

Public Abstract

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Title:Identification and characterization of M cells in the mammalian conjunctiva

The M cell is a specialized epithelial cell found in the follicle-associated epithelium (FAE) above lymphoid tissue at distinct locations along the wet surfaces of the body, known as mucosal surfaces. Two characteristic hallmarks of M cells include a unique morphology and the ability to transport material from the mucosal surface to underlying immune cells. M cells play a key protective role by their ability to sample materials, including antigens and pathogens from the external environment, which leads to protective immune responses that prevent future infection and inflammation at the mucosal surfaces. Some opportunistic pathogens, however, have the ability to exploit the antigen-sampling activity of M cells to breach the mucosal surface and cause disease. M cells have been identified at many mucosal surfaces including the respiratory and digestive tracts, but the presence of M cells in the conjunctiva of the eye has been debated. This dissertation examines whether the Guinea pig conjunctival FAE contains a unique cell-type that resembles and functions like M cells in other mucosa-associated lymphoid tissue.

The Guinea pig conjunctiva was found to have cells with the morphological characteristics of M cells in other locations. These features included a thin cytoplasmic bridge filled with numerous membranous vesicles, a deeply invaginated basolateral membrane forming a lymphoid cell-filled pocket, and distinctive microvilli. Morphological features, however, are not sufficient to prove the presence of M cells; unequivocal demonstration of M cells requires the cells be demonstrated to have the essential functional characteristic of M cells, namely the rapid transcytosis of macromolecules across the epithelium. A marker, *Maackia amurensis* leucoagglutinin-I (MAL-I), which preferentially labeled the apical surface of these putative conjunctival M cells was identified. MAL-I was subsequently found to be selectively transcytosed across the cell, thus proving they are, in fact, M cells. Additional work established that the bacterium, nontypeable *Haemophilus influenzae*, was also translocated by these conjunctival M cells. These findings provide important new insights into ocular mucosal immunity, including a possible route of entry for disease-causing ocular pathogens. Conjunctival M cell may be used as a potential therapeutic target for modulating the entry of pathogens and delivery of ocular mucosal vaccines.