SCANNING ELECTRON MICROGRAPHY OF *DEMODEX CANIS* LEYDIG 1859 *

BY

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INTRODUCTION.

The mite *Demodex canis* Leydig 1859 is usually found between the inner and outer root sheaths of the hair follicle of dogs. This mite is almost identical in its morphology to *D. folliculorum* in man but cross transmission of these mites between man and dog has not been proven. Demodectic mange in dogs is a skin disease associated with the presence of large numbers of *D. canis* in the hair follicles and sometimes the dermis. The mites are also found in several organs such as the regional lymph nodes, spleen and other viscera. The role which the mite has in production and exacerbation of skin lesions in dogs is not well understood. The mites and their progeny complete their life cycle and multiply in the hair follicles of dogs and are transmitted to newborn pups by direct contact with their mother or other infected animals. A large percentage of clinically normal dogs are reported to have a few of these mites in their hair follicles (3,5).

Since *D. canis* spends all of its life cycle in the hair follicle, it is important to know the precise constituents of its somatic tissue. It is also important to know how these mites obtain their food from their host tissues. Following death of these mites, their somatic tissues become available to its host as antigenic materials. The present study was performed in an effort to better understand the morphology and mode of feeding of these organisms.

Materials and Methods.

Adult *D. canis* mites were collected for scanning electron microscopy from skin biopsies obtained from dogs exhibiting lesions of demodectic mange. These skin biopsies were divided into pieces approximately 2 mm square. Each piece was placed with the epidermal surface facing downwards in individual depressions on glass slides. These depressions were filled with distilled water. The slides were then placed under a source of flourescent light. The heat and light from the lamp caused the mites to migrate out of the hair follicles into the water. The mites were then collected individually from the depressions on the slides and transferred to a drop of triple

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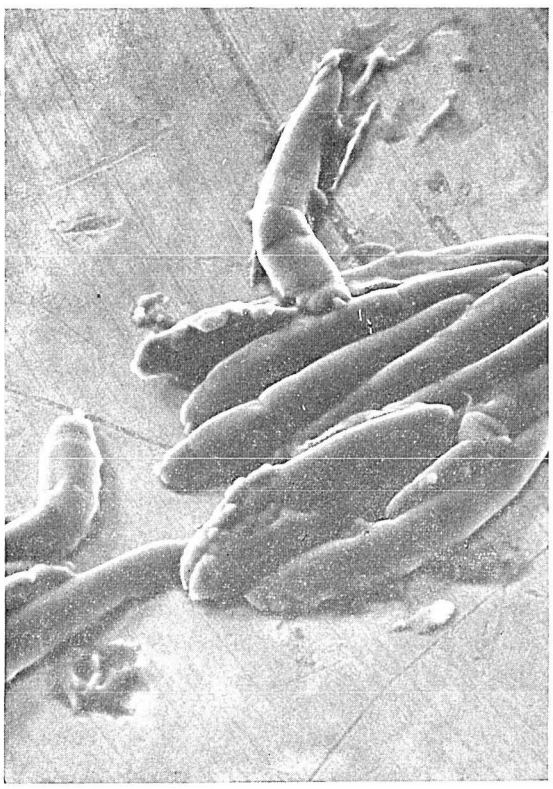
distilled water on the scanning electron microscope holder. The water was allowed to evaporate until the specimen holder was almost dry before it was placed in the microscope. The scanning electron microscope used was a Jeolco U3 *. Once the specimen was in the antichamber of the microscope, the vacuum producing procedure was applied very slowly followed by transfer of the specimen into the observation chamber. Best results were obtained when the electron energy was between 5 and 10 Kev. Using this technique the mites remained alive and active for about 30 seconds. Collapse of the exoskeleton and deterioration of the mites did not begin until they were under the electron beam for at least 3-5 minutes.

Results.

