<table>
<thead>
<tr>
<th>Title</th>
<th>ELECTRON MICROSCOPIC STUDIES ON THE MORPHOLOGY OF MICROFILARIAE OF DIROFILARIA IMMITIS: I OBSERVATIONS OF THE WHOLE BODY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author(s)</td>
<td>SONODA, Mitsuo; KOBAYASHI, Kosaku</td>
</tr>
<tr>
<td>Citation</td>
<td>Japanese Journal of Veterinary Research, 13(3): 67-69</td>
</tr>
<tr>
<td>Issue Date</td>
<td>1965-09</td>
</tr>
<tr>
<td>DOI</td>
<td>10.14943/jjvr.13.3.67</td>
</tr>
<tr>
<td>Doc URL</td>
<td><a href="http://hdl.handle.net/2115/1823">http://hdl.handle.net/2115/1823</a></td>
</tr>
<tr>
<td>Type</td>
<td>bulletin</td>
</tr>
<tr>
<td>File Information</td>
<td>KJ00002369154.pdf</td>
</tr>
</tbody>
</table>

HOKKAIDO UNIVERSITY
ELECTRON MICROSCOPIC STUDIES ON THE MORPHOLOGY
OF MICROFILARIAE OF DIROFILARIA IMMITIS

I OBSERVATIONS OF THE WHOLE BODY

Mitsuo SONODA and Kosaku KOBAYASHI
Department of Veterinary Internal Medicine
Faculty of Veterinary Medicine
Hokkaido University, Sapporo, Japan
(Received for publication, July 2, 1965)

Morphological observations on microfilariae of Dirofilaria immitis living in
the blood of dogs affected with heart filariasis have been conducted by several
workers, but their observations were by optical, phase-contrast or ultra-violet
microscope.

In the present work, the microfilariae obtained from the peripheral blood of
dogs affected with the disease have been studied by electron microscopic methods
in order to elucidate their morphological structure more fully. In particular the
structure of the body surface of the microfilaria will be described in this paper.

MATERIALS AND METHODS

1) Materials

The blood containing microfilariae was obtained from dogs in the veterinary hospital of
the Hokkaido University diagnosed clinically as having heart filariasis. The microfilariae in
the blood plasma were washed two times by centrifugation with phosphate-buffered physi­
ological saline solutions (pH 7.4) following which they were suspended in a small amount of
the same solution. The suspended solution was mounted on seat meshes with collodion
membranes strengthened by a coating of carbon powders. After 10 minutes, the solutions on
the seat meshes were sucked up gently with blotting paper leaving the microfilariae on the
surface of the seat meshes. The seat meshes were introduced into a small chamber saturated
with osmic acid gas for 10 minutes where fixation of the microfilariae on the meshes took
place. After fixation the seat meshes were recoated with carbon powders.

The samples prepared in this manner were then examined.

2) Method of examination

The holes in the seat meshes were about 100 μ in diameter. The microfilariae were much
longer than this so that they overlapped several holes. Hence microscopic examination of
some areas of the microfilariae bodies were disturbed by framework of the some holes.

Because the entire microfilariae could not be seen under a visual field, it was very difficult
to determine the exact position of the bodies except by their heads and tails. However serial
tracings using these reference points enabled entire body to be depicted.

JAP. J. VET. RES., VOL. 13, NO. 3, 1965
were described. Electronmicroscopic photographs were taken of numerous microfilariae, but
the values used were the mean values of 5 microfilariae photographed clearly from the tops
of their heads to the ends of their tails.

**RESULTS**

The form of the head is obtuse or club-like. The width of the body at the apex is 2.3 μ, whereas the width of the body 20 μ from the head is about 4.7 μ.

No special structures are found on the head except on the side where striations at regular intervals of about 1.0 μ are found.

From the 2nd through the 8th part, the widths of the body and the interval of the striations are relatively similar, as shown in the table. The widths of the body and interval of striations range from 4.7–5.3 μ, and from 0.9–1.3 μ, respectively.

