Researchers develop buckyballs to fight allergy

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A research team has identified a new biological function for a soccer ball-shaped nanoparticle called a buckyball – the ability to block allergic response, setting the stage for the development of new therapies for allergy.

Allergic disease is the sixth leading cause of chronic disease in the United States, and while various treatments have been developed to control allergy, no cure has been found. These findings advance the emerging field of medicine known as nanoimmunology.

The researchers, from Virginia Commonwealth University and Luna Innovations Inc., a private, Roanoke, Va., research company, are the first to show that buckyballs are able to block allergic response in human cell culture experiments.

Buckyballs, or fullerenes, are nanoparticles containing 60 carbon atoms. Due to their unique structure, inertness and stability, researchers from a number of scientific fields have been investigating the tiny, hollow carbon cages to serve a variety of functions. In this study, researchers modified the buckyballs so that they were compatible with water. The new study findings were published online in the June 19 issue of the *Journal of Immunology* and will appear in the July 1 print issue of the journal.

“This discovery is exciting because it points to the possibility that these novel materials can one day lead to new therapies,” said Chris Kepley,

Ph.D., M.B.A., assistant professor in the Department of Internal Medicine, Division of Rheumatology, Allergy and Immunology at the VCU School of Medicine.

“Researchers in many fields are aware of the potential fullerenes have, however, we are the first to show they can turn off the allergic response and basic immune reactions,” he said.

According to Kepley, who is the principal author of the paper, the buckyballs are able to ‘interrupt’ the allergy/immune response by inhibiting a basic process in the cell that leads to the release of an allergic mediator. Essentially, the buckyballs are able to prevent mast cells from releasing histamine.

Mast cells are responsible for causing allergic response and are packed with granules containing histamine. They are present in nearly all tissues except blood. When mast cells are activated, inflammatory substances such as histamine, heparin and a number of cytokines are rapidly released into the tissues and blood, promoting an allergic response.

The researchers found that the unique structure of the buckyball enables it to bind to free radicals dramatically better than any anti-oxidant currently available, such as vitamin E. Free radicals are molecules that cause oxidative stress, which experts believe may be the basis of aging.

“The immune system both protects us and causes harm, so we are always interested in finding new pathways to help manage the harmful effects,” said Kepley.

Source: Virginia Commonwealth University

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