As viewed under the scanning electron microscope, *D. canis* was a smooth cigar shaped mite (fig. 1). The only structures protruding from the surface were four pairs of short legs, one pair



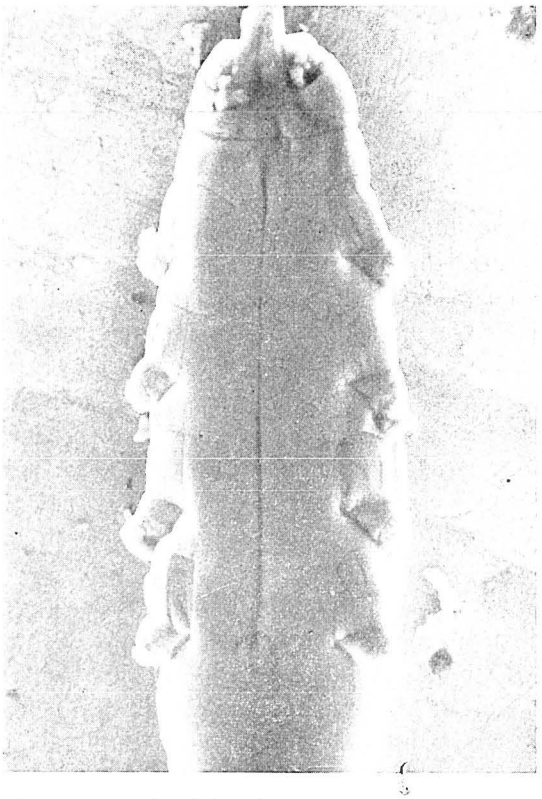


Fig. 1. — Scan Electron micrograph of *Demodex canis* adult mites × 200.
FIG. 2. — Ventral view of anterior portion of *D. canis* adult female. Note legs, pedipalps and vulvar opening. × 1000.

of pedipalps, mouth parts and in the male, the reproductive organ. The surface of the mite had a waxy appearance and the only parts of the body which had any spines or hooks were the tips of the legs and pedipalps. The surface covering of the mites appeared to be loose fitting and sac-like and covered the legs and pedipalps with barely visible joints (fig. 2). The pedipalps had a jointed base and moved in a dorso-ventral direction only. When not moving, the tips of these

* Microscope operated by Micro-Met Laboratories Inc. West Lafayette, Indiana, Dr. John RADAVICH, director.

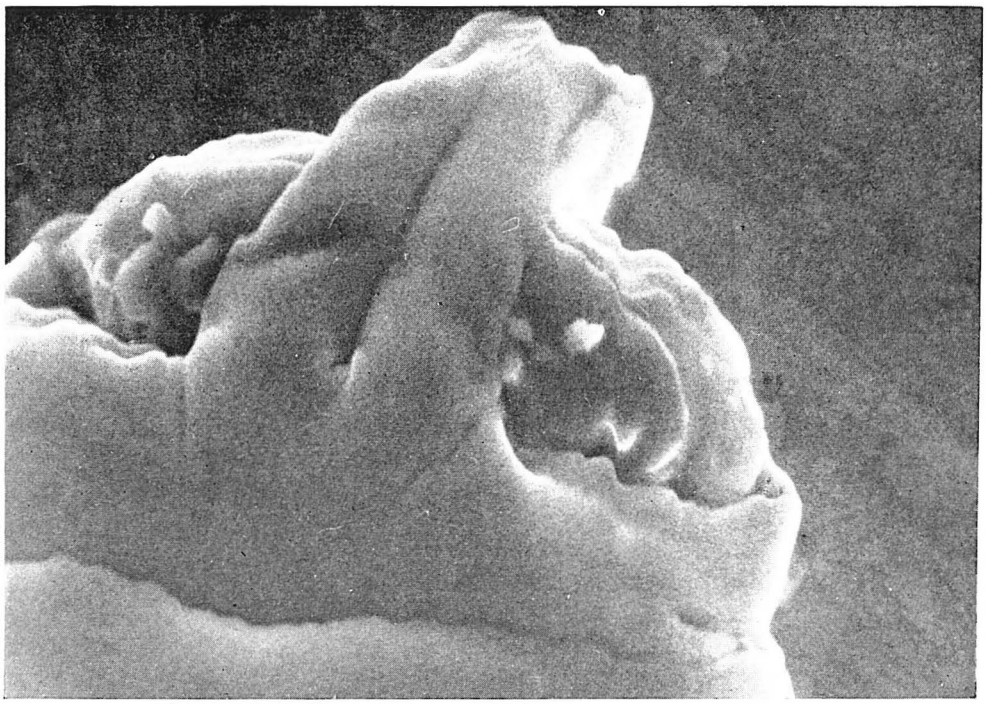


FIG. 3. Ventral view of gnathosoma of *D. canis*. Note bilobed ventral lip and pedipalps. × 4500.

