Muscle cells in the salivary glands of a planthopper, Peregrinus maidis (Ashmead) and a leafhopper, Macrosteles fascifrons (Stål) (Homoptera : Auchenorrhyncha)

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SCIENTIFIC NOTE

MUSCLE CELLS IN THE SALIVARY GLANDS OF A PLANTHOPPER, *PEREGRINUS MAIDIS* (ASHMEAD) AND A LEAFHOPPER, *MACROSTELES FASCIFRONS* (STÅL) (HOMOPTERA : AUCHENORRHYNCHA)*

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THE PRESENCE of muscle cells or myofibrils in insect salivary glands has apparently been reported only in aphids, viz. *Myzus persicae* (Sulz.) (Homoptera : Aphididae) (Moericke and Wohlfarth-Bottermann, 1960; Cruz-Landim and Kitajima, 1974; Ponsen, 1977). Reviewing ultrastructural studies of the salivary glands of Orthoptera, Dictyoptera, Lepidoptera, and Diptera, Martoja (personal communication, 1983) stated that they are always devoid of muscle fibers. In *M. persicae,* Ponsen (1977) mentioned that one myoepithelioid cell, containing a nucleus and myofibrils, connects the distal parts of the 2 lobes of each principal gland. This report describes the presence of more extensive muscle cells and muscle fibers in the principal salivary glands of 2 auchenorrhynchous homopterans: a planthopper, *Peregrinus maidis* (Ashmead) (Delphacidae) and a leafhopper, *Macrosteles fascifrons* (Stål) (Cicadellidae).

Salivary glands of the above 2 species were dissected from live insects in 0.1 M potassium phosphate buffer (pH 7.4), fixed in 2.5% glutaraldehyde followed by 1% Os O_4, both in the same buffer mentioned above. Dehydration in an ethanol – acetone series was followed by embedding in Spurr's medium. Ultrathin sections were stained with uranyl acetate and lead citrate; thick sections for light microscopy were stained with toluidine blue.

As observed by light microscopy, the salivary glands of *P. maidis* and *M. fascifrons* are generally similar to those of other delphacids or cicadellids, respectively, described by Sogawa (1965). In both species, the principal salivary gland is composed of several acini, each containing a few large secretory cells and some smaller duct cells. In *P. maidis,* electron microscopy has revealed a 3rd type of cells, i.e. muscle cells, in all acini, usually near the periphery of the principal gland. These cells, which are located between secretory cells, contain many mitochondria, myofibrils and one nucleus each (Fig. 1). Their nuclei are much smaller than those of secretory cells of the same acinus. Striated muscle fibers (Figs. 1; 2) radiate from muscle cells in several directions, and are frequently innervated by small nerve axons. Muscle fibers are abundant in intercellular spaces among adjacent secretory cells of the same or different acini, and also in the basal boundary of secretory and duct cells, under the basal lamina (Fig. 2). No muscle cells or muscle fibers were found in the accessory salivary gland of *P. maidis.* In *M. fascifrons,* muscle cells and muscle fibers are similarly found in the principal salivary gland (Fig. 3).

In other insects, where no muscle cells or muscle fibers have been reported by electron microscopy, e.g. *Blaberus discoidalis* Serville (Blattaria : Blaberidae), pinocytosis is thought to be responsible for transporting secretory material into duct cells (Dailey and Crang, 1977; Smith, 1968). In *M. persicae,* the hemolymph is pumped into the lumen of both the ducts of the 2 lobes of the principal salivary gland by pulsations of the myoepithelial cell connecting both lobes (Ponsen, 1977). However, in Auchenorrhyncha, according to this study, there is more than one muscle cell in the principal gland: in *P. maidis* there is probably at least one muscle cell/acinus, since muscle cells were found in all acini of the principal gland. In both *P. maidis* and *M. fascifrons,* an extensive network of muscle fibers was found particularly in the peripheral regions of secretory and duct cells. Thus, besides pinocytosis, myofibrils may provide an additional mechanism for transporting secretory material within secretory cells to intracellular canaliculi and from these to intercellular ducts. It is conceivable that the

