

# Mouse 이관에서 라이소자임과 락토페린 분비세포의 정상분포

박기현 · 박홍준 · 정연훈 · 송정환

## Distribution of Lysozyme- and Lactoferrin-Secreting Cells in Eustachian Tube of Normal BALB/c Mouse

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### ABSTRACT

**Background and Objectives :** Mucosal surfaces in the middle ear and eustachian tube are protected by several complex defense mechanisms, namely mucociliary clearance, immunoglobulins, cellular components, and antibacterial secretory enzymes. The secretory enzymes such as lysozyme and lactoferrin are found in various mucosal tissues and most of body secretions which cover the human mucosal surfaces. Because of their bactericidal activity, it has been suggested that these enzymes contribute to the defense against local mucosal infections. It has been known that lysozyme- and lactoferrin-secreting cells in tubotympanum were various in species such as human, chinchilla, guinea pig and Mongolian gerbil. The purpose of this study is to identify and localize the lysozyme- and lactoferrin-secreting cells in the eustachian tube of normal mice using histochemical and immunohistochemical techniques. **Materials and Methods :** Normal mice (BALB/c, 60 -120 days old, 10 heads ) were used for staining of tubotympanum with hematoxylin-eosin stain, Alcian blue-periodic acid-Schiff (AB-PAS) stain and immunohistochemical stain (antihuman lysozyme, and antihuman lactoferrin antibodies). **Results :** 1) Secretory cells in the epithelium and subepithelial glands are observed more in the pharyngeal portion than in the tympanic portion of eustachian tube. Subepithelial glands are also noted more in lower part than in upper part of eustachian tube. 2) Lysozyme was observed in the secreting cells of mucosal epithelium and the serous cells of subepithelial glands. 3) Lactoferrin was observed in the serous cells of subepithelial glands, but not in the epithelium. **Conclusion :** In the eustachian tube of BALB/c mouse, lysozyme and lactoferrin were detected in the serous cells in subepithelial glands and only lysozyme is observed in the secretory cells in the eustachian tube epithelium. **(Korean J Otolaryngol 1999;42:811-5)**

**KEY WORDS :** Mouse · Lysozyme · Lactoferrin · Eustachian tube.

5), 6) 가 ,  
7), 8) 9)  
가 .  
(lysozyme) (lactoferrin) 가 ,  
10) chinchilla,<sup>11)</sup>  
1)2) guinea pig,<sup>12)</sup> Mongolian gerbil<sup>13)</sup> ,  
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mouse  
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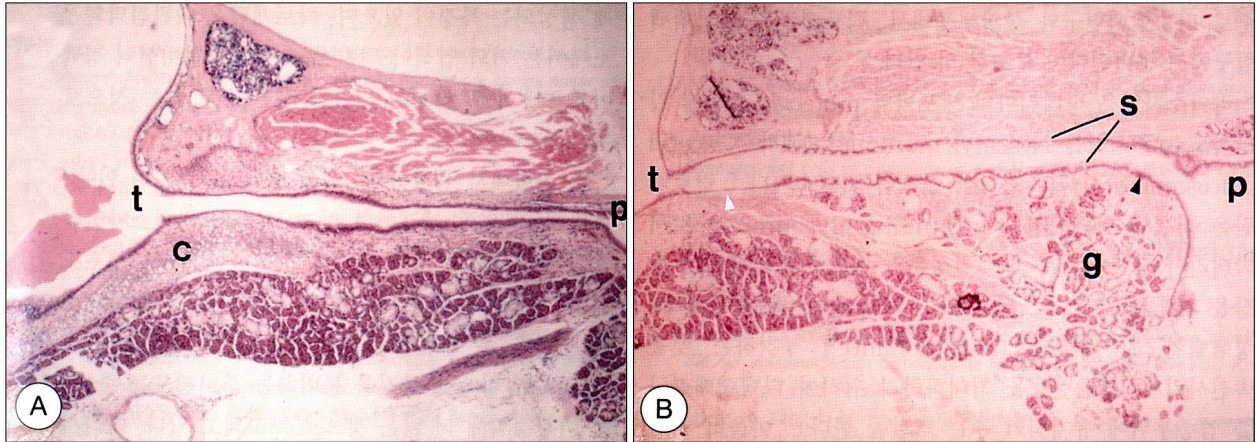
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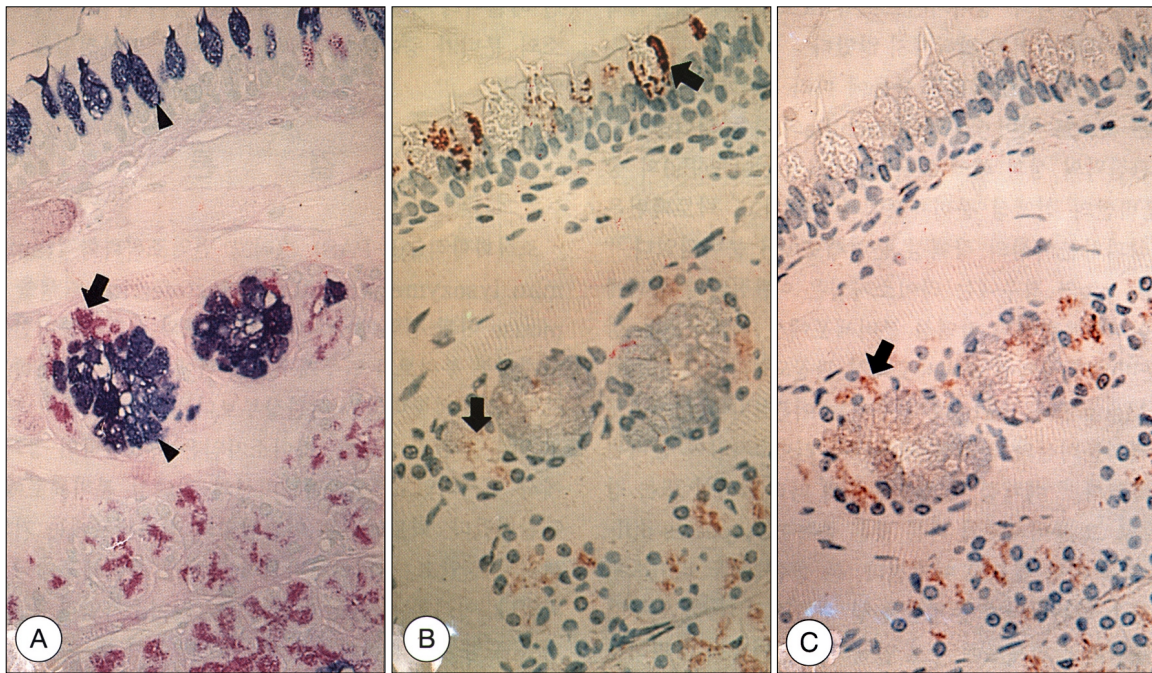
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BALB/c Mouse