FIG. 4. — Dorsal view of anterior and gnathosoma of *D. canis*.
Note two eye-like possible sensory organs and dorsal elongated lip. × 3000.

organelles were visible from the ventral side (fig. 3). The tips of the pedipalps were disc-like and had 3-5 spines or hook-like projections. These projections were used apparently for scraping the inner surface of the cells lining the hair follicle and possibly the hair itself.

The mouth parts which were not visible were apparently covered with a symmetrically bilobed long structure which was bent at approximately 90 degrees at its distal third. This structure when folded, covered part of an elongated dorsal lip-like structure thus closing an oral opening.

On the dorsal surface of the anterior end there were two eye-like depressions (fig. 4). The function of these organelles is not known, but presumed to be sensory.

The adult mites had four pairs of short legs which were made up of three barely visible joints. They were located ventro-laterally on the thorax. They can be retracted almost completely to the side of the body of the mite producing a smooth streamlined appearance. The distal joint of each leg carried three hook like spines mounted on a disc-like structure. When the legs were retracted, the body covering became wrinkled and filled the grooves at the side of the thorax.

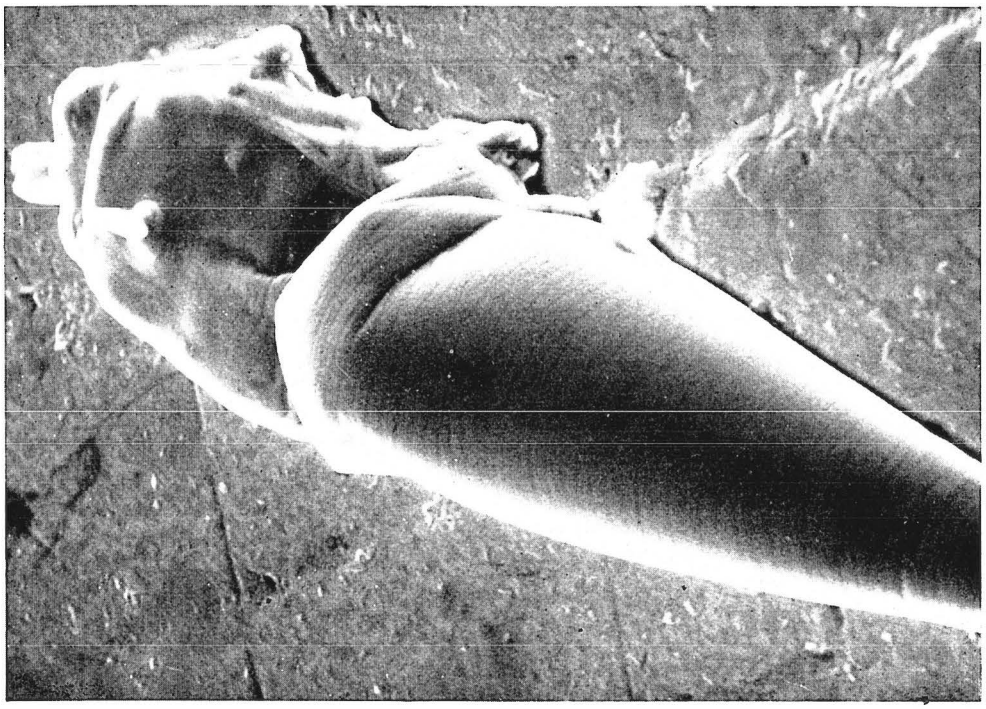


FIG. 5. — Dorsal view of male *D. canis*. Note reproductive organ on dorsal side. × 600.

Male mites were much fewer than females. They were shorter than the females and their abdomen was more triangular. The male reproductive organ was mounted on the dorsal surface of the thorax. It appeared to be a pointed, elongated structure arising from a circular elevated area at a level corresponding to the lst or 2nd pair of legs (fig. 5). The female reproductive opening was slit like and situated mid-ventrally between the fourth pair of legs (fig. 6). The abdomen of both male and female mites was smooth, shiny and had fine cross-striations.

