Although inheritance of control of antigen expression is cytoplasmic the structural gene for the Mta antigen appears to be a class I MHC gene. The genetic evidence for this contention has just been presented in *Nature* by K. Fischer-Lindahl, B. Hausman and V. Chapman (see p.383). The critical observation is that two Mta⁻ strains of mice can complement each other to produce Mta⁺ offspring. One of the Mta⁻ strains carries the cytoplasmic defect previously defined, the second Mta⁻ strain carries a defect at an MHC linked gene,

named *hmt* (histocompatibility dependent on maternally transmitted factor), which maps to the *Tla* region. As Mta⁺ antigen expression requires β_2 -microglobulin and Mta specific killing can be blocked by monoclonal antibodies to β_2 -microglobulin *hmt* is almost certainly a class I gene. This observation thus also explains why *mta* killing is not restricted to other MHC class I genes. □

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Invertebrate endocrinology

Steroids . . . the earliest hormones

from David L. Whitehead

ECDYSTEROIDS, the hormones controlling development in arthropods and present in certain plant families, have now been found in helminth parasites of humans and livestock (trematodes¹, filarial nematodes² and cestodes^{3,4}). As reported at a recent conference*, one result — of great potential importance to clinicians and veterinarians — is that diagnosis of *Schistosoma mansoni* infection in rodents can now be carried out by detecting ecdysteroids in the serum (using high performance liquid chromatography and radio-immunoassay). An even more exciting revelation was that injecting the infected rats with antibodies to an ecdysteroid hapten reduces the burden of worms (Philippe Nirde, Institut Pasteur, Lille). A further prospect is that use of anti-ecdysones or ecdysteroids, themselves quite harmless to vertebrates, could reduce infection by interfering with reproduction or development of endoparasites (Jan Koolman, Philipps Universität, Marburg, FRG).

A claim made in 1969 that *S. mansoni* can locate and infect snail vectors because they exude ecdysone⁵, should now be re-examined, in the light of new conclusive evidence that the pulmonates which transmit bilharzia to man contain 20-hydroxyecdysone⁶.

The function of ecdysteroids in helminths is not yet clear but it was suggested at a conference† this summer that

these polar sterols, found in most protozoa (arthropods, molluscs, annelid worms) and even some archaeocoelomata (starfish, sea anemone) arose as a signal substance rather early in evolution¹. The earliest or first chemical messenger might have been a hydroxylated cholesterol like 3 β , 14 α , 20, 22-tetrahydroxycholesterol from which ecdysteroids were then derived by a change in the β ring and further hydroxylation¹. Even gamones (for example, antheridiol, oogoniol), the steroids controlling gametogenesis in fungi, might owe their origin to this primitive hormone.

Progress in studying the biosynthesis and catabolism of ecdysteroids in arthropods was also reported at the two meetings. 22-Phosphate esters of four ecdysteroids, not bound to proteins, have been identified in the eggs of the desert locust⁷. They are known to be active conjugates because injection of labelled esters into *S. gregaria* later gives rise to free ¹⁴C-hormone in the embryos⁸ (a new phosphatase is responsible, located in the mitochondrial-lysosomal fraction). Inactive excretory metabolites (the unhydrolysable polar ecdysteroids⁹), found in well-developed embryos have been identified as ecdysoneic acid and its 20-hydroxyanalogue¹⁰, which must be formed from 26-hydroxy metabolites. 3-Acetoxyecdysone-2-phosphate is also an inactive metabolite product found in faeces of 5th instar *S. gregaria*. Just to emphasize that one should never generalize about insects, in *Pieris brassicae* larvae phosphate esters but not acetates have been found, while in the stick insect *Carausius morosus*

the situation is reversed (René Lafont, Ecole Normale Supérieure, Paris). Apparently in Diptera the 3-dehydro and inactive 3-epiecdysteroids are the predominant metabolites⁹. In *P. brassicae* and *L. migratoria* 3 α - and 3 β -hydroxy compounds were formed rapidly from 3-dehydroecdysteroids (René Lafont) suggesting that, as in vertebrates, 3-dehydro-compounds could represent active forms of the hormone in the target cell.

Considerable discussion took place concerning the evidence for a most unusual conjugate (22-AMP-2-deoxyecdysone) reported earlier to be bound to the vitellin in *Locusta migratoria* eggs¹¹. Final proof of its existence is awaited with great interest because it might, according to some laboratories, have been formed as an artefact during extraction.

A new chemiluminescence immunoassay for ecdysteroids sensitive down to 5 pg (6.2 fmol) has been developed (Lutz Reum, Marburg, FRG). The brain hormones (PTTH) responsible for directing ecdysteroid synthesis (from 7-dehydrocholesterol?) and release from the prothoracic glands of the silkworm and of tobacco hornworm have now been characterized (Hironori Ishizaki, Nagoya University, Japan and Walter Bollenbacher, University of North Carolina). Both occur in two forms. The larger (29kd) in *Manduca sexta* activates prothoracic glands *in vivo* and *in vitro* in a dose-dependent fashion. The *Bombyx* PTTH active in *Samia cynthia ricini* (1 x 10⁻¹¹M) is a single chain peptide of 40–43 residues whereas the peptide active in *Bombyx* itself is larger (~22kd).

Ecdysteroids in the absence of juvenile hormone act to switch off insect larval-specific genes permanently. This was very neatly demonstrated (Lynn Riddiford, University of Washington, Seattle) with the tobacco hormone caterpillar which produces a bright blue protein called insecticyanin as long as juvenile hormone continues to circulate in the blood. □

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*The Second International CNRS Symposium was held in Strasbourg at the beginning of September. The proceedings will be published in 1984.

†The VI European Ecdysone Workshop was held in Szeged, Hungary, August 23–26, 1983.

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