Dynamics of Mucosal Immune System: Development of Prospective Mucosal Vaccine

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The mucosal immune system acts as a first line of defense against bacterial and viral infections by formation of dynamic immune network based on innate and acquired secretory IgA (S-IgA) and cytotoxic T lymphocyte (CTL) responses. Various mucosa-associated lymphoid tissues (MALT) of the aerodigestive tract including gut-associated lymphoid tissue (GALT) and nasopharynx-associated lymphoid tissue (NALT) play a pivotal role in the initiation of antigen-specific T and B cell responses. Recent advances in medical and biomolecular engineering technology and progress in cellular and molecular immunology and infectious diseases have allowed the development of versatile mucosal vaccine systems. Especially, antigen delivery system is an important subject in the mucosal vaccine development. Particulate antigens appear to be more effective than soluble ones, and this effect is at least partially due to the protection of the antigen from harsh conditions of the mucosal environment such as low pH, detergent effects of bile salts, and extensive proteolytic enzyme activity. Additionally, M cells, a key gateway system for antigen sampling at MALT, are more effective to take up particulate antigens, leading to the selective and effective antigen delivery into MALT for the initiation of antigen-specific mucosal and systemic immune responses. In this section, we will outline dynamics of mucosal immune system and some approaches toward the development of an ideal mucosal antigen delivery system.