Absence of Salivary Invertase in Queen and Drone Honeybees

Worker honeybees' hypopharyngeal glands contain much invertase, and there is little or none in the other glands (post-cerebral, thoracic and mandibular) that discharge on their mouthparts[1,2]. Queen and drone honeybees have no hypopharyngeal glands, so the possibility that their other salivary glands might produce invertase has now been investigated. As drones' postcerebral and mandibular glands are vestigial, only their thoracic glands were tested.

Each pair of glands was removed under distilled water and ground up in sucrose solution buffered to pH 6.5. The amounts of glucose present before and after 24 h incubation at 35°C were estimated by the iodine oxidation method. The procedure was calibrated with a standard glucose solution and its reliability tested by titrations of buffered sucrose before and after incubation.

The amounts, if any, of invertase in the glands of queens and drones were small compared with those in the hypopharyngeal glands of workers (Table). The large standard error of the latter results from the great variation in the amount of invertase in individual bees.

When bees convert nectar into honey, its sucrose is inverted in their honey-stomachs, which can receive invertase only from the salivary glands. As queens and drones do not participate in honey storage they probably do not need salivary invertase. Drones, at least, eat large quantities of honey or nectar directly from the cells[3] but the invertase required to digest any sucrose this food contains is supplied by the mid-gut cells[4].

Invertase in salivary glands

Bees	Glands	Number of observations	Mean amount (mg) of glucose produced in 24 h	Standard error of mean
Worker	Hypopharyngeal	5	35.30	5.99
Queen	Mandibular	5	0.72	0.36
Queen	Post-cerebral	6	0.25	0.86
Queen	Thoracic	6	0.32	0.21
Drone	Thoracic	5	0.36	0.43

Zusammenfassung. Untersuchungen an Mandibel-, Hinterkopf- und Thoraxdrüsen der Bienenkönigin sowie an Thoraxdrüsen der Drohne haben gezeigt, dass sie, verglichen mit den Hypopharynxdrüsen der Arbeiterin, nur sehr wenig oder gar keine Invertase enthalten. Da weder Königin noch Drohne an der Honigspeicherung teilnehmen, brauchen sie keine Speicheldrüsen-Invertase.

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Similar Pattern of Fine Structure in the Basement Lamella of the Skin and the External Sheath of the Notochord in *Xenopus* larvae[1]

Electron microscopical observations on the larval skin of various Amphibian species revealed a common pattern of fine structure in the basement lamella of the epidermis[2–7]. As already suggested by Rosin[4] from studies by light microscopy, the basement lamella was found to consist of orthogonally arranged plies of collagenous fibrils which gradually appear during embryonic development[2].

In the course of electron microscopical observations on tissues of *Xenopus* larvae, we found a very striking similarity in the texture of the basement lamella of the epidermis and in the external sheath of the notochord. The present findings refer to tail tissue of *Xenopus* larvae, measuring about 30 mm in length. The tissue samples were fixed in a mixture of 1% OsO_4 and 0.5% neutralized potassium-di-chromate for 3 h and then immediately transferred into 65% alcohol containing 0.1% uranium nitrate. For dehydration, embedding and sectioning, the conventional procedures were followed.

Figure 1 represents the basement lamella which is located between the epidermal and the pigment cells. The boundary of the epidermal cells is marked by the so-called 'hyaline layer' which is about 0.2 μ thick and contains fibrillar and presumably also granular components. The basement membrane proper is composed of about 12 orthogonally arranged plies, some of which reveal at least two layers of collagenous fibrils. In *Xenopus* larvae the collagenous fibrils are on an average 200 Å thick, and show a periodicity of about 400 Å; it is also noteworthy that open communications may be found between the intralamellar space and the underlying pigment cells. The total thickness of the basement membrane, including the hyaline layer, is about 1.5 μ.

Figure 2 represents a small portion of the external sheath of the notochord in cross-section. It clearly reveals the pattern of orthogonally arranged plies in which the collagenous fibrils are rather tightly packed. On closer inspection, there are some differences as compared with the basement lamella. Thus, the outer boundary (500 Å) of the sheath is composed of very thin circular fibrils. Its body shows at least 13 crossed plies which often comprise several layers of fibrils, having similar dimensions as those of the basement lamella. At the inner boundary, the sheath communicates with the epithelial cells of the notochord.

In summary, our observations on *Xenopus* larvae reveal the occurrence of a common texture in both the epidermal basement lamella and the external sheath of the notochord, being composed of orthogonally arranged collagenous fibrils of approximately 200 Å in diameter. In the notochord sheath, the collagenous fibrils are more tightly packed than in the basement lamella[8].

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