NERVE–MYOEPITHELIUM AND NERVE–GLANDULAR EPITHELIUM CONTACTS IN THE LACRIMAL GLAND OF THE SHEEP

AKIO YAMAUCHI and GEOFFREY BURNSTOCK. From the Department of Zoology, University of Melbourne, Victoria, Australia

Electron microscope studies of several types of secretory glands (6, 17, 18) have shown that myoepithelial cells envelop the acini and resemble smooth muscle cells in their fine structure (15). No close nerve-myoepithelium contacts with a separation of less than 0.1 μ have been described, and it has been suggested, for example in the rat submaxillary gland, that activation of the myoepithelium may occur by diffusion of transmitter substance over relatively long distances (18).

In examining the fine structure of the lacrimal gland of sheep, we have observed that nerves are in close association with both the myoepithelium and the acinar epithelium. The material was taken from an animal under fluothane anesthesia, fixed with 1% OsO_4 in a phosphate buffer, pH 7.6 (10), and embedded in Araldite (8). Unsupported sections, about 1,000 A thick, cut with glass knives in a Cambridge-Huxley-pattern microtome, and double-stained with uranyl nitrate (Merrillees, unpublished observations) and with lead citrate (11), were examined in a Hitachi 11B electron microscope.

A montage of electron micrographs (15,000 magnification) was prepared to cover the entire profile of an acinus of the gland (Fig. 1). The myoepithelium was identified by the presence of myofilaments and dense bodies in the dark ground

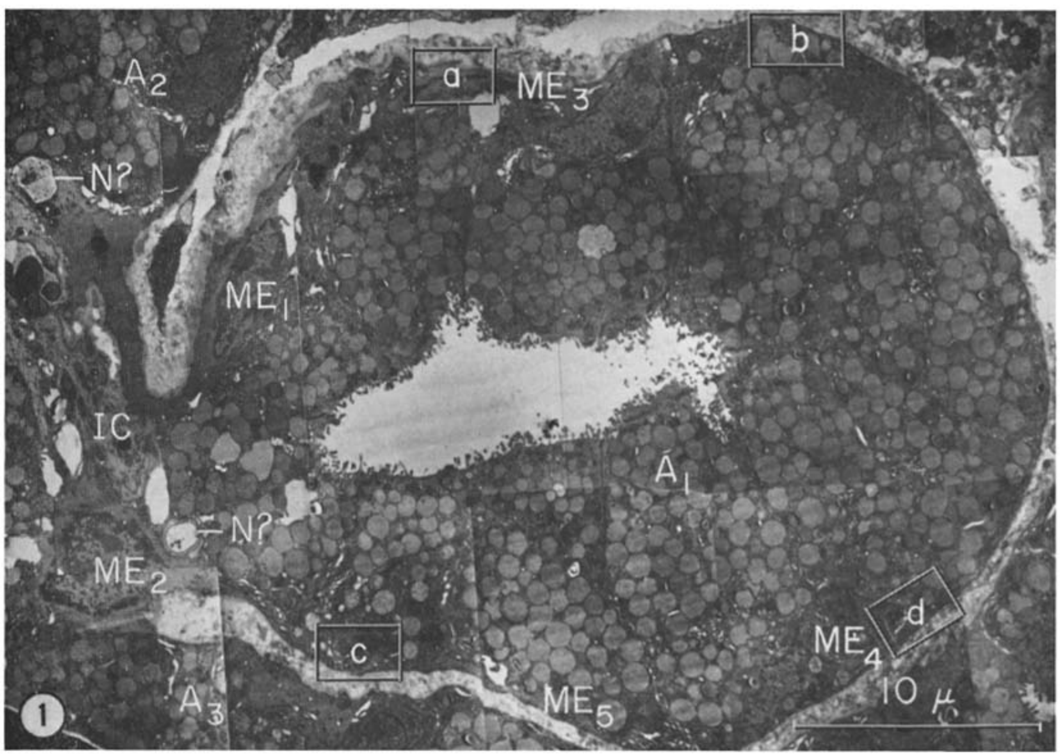

FIGURE 1 Photograph of a montage of electron micrographs, showing profiles of one entire acinus (*A1*) and parts of two other acini (*A2*, *A3*). Two myoepithelial cells, *ME1* and *ME2*, appear to envelop two acini, *A1* + *A2* and *A1* + *A3*, respectively. Squares *a–d* indicate the presence of nerve axons. *IC* = epithelium of the intercalary duct. *ME1–5* = myoepithelium. *N*? = a probable axon. × 3,300.

