

THE IMMUNE RESPONSE TO AN INTESTINAL PARASITE, ALLERGY OR ASTHMA: WHAT THEY HAVE IN COMMON?



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Mast cells are known for their role in allergy, asthma, autoimmunity, hypersensitivity responses and increase inflammation. However, mast cells can limit inflammation and tissue injury. These and other findings suggest that mast cells occupy a critical niche at the interface of innate and acquired immunity, where, depending on circumstances, mast cells may function to perturb or help to restore homeostasis, with consequences that can either promote health or contribute to disease.

In this work we aim to explain the importance of mast cells in the immune response using four examples of pathologies in which these cells are involved: Allergy, Asthma, Irritable bowel Syndrome (IBS) and the response to nematodes such as *Trichinella Spiralis*.

Mast cells don't mature before exiting the bone marrow and circulate as committed progenitors. These progenitors complete their maturation with concomitant phenotypic diversity after moving into diverse peripheral tissues. Two prominent phenotypes were recognized in rodents: connective tissue mast cells (CTMCs) and mucosal mast cells (MMCs)

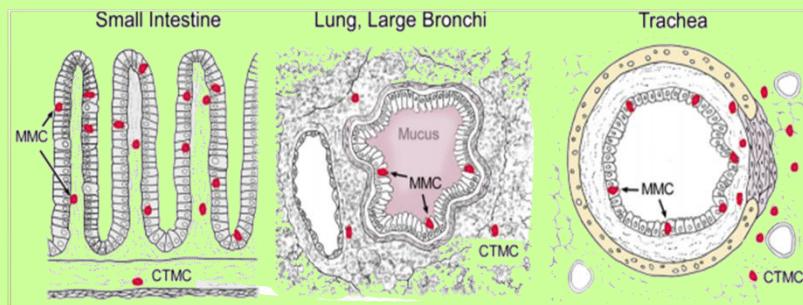


Figure 1. Different phenotypes depending on the tissue. Source: (Gurish and Austen, 2012)

ALLERGY

In the first contact with the allergen, Th2 cells promote B cells to produce IgE. Those fix in mast cells specific receptors FcεRI/II. When the second contact, a cross reaction occurs that triggers the release of large number mediators that produce the smooth muscle contraction, increase in vascular permeability and vasodilatation. Clinical manifestations of allergy are related to the effects of mediators released during mast cell degranulation. This results in unnecessary increases in vascular permeability and inflammation, whose harmful effects outweigh any beneficial effect. The ultimate example of this is anaphylaxis, a systemic allergic reaction to a harmless antigen that represents the imbalance between the cost and benefit of the immune response.

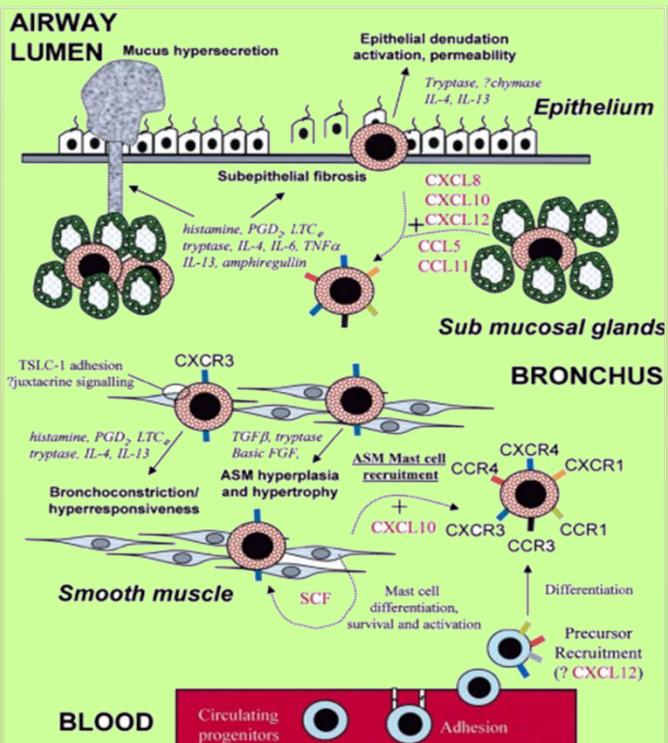


Figure 3. Interactions between mast cells- airways in asthma. Source: (Bradding et al., 2006)

