Fine Structural Observations of the Peritubular Cell Layer in the Hamster Testis

Brief Report

ROBERT G. McCORD, JR.
Department of Anatomy, University of Wisconsin, Medical School, Madison, Wisconsin, U.S.A.

With 5 Figures

Received November 10, 1969

Summary

The seminiferous tubule of the hamster is surrounded by a layer of specialized cells. The fine structure of these cells is similar to that of smooth muscle. Their cytoplasm contains numerous fine filaments and dense areas; in addition, vesicles can be seen forming on the plasmalemma and are also free in the cytoplasm. It is possible that their contractions aid in the transport of spermatozoa through the seminiferous tubules.

1. Introduction

The presence of a single peritubular cell layer around the seminiferous tubule was first reported by von Ebner (1871) in his studies with the rat. Confirming these observations, Regaud (1901) observed that these cells lay between two homogeneous lamellae. Stieve (1930), while not recognizing a discrete peritubular layer, commented upon the circumferential organization of the adjacent connective tissue fibers and fibroblasts. An early electron micrograph showing this layer appeared in a paper by Watson (1952) who described the seminiferous tubule of the albino rat but did not mention a peritubular cell layer.

Subsequently Clermont (1958, 1960) attempted to correlate the fine structure of these cells in the rat with a possible function. He interpreted the presence of fine cytoplasmic filaments and micropinocytosis vesicles similar to those of smooth muscle as indicative of a contractile function. Since the shape and arrangement of the cells were more characteristic of epithelium he felt that they represented a new type of contractile epithelial cell.

Similar ultrastructural observations were reported by Brökelmann (1960), Lacy and Rotblat (1960), Leeson and Leeson (1963), Kagayama et al. (1965), Ross (1964, 1967), and Ross and Long (1966).
2. Materials and Methods

Young (2–6 months) male hamsters, which were known to be fertile, were used in this study. The majority of these animals were killed with ether and their testes were immediately excised and immersed in 2% glutaraldehyde, which was buffered with a combination of 0.15 M sodium cacodylate and 0.001 M calcium chloride. A three hour glutaraldehyde fixation was followed by a half hour buffered sucrose rinse and a subsequent one and a half hour post-fixation in buffered 1% osmium tetroxide.

The testes of some animals were fixed by perfusion. The testes were flushed with oxygenated Tyrode's solution and then perfused for five minutes with buffered 2% glutaraldehyde. The tissue was then excised and fixed as previously stated.

All tissues were dehydrated with a graded series of ethanol-water solutions, infiltrated with propylene oxide and then propylene oxide-epon, and finally embedded in Epon 812 (Lupt 1961).

Sections of one micron thickness were cut with glass knives on a Porter-Blum MT-2 ultramicrotome, and stained with safranin, for the purpose of orientation. Thin sections were cut with a Dupont diamond knife and picked up with either 100 × 400 or 200 mesh uncoated copper grids. These sections were stained with uranyl acetate (Watson 1958) and lead citrate (Venable and Coggeshall 1965). The light micrograph was taken with a Zeiss Ultraphot and all electron micrographs were taken with a modified RCA EMU-3 E electron microscope at 50 KV.

3. Observations

The testis of the hamster consists of both seminiferous tubules and interstitial tissue. The seminiferous tubules (Fig. 1) contain sustentacular cells, which are the Sertoli cells, and germ cells (spermatogonia, spermatocytes, spermatids, and spermatozoa). The interstitial tissue (Fig. 1) contains Leydig cells, mast cells, and fibroblasts.

Another type of interstitial cell is present which is peritubular in location and closely apposed to the seminiferous tubule (Figs. 1, 2). In light microscopic sections, the only part of this cell that is clearly visible is its dark nucleus (Fig. 1). The electron microscope reveals that the cell possesses a thin cell body which follows the contour of the tubule for a considerable distance (Fig. 2) and is separated from the tubule by an average distance of 0.5 μ. A layer of fibroblasts (Fig. 2) is usually located peripheral to the peritubular cell layer and can be identified by the long, tenuous processes of the component cells.

At a higher magnification, it is possible to resolve junctions between the peritubular cells (Fig. 3 and inset). At these junctions the plasmalemmas are separated by a distance of approximately 270 Å. Elsewhere the cells are imbricated at the site of the specialized junctions as reported by other authors (Clermont 1958, Brökelmann 1960, Leeson and Leeson 1963, and Ross 1967).

Other features visible at this magnification include two basal laminae, one adjacent to the seminiferous tubule and the other adjacent to the peritubular cell. Mitochondria and vesicles can be seen in both the peritubular cell and the peripheral fibroblast.