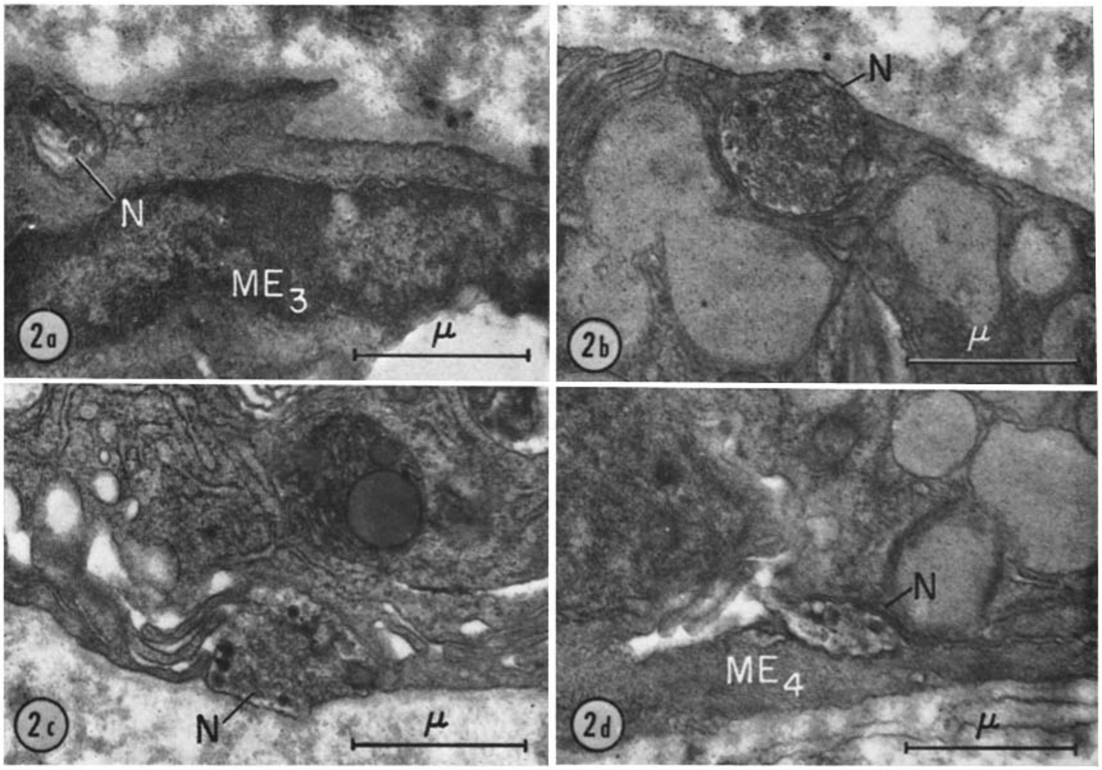

FIGURE 2 Enlarged four parts (*a, b, c, d*) of Fig. 1. *N* = nerve axons containing small granular and nongranular vesicles. × 23,000.

cytoplasm. Identification of the nerve axon was difficult with observation in one plane of the section. Small granular vesicles were often observed in axon profiles (see Fig. 2). They have also been reported in the sheep periarteriolar nerve (16), as well as in the autonomic nerve terminals in many other mammals (1, 4, 5, 7, 9, 12–14, 19 Also Burnstock, G., and Robinson, P. M., 1967. In preparation.) At least four single axons free of Schwann cell processes were seen in close proximity to one acinus (Fig. 2 *a-d*). Two of these axons were located in a groove on the surface of the myoepithelium, leaving a neuro-effector gap of about 200 A (Fig. 2 *a, d*). This relation of autonomic axon to smooth muscle effector has been observed in a number of other preparations where it was considered to be a functional synapse (2, 3).

It is of particular interest to find that, as shown in Fig. 2 *d*, an axon is sandwiched between the acinar epithelium and the myoepithelium. Axons in direct contact with acinar epithelium, as seen in Fig. 2 *b* and *c*, have also been reported in the rat submaxillary gland (17). However, it is possible that these axon-gland cell contacts are not functional junctions, but rather represent close association of axons and gland cells as axons pass on the way to their terminations on myoepithelial cells. This problem can be resolved only by studying serial sections through two or three acini of this gland.

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