【Grant-in-Aid for Scientific Research (S)】

Integrated Disciplines (Environmental Science)

Title of Project : Comprehensive and systematic study for control/eradication of allergic diseases via environmental and medical approaches

Hirohisa Takano
(Kyoto University, Graduate School of Engineering, Environmental Health Division, Professor)

Research Project Number : 16H06308 Researcher Number : 60281698
Research Area : Environmental Science
Keyword : Allergy/asthma, environment, hygiene, social medicine, immunology

【Purpose and Background of the Research】

Allergic diseases including bronchial asthma, pollinosis, atopic dermatitis and food allergies have been dramatically increasing worldwide, especially in the developed countries and urban areas. Changes in environmental factors, rather than those in genetic factors, are thought to be responsible for the increase in allergic diseases. An increase in environmental pollutants is involved in the recent changes in the environment and is thought to be responsible, at least partly, for the increase in allergic diseases. We have previously reported that environmental pollutants such as diesel exhaust particles, representatives of ambient fine particles (PM2.5), environmental chemicals including plasticizers, and nanomaterials can enhance allergic diseases. To control allergic diseases in modern society, not only medical approach but also environmental approach should be considered, because environmental pollution or pollutants are ubiquitous in our living environment. The aim of our comprehensive and systematic study is to control allergic diseases via environmental and medical approaches.

【Research Methods】

Our systemic study using *in vitro*, *ex vivo*, and *in vivo* procedures will analyze the underlying essential and fundamental mechanisms through which environmental pollutants enhance allergic diseases such as bronchial asthma and atopic dermatitis. Especially, we will focus on the important cells including epithelial cells, antigen presenting cells and a variety of immune cells and their intercellular interactions in the enhancing effects of environmental pollutants. Our targets include brain and bone marrow in addition to local inflammatory sites. Furthermore, we will identify the critical intracellular molecules, cell surface molecules and humoral mediators which play pivotal roles in the important cells and intercellular interactions. On the other hand, we will identify the possible enhancing factors and/or substances for allergic diseases by creating the evaluation system, where test samples will be applied to the *in vivo* evaluation using animal models on the basis of the results in the simple *in vitro* screening test using the identified cells and molecules.

【Expected Research Achievements and Scientific Significance】

We will elucidate the essential and fundamental mechanisms by which environmental pollutants enhance allergic diseases at the original source of biological/immunological responses and cell development/differentiation. Especially, we will identify the critical molecules as the possible targets for the new medicines or the medical approach to allergic diseases under the combined exposure to environmental pollutants and allergens which we usually suffered in daily life. On the other hand, we will identify the possible enhancing factors and/or substances for allergic diseases by testing a variety of environmental samples and consumer products. Finally, we would like to control allergic diseases via environmental and medical approaches.

【Publications Relevant to the Project】

・Takano H, et al.: Diesel exhaust particles enhance antigen-induced airway inflammation and local cytokine expression in mice. ***Am J Respir Crit Care Med*** 156: 36-42, 1997.
・Takano Hirohisa : Sick building syndrome, chemicals and allergies. ***Japan Medical Journal*** 4742: 18-22, 2015.

【Term of Project】 FY2016-2020

【Budget Allocation】 139,000 Thousand Yen

【Homepage Address and Other Contact Information】

http://health.env.kyoto-u.ac.jp/environmental_health_division/index.html