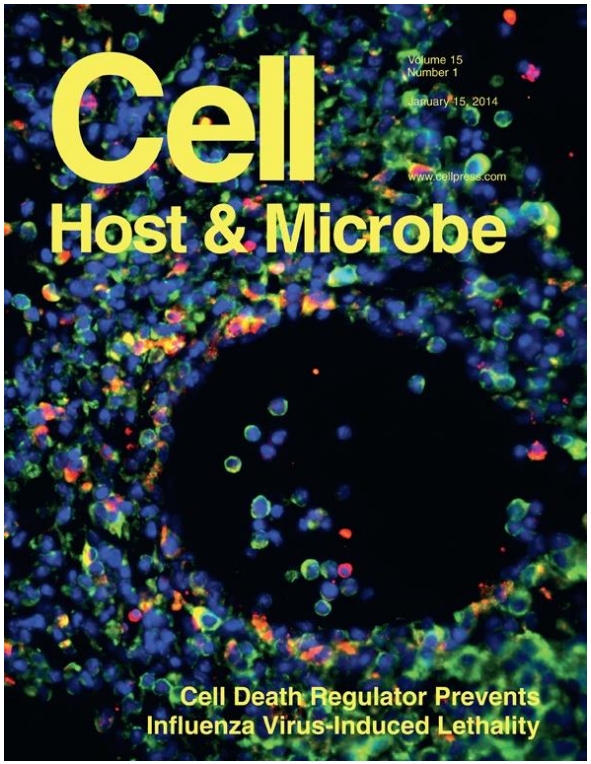
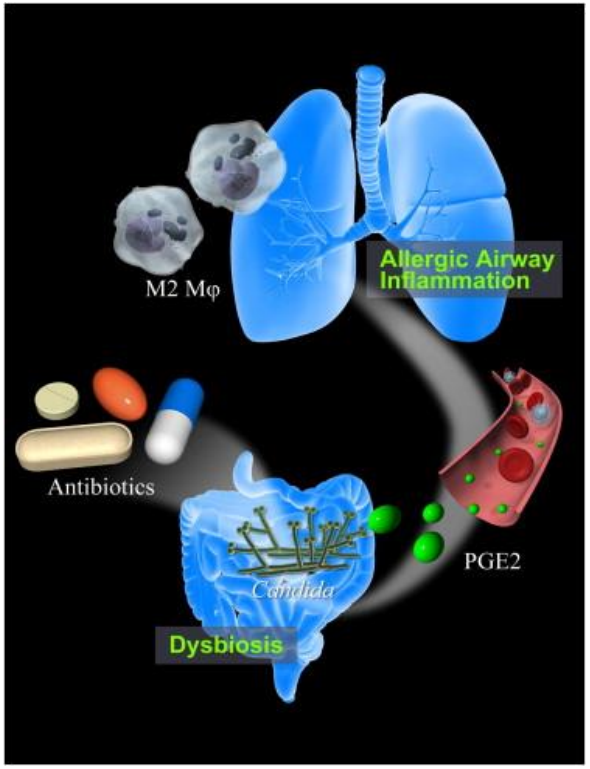
From Laboratory of Immunology

Gut dysbiosis promotes M2 macrophage polarization and allergic airway inflammation via fungi-induced PGE_2





Tsukuba team uncovers asthma-intestine mechanism

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A team of researchers from the University of Tsukuba in Ibaraki Prefecture has found a mechanism in which bad bacteria within mice intestines exacerbates asthma, fueling hope it can lead to a treatment for asthma in humans.

The team, headed by Akira Shibuya, a professor in the university's immunology laboratory, said that while it was already known that imbalances in gut micro biota composition, or dysbiosis, can be a cause of inflammatory bowel disease, asthma, atopic dermatitis and diabetes, its mechanism has been largely unknown.

It was clarified that a mechanism exists in which dysbiosis caused by taking a certain type of antibiotic can worsen asthma, the researchers said in a report released Wednesday.

In their experiments, conducted in conjunction with the University of Michigan Medical School, researchers gave mice five different types of antibiotics for two weeks each, and then made the mice inhale substances that cause allergies. As a result, the mice developed asthma.

The team found out that with one of the antibiotics, the asthma became worse.

When they checked inside the intestines of the mice, they found a decrease in good bacteria such as lactic acid and an abnormal increase in bad bacteria, namely a type of fungi called Candida.

A substance called prostaglandin E2 is produced from Candida, and reaches the lungs through the blood. Inside the lungs, prostaglandin E2 helps to increase M2-macrophage, which are specific immune cells that produce allergic reactions.

It was revealed that asthma symptoms improved in mice when Candida in the intestines was eliminated or when they were given medicine that suppressed the increase of prostaglandin E2 in the lungs.

The team is considering further experiments on how the same kind of mechanism would work for people who suffer from asthma, and develop medicine to treat such patients.

The Japan Times, Jan. 17, 2014

Antibiotic treatment induces dysbiosis. The effects of dysbiosis on host physiology are just emerging. Kim et al. find that antibiotic treatment of mice facilitates overgrowth of a gut commensal *Candida* species, which increases plasma concentration of prostaglandin E_2. Fungi-induced prostaglandin E_2 in turn promotes M2 macrophage activation and thus exacerbates allergic airway inflammation.

Reference: *Cell Host and Microbe*, 15:95, 2014