Sex Differences in Allergy and Immunology

Junichi Chihara [1] Isao Ohno [2] Kaori Okuyama [2] Wataru Ito [1] Shigeharu Ueki [1]

[1] Department of Clinical and Laboratory School of Medicine, Akita University School of Medicine, Akita, Japan
[2]Department of Pathophysiology, Tohoku Pharmaceutical University, Sendai, Japan

Several epidemiologic studies have demonstrated that the incidence of asthma are higher in females than in males after puberty. Some of asthmatic women also have worsening symptoms before or during menstruation. However, the molecular mechanisms of worsening of asthma in females are unclear, although sex hormones have been shown to affect several immunologic responses. PPARg is a member of the nuclear hormone receptor superfamily that regulates lipid metabolism and glucose homeostasis. The incidence of the side effects of PPARg in the treatment of diabetes are much higher in females than in males. We have demonstrated that human eosinophils , which are considered as major effector cells as well as lymphocytes in allergic diseases, express PPARg and PPARg agonist inhibited eosinophil activation. Moreover, our studies showed that the PPARg expression was possibly higher in females, and estrogen enhanced PPARg. In a mice model, we found that the numbers of eosinophils in lung lavage fluids after antigen challenge in females were higher in either Balb/c or C57BL/6 mice. Concerning neutrophilic airway inflammation, evoked by the inhalation of LPS, sex difference in the number of neutrophils was not observed. These data suggest that the inflammatory mechanisms underlying sex differences in asthma is specific for eosinophilic inflammation. Moreover, from the viewpoint of innate immunity, we investigated the gram-negative bacteria ratio in respiratory tract, resulting that higher ratio in female was observed. Our preliminary studies emphasize the importance of the viewpoint of sex-difference to develop the pathophysiologic investigation in allergy.