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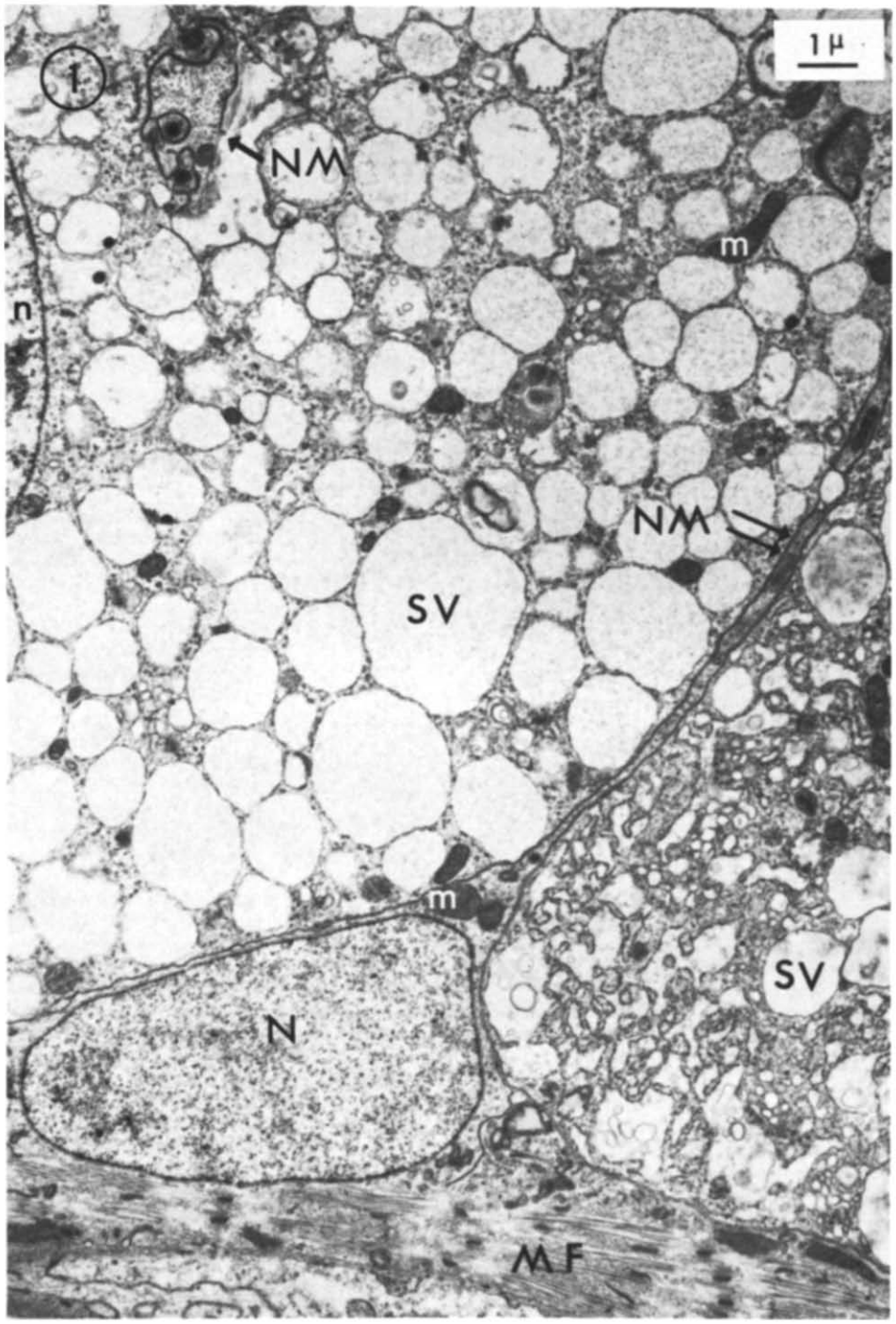

FIG. 1. A muscle cell (lower left) located between secretory cells in the principal salivary gland of *Peregrinus maidis*. Striated muscle fibers (MF) and neuromuscular ramifications (NM) radiate from muscle cell, intercellularly, among secretory cells. m = mitochondrion, n = nucleus of secretory cell, N = nucleus of muscle cell, SV = secretion vesicle.