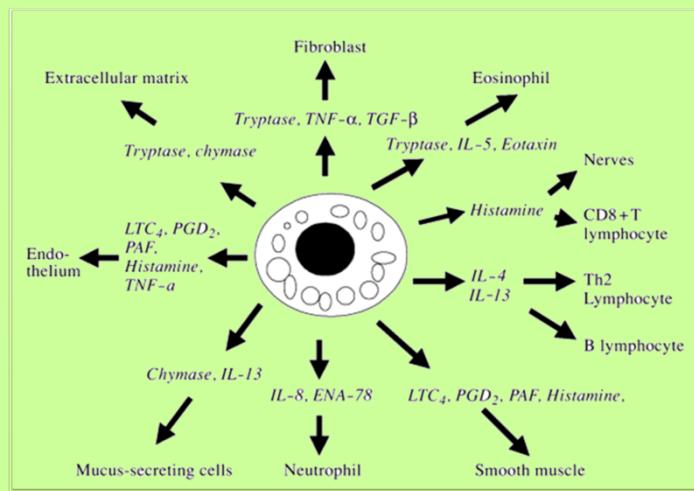


Figure 2. Products of mast cells in asthma development. Source: (Hart. 2001).

ASTHMA

In asthma the number of mast cells is increased and its activation is always equal to that discussed above. The location of mast cells in the airway smooth muscle facilitates the interactions between them. For location, the release of their mediators can contribute to the development of hypertrophy and hyperplasia and changes in airway obstruction. This close relationship is perpetuated by releasing chemokines and growth factors for muscle showing chemotactic action on mast cells receptors. Moreover, amphiregulin is expressed by mast cells in the asthmatic bronchial mucosa, and induces the expression of mucin gene. It is suggested that amphiregulin and therefore mast cells contribute to metaplasia of glands and mucus hypersecretion.

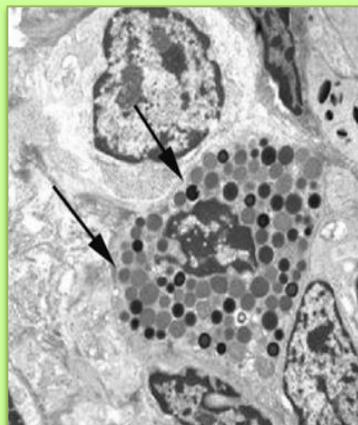


Figure 4. Mast cell degranulation. Source: (Ramos et al., 2007)

IRRITABLE BOWEL SYNDROME

Irritable bowel syndrome is characterized by an increased stool frequency and consistency. It has been demonstrated that psychosocial factors produce a state of low-grade inflammation related to activation of mast cells. These produce an increase in permeability. At the same time mast cells maintain a close relationship with the enteric nervous system which facilitates visceral hypersensitivity.

RESPONSE TO NEMATODES

In the response to nematodes, the immune system tries to create an uninhabitable environment in the bowel to eject the parasites. This mechanisms are the same as the irritable bowel syndrome: an increase in the permeability, smooth muscle contraction and hypersensitivity.. This time we notice that are used to solve the pathology instead of create it.

CONCLUSIONS

In this work, we see that depending on the circumstances mast cells can be the creators of the disease or those responsible for the solution. Two related examples are the IBS and response to parasites. It is not clearly known why this behavior. The hygiene theory tells us that the current good sanitary conditions and lack of contact with pathogens induces an alteration in the immune system leading to the reaction to other environmental proteins which should have induce a tolerance response.