Protection against allergic asthma: When innate lymphoid cells educate alveolar macrophages

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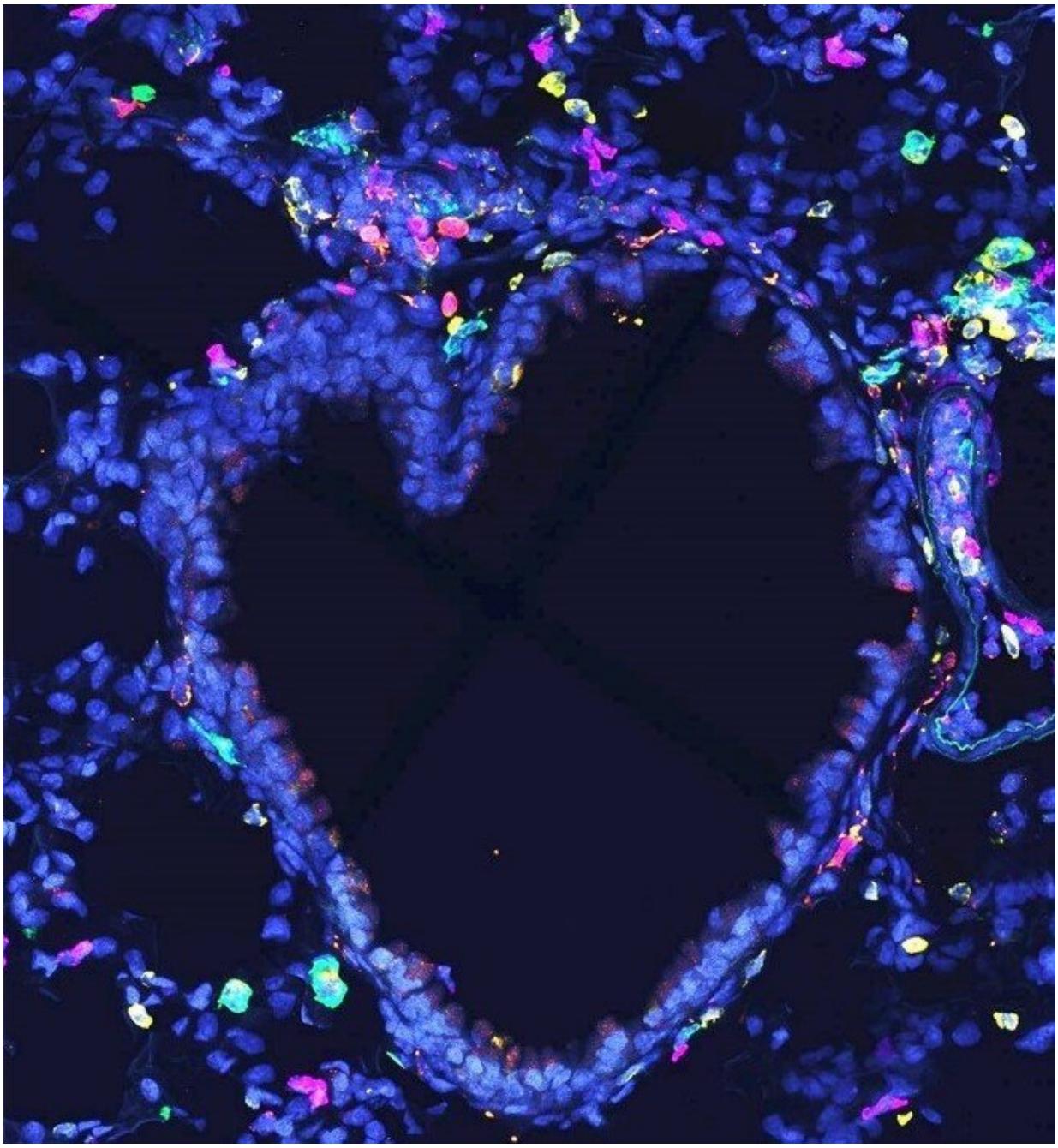


