

THE CUTICLE OF THE PARASITIC NEMATODE,
Nematospiroides dubius

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There once was a worm called N. dubius,
Whose habits were really quite curious.
He shunned the fresh air,
And lived without care
In the gut of the mouse Mus musculus.

(Hurley, 1984).

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SUMMARY

The cuticle of nematodes is of interest because it forms the boundary between the animal and its environment. In this thesis, the cuticle of the parasitic nematode, Nematospiroides dubius, was examined with particular attention being focused on the epicuticle.

The fourth-stage cuticle of N. dubius, at least, is an extracellular structure which probably forms by self-assembly from molecules secreted by the epidermis. Because cuticle formation is a fundamental process, it is assumed that the cuticle of each stage forms in a similar way.

The structure of the cuticle of N. dubius, which is highly variable, appears to be related to the environment in which the worm lives and, in particular, to parasitism. The cuticle of the parasitic stages, that is, the fourth-stage and adult worms, are similar but differ markedly from those of the first three stages. The cuticle of the free-living stages exhibit longitudinal specializations, the lateral alae, which run along each side of the worm. In contrast, the entire cuticle of the parasitic forms was thrown into a series of longitudinal ridges. Moreover, a fuzzy electron-dense coat could be detected only on the surface of the parasitic worms.


The third-stage cuticle had some unusual properties. Unlike the other stages, the epicuticle of third-stage larvae was multilaminate when viewed in transverse section, and did not exhibit a net negative charge. Furthermore, substantial ultrastructural changes in the body wall of third-stage larvae occurred during the transition to parasitism, and these appeared to be related to behavioural changes.

The composition of the epicuticle of N. dubius varies amongst stages. The epicuticle of adult worms, at least, appears to depend on disulphide bonds because it was found to be susceptible to reduction. In addition, some molecular interactions within the epicuticle might be hydrophobic, because the epicuticle was affected by a detergent.

The adult epicuticle split when freeze-fractured to reveal two fracture faces. This result, together with the effect that a variety of stains and organic solvents had on the surface of the epicuticle, suggests that a major component of the epicuticle might consist of a bilayer of lipid in some form, possibly lipopolysaccharide. Protein and/or glycoprotein also probably form an important part of the adult epicuticle.

The third-stage cuticle differed from that of adult worms. The epicuticle did not split when freeze-fractured, nor did it react with many of the stains used to highlight the surface of adult worms.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference is made in the text. If accepted for the award of the degree, the thesis is available for photocopying and loan.



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THIS THESIS IS DEDICATED TO MY PARENTS
WHO NEVER ONCE SAID THAT I HAD TO DO IT.