mouse ( 1 : 50) ( 1 : 100)  
 9 40  
 PBS microprobe plate  
 (biotinylated goat anti - rabbit antibodies)  
 40 4 PBS  
 mouse microprobe plate  
 peroxidase reagent 40 4  
 PBS enhancer re -  
 agent aminoethylcarbazole  
 10  
 60 120 BALB/c mouse 10  
 가  
 hematoxylin 10  
 crystal mount  
 mouse  
 (rabbit antihuman lysozyme, rabbit antihuman  
 lactoferrin) 가  
 goat serum 가  
 Mouse ,  
 30cc , 10 %  
 (perfusion fixation)  
 ,  
 10%  
 48 , 10% EDTA(ethylened -  
 iaminetetraacetic acid in 0.1 M Tris buffer, pH6.95) 가  
 2 . 0.1M phosph -  
 ate buffer ( PBS) 70%, 80%, 90%,  
 100% 10 ,  
 xylene 3 Mouse (pseudostrati -  
 12 3 μm gland) (subepithel - ial  
 toxylineosin ,  
 alcian blue periodic acid -  
 Schiff(pH2.5) . (Fig. 1A and B).  
 (rabbit antihuman lysozyme ; DAKO, Denmark, lot.  
 #048) (rabbit antihuman lactoferrin;  
 DAKO, Denmark, lot. #089) AB - PAS  
 3 μm  
 Probeon® , xylene 5 3 AB - PAS  
 가 100%, 90%, 80%, 70%  
 5 mi - (Fig. 2A and B).  
 croprobe kit plate peroxidase  
 2 40 PBS  
 microprobe plate



**Fig. 1.** Hematoxylin-eosin staining of longitudinal section of eustachian tube of mouse (H & E stain,  $\times 40$ ). A : Upper part : Subepithelial glands are observed relatively less in upper part than in lower part (Fig. 1-B). cartilage (c) B : Lower part : Secretory cells (s) in the epithelium and subepithelial glands (g) are observed more in pharyngeal portion (p) than in tympanic portion (t). Pseudostratified ciliated columnar epithelium (black arrowhead) and cuboidal epithelium (white arrowhead) are noted in pharyngeal and tympanic portion, respectively.



**Fig. 2.** Enlargement of eustachian tube ( $\times 400$ ). A : AB-PAS stain : Mucous cells (arrowheads) and serous cells (arrow) are noted in the epithelium & subepithelial glands. B : Area adjacent to Fig. 2-A immunostained with antiserum to lysozyme : Lysozyme-positive cells stained brown (arrows) are located in the epithelium and serous cells of subepithelial glands. C : Area adjacent to Fig. 2-A immunostained with antiserum to lactoferrin : Lactoferrin-positive cells stained brown (arrow) are observed in serous cells of subepithelial glands, but not in the epithelium.

AB - PAS  
ulin A  
, 2) immunoglob -  
, 14) 3)  
(Fig. 2A and C).  
, 4)

10)12)

; 1)

BALB/c Mouse

가  
 14)  
 가  
 Giebink  
 15)  
 proteoglycans  
 N - acetyl muramic acid N - acetyl  
 glucosamine 4)  
 (iron - binding glycoprotein)  
 가  
 1)  
 가 (endothelium) , Hanamura 11)  
 16)  
 classical C3 convertase  
 (complement system)  
 3)  
 가 가 14)  
 가 Chinchilla  
 (epithelial goblet cells) (AB - PAS) (antihu -  
 man lysozyme, antihuman lactoferrin)  
 11) Guinea mouse  
 pig  
 12) Mo -  
 ngolian gerbil  
 13)  
 가 (species difference) mouse  
 mouse  
 AB - PAS  
 ( ) - : Mouse  
 7) 4)

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