Kernaghan, R.P. S.U.N.Y. at Stony Brook, New York. Intracellular symbionts in the larval gonad of Drosophila paulistorum.

A Mycoplasma-like organism has been implicated in the hybrid male sterility observed in crosses between some semi-species of Drosophila paulistorum (Kernaghan and Ehrman 1970a). Further support for this hypothesis is provided by the observation of an increase in the proportion of fertile F_1 males when such hybrids are allowed to develop upon media containing antibiotics known to suppress the growth of these organisms (Kernaghan and Ehrman 1970b). Except in rare circumstances, the testes of the sterile hybrid male is the only adult male organ infected by this symbiont (Kernaghan 1971a).

Fertile sisters of sterile male hybrids have the ability to produce sterile sons. Coincident with this ability is the observation of similar Mycoplasma-like organisms within the germinal and nutritive cells of the ovary as well as within the mature unfertilized egg (Ehrman and Kernaghan 1971). Numerous such organisms may be dispersed throughout the matrix of a single egg. Following fertilization, such symbionts could be captured as cell boundaries are established.

In larval development the gonad is segregated early as an isolated island of cells. Examination of the third instar F_1 hybrid larval gonads of both sexes commonly reveals the presence of many Mycoplasma-like organisms within the cytoplasm of these cells. (See Plate 1) Often every cell of such a larval gonad exhibits one or more clusters of this microorganism. As an intracellular symbiont of these larval gonad cells, the microorganism is often enclosed within a cytoplasmic vacuole exhibiting concentric lamellar layers of granular endoplasmic reticulum or limited by a dense region formed by the juxtaposition of the outer membrane of the organism and the vacuolar membrane of the host (Kernaghan 1971b). At the ultrastructural level these microorganisms appear to be similar if not identical in morphology to the organisms observed in the adult sterile testes, adult hybrid ovary and the fertilized egg.

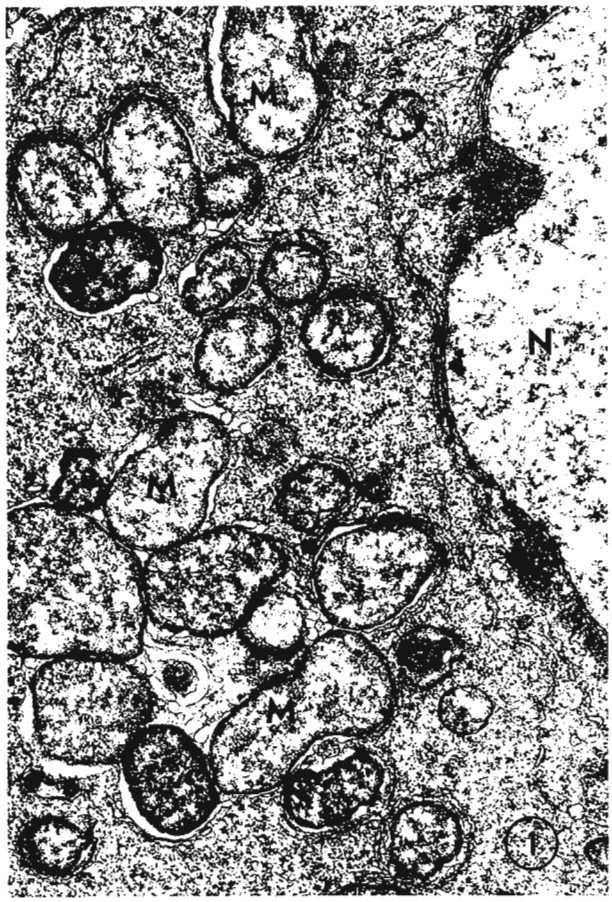

Plate 1. An electron micrograph of a perinuclear area of a cell from an F_1 hybrid third instar larval gonad showing many pleomorphic microorganisms dispersed throughout the cytoplasm. Note the reticulate form of the organism and the electron dense area at the periphery. Also illustrated are lamellar arrays of concentric granular endoplasmic reticulum surrounding some symbionts. N = nucleus, m = mycoplasma-like organisms. From a cross Mesitas females x Santa Marta males. 18,500X.

Should these forms prove to be identical, the segregation of these microorganisms to the larval gonad assures transmission of the symbiont to the adult structures derived from these primordia. The microorganism involved in hybrid male sterility in Drosophila paulistorum then exhibits a special tissue affinity to effect direct passage from the female parent via the egg cytoplasm to the reproductive organs of the adult. R.P. Kernaghan acknowledges support of NIH Grant # AI09945.

References: Ehrman, L. and R.P. Kernaghan 1971 J. Hered. 62:66; Kernaghan, R.P. 1971a Prod. 11th Ann. Meet. Amer. Soc. Cell Biol. 149:290; _____ 1971b DIS 47:69; Kernaghan, R.P. and L. Ehrman 1970a Chromosoma 29:291; _____ 1970b Science 169:63.