Afferent and Efferent Nerve Endings of the Outer Hair Cells in the Rabbit*

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Afferente and efferente Nervenendigungen der äußeren Haarzellen beim Kaninchen


Die efferente Nervenendigung war 4,0 × 6,0 μm groß. Sie enthielt zahlreiche synaptische Bläschen und viele längliche Mitochondrien sowie multivesikuläre Einschlüsse. Die synaptischen Vesikel erschienen an bestimmten Stellen gegenüber dem synaptischen Spalt konzentriert. Dieser Bezirk kann als aktive Zone angesehen werden, in deren Bereich der Vesikelinhalt zum synaptischen Spalt hin entleert wird. An manchen Stellen dieses Spalts fanden sich Erweiterungen (0,16 × 0,68 μm) mit kleinen Vesikeln. Die mögliche Bedeutung solcher Erweiterungen des synaptischen Spaltes wurde kurz diskutiert.

Schlüsselwörter: Äußere Haarzellen – Afferente Nervenendigungen – Efferente Nervenendigungen – Kaninchen

Summary. The afferent and efferent nerve endings of the outer hair cells of the rabbit were investigated electron-microscopically. The afferent nerve ending was 1.4 × 2.0 μm in size and contained small vesicles, spherical mitochondria, and occasionally multivesicular bodies. The partially thick

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and dense membranes on either side of the synaptic cleft were observed and this region of the synaptic cleft was high in electron density. This area was considered to be an active zone of the afferent nerve ending.

The efferent nerve ending was $4.0 \times 6.0 \mu m$ in size and contained many synaptic vesicles, many oblong mitochondria, and multivesicular bodies. Synaptic vesicles were concentrated at some sites opposite the synaptic cleft. This area was thought to be an active zone where vesicles discharge their contents into the synaptic cleft. Furthermore, in some places of the synaptic cleft there were gaps ($0.16 \times 0.68 \mu m$) which contained small vesicles. The gaps in the synaptic cleft have been briefly discussed.

**Key words:** Outer hair cells – Afferent nerve endings – Efferent nerve endings – Rabbit

The electron-microscopic studies of the inner ear are generally thought to be technically difficult in comparison with that of the other materials by reason of the orientation (tissue directionality) of the inner ear and the bone which encloses the inner ear. Under this condition, guinea pigs are often used for the studies of cochleae more than other animals for the technical reason that the cochlea of the guinea pig is more easily approached. The rabbit has been used in the inner ear researches. However, there are few histological reports on the cochlea of the rabbit. Lately, authors reported the electron-microscopic observations of the outer hair cells of the rabbit (Omata et al. 1976, 1978).

The purpose of this paper is to describe, in more detail, the ultrastructural features of the afferent and efferent nerve endings of the outer hair cells in the rabbit.

**Material and Methods**

Six rabbits with normal Preyer's reflex, weighing about 2 kg each, were used for this investigation. Immediately after the temporal bone was removed from the killed animals, it was fixed for 2 h in 1.0% osmium tetroxide buffered at pH 7.4 with veronal acetate; the specimens were then dehydrated in graded ethanol and finally embedded in Epon 812. Thin sections cut from blocks were stained with uranyl acetate followed by lead citrate according to Reynolds and examined with a Zeiss EM 9S electron microscope.

**Results**

**Afferent Nerve Ending**

The afferent nerve ending was $1.4 \times 2.0 \mu m$ in size and contained small vesicles and mitochondriae (Fig. 1). Small vesicles which had various electron densities varied in size (0.06–0.16 $\mu m$ in diameter) (Fig. 2B). There were a few mitochondria in the afferent nerve ending, but mitochondria were not always