Immunostaining AM ILC2. Credit: P.Loos and A.Hego-ULiège

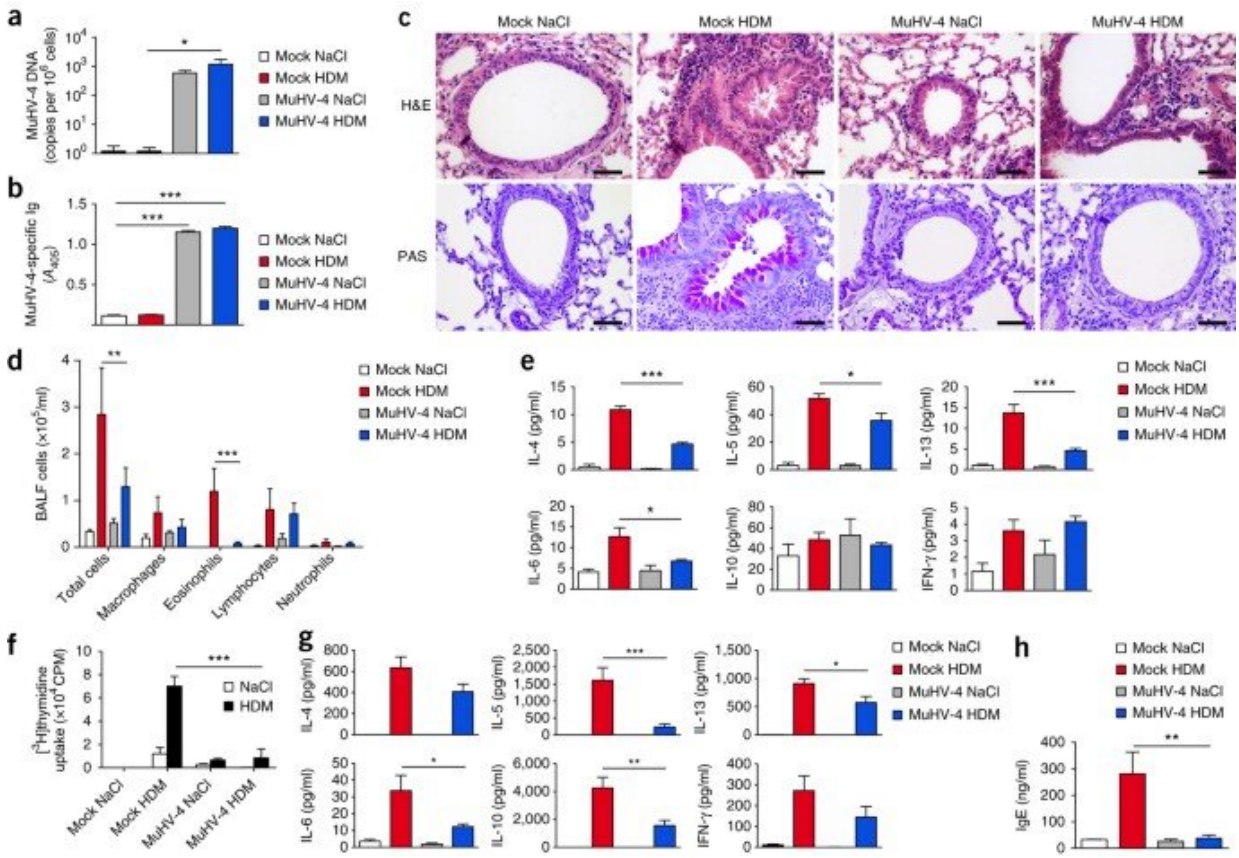
A study conducted by researchers at the University of Liège on group 2 innate lymphoid cells (or ILC2s) shows that the functional

reprogramming of these cells following their exposure to viruses allows our body to react differently to exposure to certain respiratory allergens. This study is published in *Science Immunology*.

The hygiene hypothesis states that exposure during childhood to certain micro-organisms protects against the development of allergic diseases such as asthma. In this context, researchers from the immunology-vaccinology laboratory (FARAH research unit/Faculty of Veterinary Medicine) at ULiège demonstrated in *Nature Immunology* in 2017 that the infection of laboratory mice by a gammaherpesvirus protected them from developing asthma.

In order to go further in the functional understanding of this mechanism, the ULiège researchers conducted a study, published in the journal *Science Immunology*, which now demonstrates that the functional reprogramming of lymphoid cells induced by the virus is one of the mechanistic keys.

"Group 2 innate lymphoid cells (ILC2s) were first described in 2010," explains Laurent Gillet, professor at the Faculty of Veterinary Medicine. "ILC2s are involved in responses to allergens and certain viruses, including the influenza virus. Even if this population is in the minority in the lung, this does not detract from their importance and this new study highlights their central role in shaping the alveolar niche."



Infection with MuHV-4 inhibits the development of HDM-induced allergic asthma. Credit: *Nature Immunology* (2017). DOI: 10.1038/ni.3857

"The concept of a niche can be compared to a house that gives structure, support and identity to its owner. This notion proposes that an immune cell needs a structure and other cells to function properly. In the case of the alveolus, the 'residents' correspond to the alveolar macrophages," says Pauline Loos, a Fund for Scientific Research—FNRS Research Fellow who conducted this study in the laboratory.

"During life, these niches will be remodeled by environmental factors," continues Bénédicte Machiels, a Fund for Scientific Research—FNRS Research Associate and co-director of the study. "The macrophages

disappear and are replaced by recruited cells, the monocytes, whose functional profile will depend on the repairs made to this house over time, and in particular on the ILC2s that are part of its structure."

This research makes it possible to describe for the first time the modulating effect of ILC2s on monocyte-derived macrophages in adulthood, in the context of a viral infection ensuring protection against the development of allergic asthma. This discovery is of great importance given that the alveolar niche is remodeled over time according to different events encountered during life such as respiratory infections, but also exposure to cigarette smoke or pollutants.

These different exposures are responsible for distinct education programs of macrophages by ILC2s and could partly explain the variations in sensitivities to respiratory diseases observed between individuals.

More information: Pauline Loos et al, Dampening type 2 properties of group 2 innate lymphoid cells by a gammaherpesvirus infection reprograms alveolar macrophages, *Science Immunology* (2023). DOI: 10.1126/sciimmunol.abl9041.
www.science.org/doi/10.1126/sciimmunol.abl9041

Bénédicte Machiels et al, A gammaherpesvirus provides protection against allergic asthma by inducing the replacement of resident alveolar macrophages with regulatory monocytes, *Nature Immunology* (2017). DOI: 10.1038/ni.3857

Provided by University de Liege