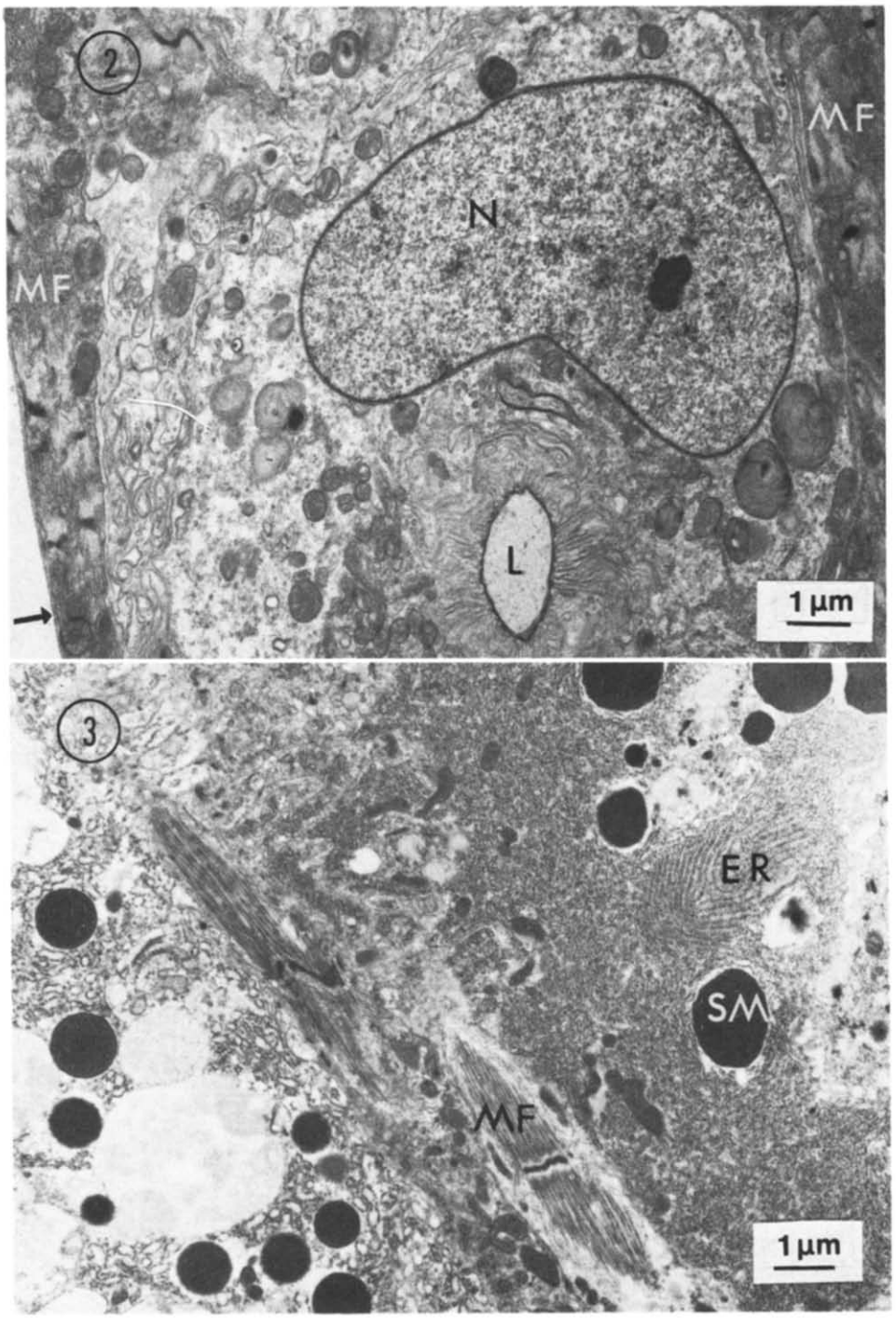

FIG. 2. Striated muscle fibers (MF) surrounding duct cells, under basal lamina (arrow), in the principal salivary gland of *P. maidis*. L = duct lumen, N = nucleus of duct cell.

FIG. 3. Striated muscle fibers (MF) between 2 secretory cells in principal salivary gland of *Macrosteles fascifrons*. ER = rough endoplasmic reticulum, SM = secretory material.

diversity and importance of salivary secretions in Homoptera, which brought about different types of secretory cells in their salivary glands (Miles, 1972), may have also required specialized cells for secretory transport. This may have started with the one myoepithelioid cell in the principal salivary glands of Aphididae, but evolved into a more extensive network of muscle cells and muscle fibers in those of Cicadellidae and Delphacidae. However, the presence of muscle cells in the salivary glands of other orders, particularly those that have not been investigated with electron microscopy, cannot be dismissed.

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