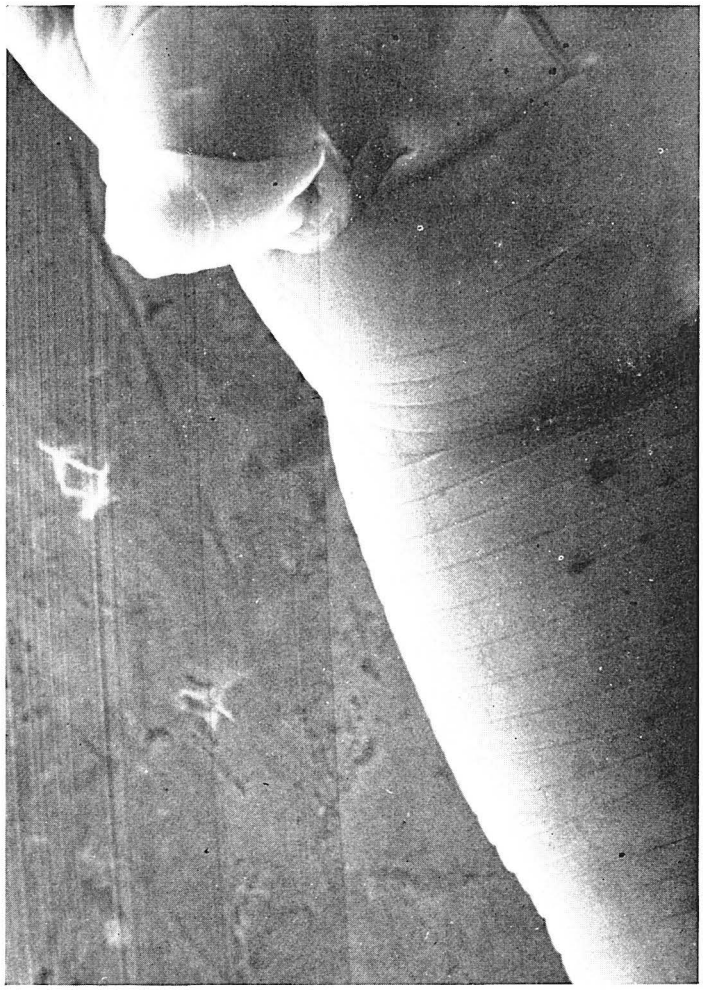


FIG. 6. — Ventral view of female *D. canis*.
Note female reproductive opening and cross striation of abdomen. × 3000.

DISCUSSION.

The scanning electron micrography performed in the study seems to be the first such observations made of *D. canis*. It revealed a number of morphologic characteristics of the mites which may be relevant to their pathogenicity in the hair follicles of infected animals. In previous studies (2), it was shown that the mites were encased in a thick acid-fast covering similar to the lipoid layer around *Mycobacterium tuberculosis* bacteria. The present investigations showed that this covering or cuticle was loose fitting and surrounded the whole body surface including the legs and mouth parts.

The structures of the mouth parts of the mites suggest that they scrape the inner surface of the epithelial cells and keratin lining the hair follicle. They may also scrape the inner root sheath of the hair causing sloughing of the hair. This surface scraping in contrast to piercing and sucking would explain the low pathogenicity of the mites in many cases. The streamlined appearance of the mite would assist it in moving in the hair follicle without causing much damage to the structures.

The elongated bilobed tongue-like projection of the ventral part of the anterior end of the head acts as a collecting receptacle for the fluids or fine particulate material scraped by the pedipalps. The angle at which it is bent and the tight closure by overlapping on the upper elongated lip would also add to the streamlining of the shape of the organism. This smooth appearance also results when the legs are withdrawn and the whole mite becomes tubular in shape.

The male reproductive organ appears to be capable of being withdrawn or folded in the dorsal part of the thorax. This may also assist the mite in its habitat and its reproductive function.

SUMMARY.

Scanning electron micrography was performed on freshly isolated adult *Demodex canis* mites. The mites remained alive and their bodies intact for 3-5 minutes in the vacuum of the scanning electron microscope. Structures of the mouth parts, legs, male reproductive organ, female genital opening and whole body cuticle were described. The relationship between some of the morphologic characteristics of this mite and its pathogenicity are briefly discussed.

ZUSSAMENFASSUNG.

Skandierende Elektronmikrographie wurde mit frischen isolierten erwachsenen *Demodex canis* Milben durchgeführt. Die Milben blieden 3-5 Minuten lang im Vakuum des skandierenden Elektronmikroskop lebendig und ihre Körper blieden unverletzt. Die struktur der Teile des Mundes, der Beine, der männlichen Geschlechtsorgane, der weiblichen Zeugungsöffnung, und der Oberhaut des ganzen Körpers wurden beschrieben. Die Beziehung zwischen einigen morphologischen Kennzeichen und der Pathogenese dieser Milben werden kurz besprochen.

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