligamentum nuchae.

Representative specimens of adult nematodes have been deposited in the National Museums of Canada Invertebrate Collection (Parasites) as follows: *Onchocerca lienalis* NMCIC(P) 1978-382; *O. gutturosa* NMCIC(P) 1978-383.

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