STUDIES ON THE ENDOCAINE DEVELOPMENT OF NEMATODES

by

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SUMMARY

The results obtained in this work can be interpreted in terms of the following working hypothesis; growth and developmental control mechanisms in nematodes are similar to or the same as those in insects. This implies that the endocrine factors themselves are the same or closely related.

Various physiological and biochemical events of morphogenetic processes in the Nematoda, superficially similar to those in the Insecta, were examined to determine any relationships in the control mechanisms. The nematode, *Nematodiridae dubius*, reacted in an analogous physiological manner to insect growth hormones at definite stages of the life-cycle. Moulting was stimulated by 
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\alpha\text{-ecdysone and inhibited by synthetic juvenile hormone (SJH), whilst egg-laying by females was unaffected by the former but stimulated by the latter terpenoid. The stimulation by } \alpha\text{-ecdysone of the activity of the leucyl naphthylamidase (Induction Ratio 1.709 at 24 hr post-infection) located in the body-wall of } \textit{Aphelenchus avenae}, \text{ indicated a possible hormonal correlation between moulting and this enzyme. The purification of the enzyme by } (\text{NH}_4)_2\text{SO}_4 \\
\text{fractionation, ion-exchange and gel filtration chromatography was unsuccessful due to its instability, with an enzyme purification of 27-fold but an equivalent protein purification of 514-fold. The properties of the crude enzyme extract resembled those of the mammalian (leucyl) naphthylamidases. The enzyme required a thiol group for activity, was inhibited by the sulphydryl reagent } \beta\text{-hydroxymercuribenzoate and puromycin, had a neutral pH optima, and was unstable.
following (NH₄)₂SO₄ and DEAE-cellulose chromatography. Evidence is presented that it may be a Zn-dependent metalloenzyme.

If the mechanism of action of the control of translation of protein synthesis (gene expression) by juvenile hormone was at the level of the polyribosome, then it was not by altered profiles in Panagrellus redivivus. The ribosomes, polyribosomes and polyribosomal RNA's of P. redivivus were considered "normal", following physical, chemical and biochemical comparison with other invertebrates. Also, the cytoplasmic RNA's of A. avenae showed the expected S-values and R.N.'s.

Direct evidence for the presence of morphogenetic hormones of the MA-type (moulting hormone) has been shown by radioimmunoassay for 5-ecdysone, and ecdysone-like substances have been shown to occur in the nematodes, P. redivivus and A. avenae. The yield was consistently greater in the latter animal. Indirect evidence from the effect of various Na⁺/K⁺ ratios, in the absence of Ca²⁺, on the moulting of fourth-stage larvae of H. dubius also suggests this conclusion. The effect of such hormones on insects is mediated by the alteration of the ionic balance of the haemolymph, including the above cations (Kroeger, 1963). No ecdysone-specific binding proteins were detected in the cytosol fraction of P. redivivus. From equivalence with the properties of the mammalian steroid hormone receptors, this would have given added physiological evidence to the above findings.