Emerging roles for basophils in protective and pathological immune responses

KARASUYAMA, Hajime

Professor, Department of Immune Regulation, Tokyo Medical and Dental University

E-mail: karasuyama.mbch@tmd.ac.jp

ABSTRACT

Basophils are the least abundant granulocytes, and represent less than 1% of peripheral blood leukocytes. Although they are evolutionarily conserved in many animal species, their functional significance remained an enigma for a long time since the first description of their presence by Paul Ehrlich more than 120 years ago. The research on basophils has been hampered by their rarity and the lack of useful analytical tools. Accordingly, basophils have often been erroneously considered as lesser relatives or blood-circulating precursors of tissue-resident mast cells. We have recently developed powerful tools suitable for *in vivo* analysis of basophil function, such as basophil-depleting mAb, transgenic mice expressing GFP only in basophils, and knock-in mice in that basophils can be inducibly and selectively ablated with diphtheria toxin treatment. Taking advantage of these novel tools, we demonstrated that basophils play critical roles in the initiation of allergic responses, in a manner independent of mast cells, including IgE-mediated chronic cutaneous allergic inflammation, and IgG-mediated systemic anaphylaxis. We then explored whether basophils have any host-beneficial function *in vivo*, and identified their essential role in protective immunity against both ectoparasites (ticks) and endoparasites (intestinal helminths). Basophil depletion abolished the IgE-mediated, acquired resistance against the re-infection with these parasites. We further demonstrated that basophils contribute to the regulation of allergic inflammation by converting tissue-infiltrating inflammatory monocytes into anti-inflammatory M2-type macrophages through IL-4 production. Collectively, basophils play non-redundant roles in both protective and pathological immune responses, and could be a promising target for the treatment of allergic disorders.

References

1. Karasuyama et al.: Nonredundant roles of basophils in immunity. ***Annu. Rev. Immunol***. 29: 45-69, 2011.
2. Karasuyama et al.: Emerging roles of basophils in protective immunity against parasites. ***Trends Immunol***. 32: 125-130, 2011.
3. Karasuyama et al.: Newly-discovered roles for basophils: a neglected minority gains new respect. ***Nat. Rev. Immunol***. 9: 9-13, 2009.