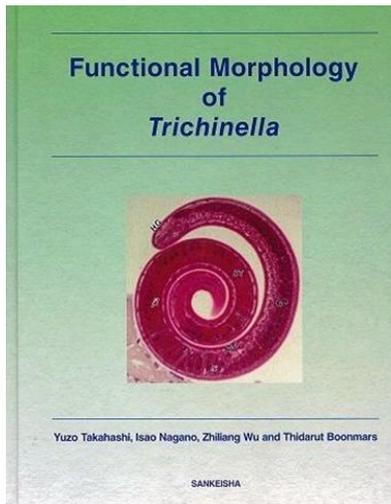


Functional Morphology of *Trichinella*

Yuzo Takahashi, Isao Nagano, Zhiliang Wu and Thidarut Boonmars



This book overviews morphology of *Trichinella* with emphasis on the function of this parasite for better understanding of intriguing host-parasite relationships during the course of trichinellosis. Self protection and excretion of functional proteins are most important, which are closely related each other but described in the nine chapters.

Key Words, *Trichinella*, morphology, function, nurse cell, cuticle, stichosome, ES product, recombinant protein, satellite cell, electron micrograph

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Introduction

Oftentimes the morphology of an organ or tissue can predict its function. And, knowing its function may predict its morphology. Although there are exceptions to this rule, function may be better understood when analyzed in relation with morphology and vice versa. Research on the roundworm *Trichinella* has been an attractive target both morphologically and functionally. In the past, purely morphological investigations of *Trichinella* have revealed major characters of this parasite (sort of archives). Examples are papers by earlier authors including Chitowood, Despommier, Kozek, Wright and Takahashi. And more recently deeper and long-lasting molecular studies have revealed much about function of this parasite.

The authors think it is a good timing to summarize previous investigations regarding the biology of *Trichinella* that link morphology with function, because the former has reached a plateau and the latter is still expanding. As such what we need is a platform to integrate both and which may indicate the path for future investigations about *Trichinella*.

[Chapter 1] Mechanical force generator

[Chapter 2] Stichocyte granules: synthesis, excretion, fate and possible function

[Chapter 3] Location origin of isolated proteins

[Chapter 4] "Exocrine or not", the morphological criteria

[Chapter 5] External coverings; a critical controller of in-and-out transport and a defensive wall against the immune attack by the host

[Chapter 6] Anatomy of *Trichinella*; a useful chart for reading immunolocalization results

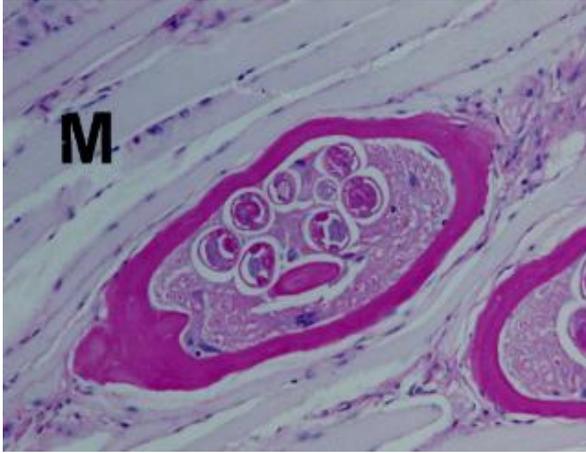
[Chapter 7] Reproduction

[Chapter 8] Cyst wall; the sole morphological marker for taxonomy [Chapter 9] Nurse cell formation; a sequence of drastic changes and a strategy for *Trichinella* survival

Appendix includes many electron micrographs of great interest and importance, published or unpublished.

Pathology of muscles (M) infected with *Trichinella spiralis*. PAS staining.

The cyst wall, PAS positive and pink in color, accommodates the nurse cell and the parasite. Because of coiling of the body of *Trichinella*, there are several sections out of a single parasite.

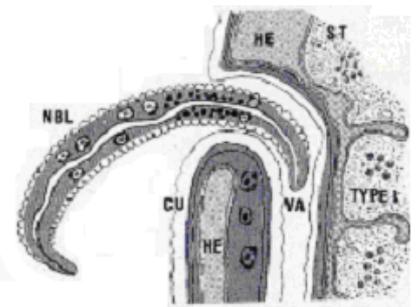
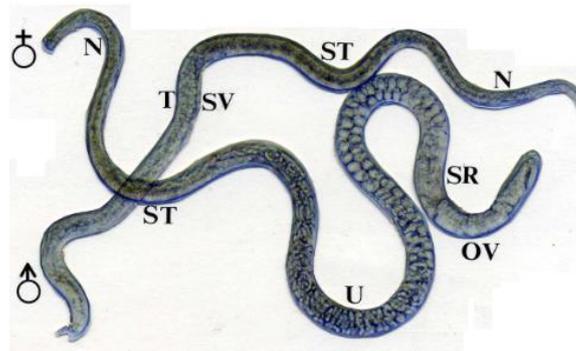


Schematic illustration of the cyst of *T. spiralis*, a reconstruction by combining light and electron microscopical observations.

The body of the parasite is coiled in the cyst. Mononuclear cell infiltration is prominent near the poles of the cyst.



General images of *Trichinella* at the three developmental stages, ML, adult and NBL.



ML were excysted by digestion in an artificial gastric juice and photographed under a light microscope (left panel). Adults (5 days old) were isolated from the host intestine and photographed similarly. The right panel shows an NBL leaving the vagina, and the image is a reconstruction based on electron microscopic observations.

Current research interests on *Trichinella*

- (1) biology: morphology, lifecycle, host specificity, cold tolerance, taxonomy, gene flow
- (2) clinical study: manifestation, diagnosis, chemotherapy
- (3) etiological study, public health
- (4) immunodiagnosis: diagnostic antigen, test system, evaluation
- (5) protective immune response: vaccine, target antigen, mode of action
- (6) local effect: myopathy, nurse cell formation
- (7) systemic effect: immune modulation, host blood sugar
- (8) recombinant protein; functional protein, antigen

Topics which should be connected with morphology for better understanding of function

- (a) Locomotion of *Trichinella*; muscle structure, nerve system , mode of penetration
 - (b) physiology; circulation, nutrition uptake, excretion, reproduction
 - (c) antigenic substances; localization, specificity
 - (d) immune attack; target antigen localization, mode of action
 - (e) self-protection; cuticle, epicuticle, septate junction
 - (f) life cycle; morphology of *Trichinella* at each stage, NBL, ML and Adults
 - (g) nurse cell formation; involved cells, sequence of events
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