

Mucosal Immunology: An Overview

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Received date: December 22, 2017; Accepted date: December 28, 2017; Published date: December 29, 2017

Kumaraswamy Naidu Chitrالا (2017) Mucosal Immunology: An Overview. *J Mucosal Immunol Res* 1: e103

Abstract

Immune system is a complex and diverse system designed to protect the body from dangerous pathogens whereas the mucosal immune system on other hand comprises the largest immune system in the human body designed for protecting against toxic elements entering the body through mucous membranes. Here has been a significant advancement in the mucosal immunology research in recent years including the discovery of new cell types and microbial alterations in the gastrointestinal tract. In general, the vast majority of infections occur through the mucosa therefore, understanding the mechanism of initial host defense response or innate immunity at the mucosal surface controlling these infections thereby protecting the system is a novel and promising area of research. Specifically mucosal innate immune cells play a key role in regulating the gut homeostasis and intestinal inflammation. Mucosal immunity plays a major role in the pathology of some diseases such as inflammatory bowel disease particularly in Crohn's disease and ulcerative colitis. The mucosal immune system demonstrates extensive flexibility affected by several factors such as diet, antibiotics and other environmental factors. Recent studies showed that the innate lymphoid cells (ILCs), intestinal microbiota, intestinal macrophages, retinoic acid (RA) and mucosa-associated invariant T Cells (MAIT) are some of the factors that play a major role in mucosal immune system of gut. Among these, ILCs are the key cells enriched in the mucosal surfaces shown to activate in response to the stress signals and multiple epithelial- and myeloid-cell-derived cytokines. Gut microbiota on other hand, has demonstrated to play an indispensable role in shaping the local mucosal gut-associated lymphoid tissue as well as systemic immunity specifically in the development of effector T helper (H) 1, Th1 and regulatory T (Treg) cells responsible for Th1/Th2/Th17 homeostasis. Gut microbiota and intestinal macrophages has associated in various diseases such as obesity, allergy, cancer, diabetes, inflammatory bowel disease, asthma and several neurological or behavioral disorders. Macrophages are the most abundant leucocytes living in the intestinal mucosa that maintain intestinal homeostasis by secreting cytokines and by engulfing or clearing the bacteria or their product.

Previous reports showed that the prototypical Th1/Th2 cytokines, microbial or endogenous signals such as IL-4, IL-13, IL-10 and TGF- β could regulate these macrophages. In addition to these factors, RA and RA receptors play a critical role in maintaining the balance between optimal protective immunity and effective peripheral tolerance for the mucosal immune system.

MAIT on other hand found in the intestinal mucosa play a key role in antibacterial host defense. Overall, these factors maintain the perfect balance of mucosal immune system through a cascade of

events. Some of the key challenges and prospects for the future research in mucosal immunology will include studies involved in elucidating the prospective application of innate lymphoid cells and their subsets, signaling cascade mechanisms involving various receptors and microbiome, metabolome analyses in the expansion of novel therapeutic treatments for human patients with inflammatory and infectious diseases. Finally, in recent scenario mucosal immunology research is one of the burgeoning and novel areas of research in immunology