<table>
<thead>
<tr>
<th>PART OF BODY</th>
<th>BODY WIDTH</th>
<th>INTERVAL BETWEEN STRIATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>2.3–4.7 μ</td>
<td>1.0 μ</td>
</tr>
<tr>
<td>2nd</td>
<td>5.0</td>
<td>1.3</td>
</tr>
<tr>
<td>3rd</td>
<td>5.3</td>
<td>1.3</td>
</tr>
<tr>
<td>4th</td>
<td>5.3</td>
<td>1.2</td>
</tr>
<tr>
<td>5th</td>
<td>5.3</td>
<td>1.2</td>
</tr>
<tr>
<td>6th</td>
<td>4.7</td>
<td>1.2</td>
</tr>
<tr>
<td>7th</td>
<td>4.7</td>
<td>1.0</td>
</tr>
<tr>
<td>8th</td>
<td>4.7</td>
<td>0.9</td>
</tr>
<tr>
<td>9th</td>
<td>2.7–1.2 μ</td>
<td>0.7–0.4 μ</td>
</tr>
<tr>
<td>10th</td>
<td>0.8–0.3 μ</td>
<td>0.4</td>
</tr>
</tbody>
</table>

On the 9th part, the width of the body decreases proximally from 2.7 μ to 1.2 μ distally, while at the same time the interval of the striations decreases from 0.7 μ proximally to 0.4 μ distally.

On the 10th part, the striations on the body surface are so clear that they look like peculiar body-joints. The width of the body 10 μ from the tail is 0.8 μ and the interval between striation is 0.4 μ. At a distance of 3.3 μ from the end of the tail, the body takes a straight, smooth rod-like shape with a width of 0.3 μ. The end of the tail is blunt.

For this part, the electron density was very low in comparison with the other parts.

**DISCUSSION**

It has been reported by Taylor\(^5,6\) that there are numerous transverse grooves 0.6 μ in width on the cuticle and that there is a small hook-like structure
at the tip of the head of the microfilaria of *Dirofilaria immitis*. In our observations using the electron microscope, the hook-like structure was not found at the head, and the striations were found on the entire body with the exception of the tip of the head and the tail.

These striations are especially clear on the surface of the posterior part of the body where they look like body-joints. The width between the striations varies but, in general, it is about 1.0–1.3 μ from the head to the middle part of the body, and about 1.0–0.4 μ distal to that.

NEWTON & WRIGHT and WALLenstein & TIBOLA reported that the straight form of the tail of the microfilariae of *Dirofilaria immitis* was characteristic of the species and by this findings the microfilariae were differentiated from the microfilariae of tissue filariid—*Dipetalonema* sp.—having a curved, button hook-like tail.

The straight tail of the microfilariae of *Dirofilaria immitis* was confirmed by our observations.

**SUMMARY**

Using the electron microscope, the structure of the body surface of microfilariae of *Dirofilaria immitis* obtained from dogs with heart filariasis was observed. The width of the striations on the body surface and the shape of the tail were described.

**ACKNOWLEDGEMENTS**

The authors wish to express their sincere gratitude to Dr. Y. KOJIMA, the Institute of Low Temperature Science, Hokkaido University, for his kind advice in carrying out this work. Also, their thanks are due to Mr. Y. MIFUNE, the Electron Microscope Laboratory, Faculty of Veterinary Medicine, Hokkaido University, for his technical assistance.

**REFERENCES**

EXPLANATION OF FIGURES

Fig. 2 The head × 3,000
Fig. 3 Striations on the body surface of the 1st part × 15,000
Fig. 4 The 4th part of the body × 3,000
Fig. 5 Striations on the body surface of the 4th part × 15,000
Fig. 6 The 8th part of the body × 3,000
Fig. 7 Striations on the body surface of the 8th part × 15,000
Fig. 8 The 10th part (tail) of the body × 30,000