

Autometallographic Demonstration of Ionic Zinc in the Rat Olfactory Mucosa

*Dong Woo Nam, Yuanjie Sun, Sung Joo Kim, Yong Kuk Kim,
Soo Jin Kim¹, Yun Cho Yu², Young Gil Jeong³, Seung Mook Jo*

Department of Anatomy, Hallym University

¹Department of Biology, Hallym University

²Department of Oriental Medicine, Woosuk University

³Department of Anatomy, Konyang University

The present study was designed to demonstrate ionic zinc in the rat nasal mucosa by means of zinc selenide autometallography (ZnSeAMG). Rats were given sodium selenide either intraperitoneally (i.p.) or intranasally (i.n.). Prior to the i.n. administration the rats were anesthetized with pentobarbital sodium (30 mg/kg, i.p.). A thin plastic tube coupled to a Hamilton syringe was then inserted into the right nostril and 10 μ l of the solution was instilled. For the i.p. administration non-anesthetized rats were given 100 μ l of the sodium selenide solution (10 mg/kg). Control rats were instilled with saline. After 2 hrs survival, the rats were anaesthetized and transcardially perfused with 3% glutaraldehyde in 0.1M phosphate buffer. The nasal area was removed and put into same fixative. After 3 hrs the nose were placed in the 30% sucrose until it sank to the bottom of the container. The nose were then sectioned (30 μ m) horizontally using a Cryomicrotome. Autometallography (AMG) was performed according to Danscher et al (1997). After silver enhancement, fine AMG grains were scattered in the whole length of the olfactory epithelium containing olfactory receptor neurons, sustentacular and basal cells. However, much higher concentration of the AMG grains occupied near the surface and in the basal region of the olfactory epithelium. Both groups of i.p. and i.n. administration showed almost same level in the concentration of the AMG grains. In i.n. group, few AMG grains were also found in olfactory nerves of the lamina propria, suggesting zinc transport into the olfactory bulb via olfactory axons. At the electron microscopic level, the AMG grains were most entirely found in the supporting cells of the olfactory epithelium, and they were mostly localized in lysosome-like organelles. The i.n. group showed various signs of tissue damage of the olfactory mucosa, where dense concentration of AMG grains were localized at crystal-like structures.

The present study demonstrated dense population of ionic zinc distributed in the rat olfactory epithelium. So far there is no definite evidence what zinc may play a role normally in the olfactory system. However, it can be noted that zinc dysregulation leading to increased extracellular zinc, has been implied to play a role in Alzheimers disease by inducing precipitation of amyloid beta. It has also been observed that injuries in the olfactory pathway may be early manifestation of neurodegenerative disorders.

Figure Legends

Fig. 1. Light micrographs showing autometallographically stained olfactory mucosa in the rat administrated i.p. (A & B) and i.n. (C & D) with sodium selenide. Fig. 1B & D are magnifications of the rectangular areas depicted in Fig. 1A & B, respectively. Arrows indicate AMG grains in the basal region of olfactory epithelium (B) and lamina propria (D) containing fila olfactoria.

Fig. 2. Light (A) and electron (B) micrographs showing AMG grains (arrows & arrowheads) 2 hr after i.p. administration of sodium selenide.

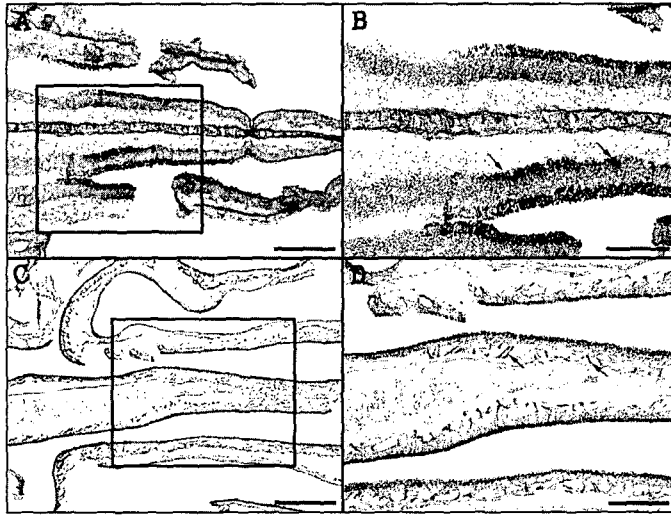


Fig. 1.

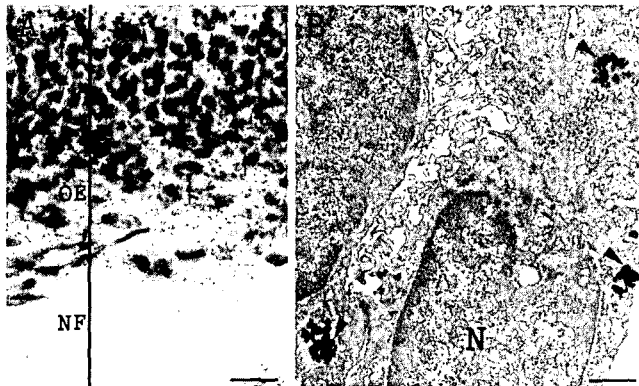


Fig. 2.