Immune regulation of goblet cell and mucus functions in health and disease

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Mucosal surfaces are lined with mucus produced by goblet cells. This mucus serves as a protective barrier against harmful agents like microorganisms, allergens and dust. Goblet cell functions and mucus properties vary between organs, and are tightly regulated to meet the needs of each tissue. The immune system plays a key role in this regulation both during steady-state, and in response to threats such as damage or infection. During infection, activation of the immune system often leads to goblet cell hyperplasia, and enhanced mucus secretion that contribute to pathogen clearance. However, while the immune system plays an essential role in maintaining mucosal integrity, chronic immune activation often leads to pathological changes to goblet cells and mucus that can severely impair organ function. For example, chronic airway inflammation often causes mucus plugging that restricts air flow, and intestinal inflammation leads to disruption of the colonic mucus barrier. Mechanisms driving these pathological changes remain poorly understood, and large research efforts are put into unraveling these mechanisms with the aim to restore goblet cell and mucus functions as therapeutic strategies for chronic inflammatory diseases.