

Researchers discover how to capture images of cells at work inside our lungs

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University of Calgary scientists have discovered how to capture "live" images of immune cells inside the lungs. The group at the Snyder Institute for Chronic Diseases at the Cumming School of Medicine is the first in the world to find a way to record, in real time, how the immune system battles bacteria impacting the alveoli, or air sacs, in the lungs of

mice. The discovery has already provided new insights about the immune systems' cleaners, called alveolar macrophages. Once thought to be stationary, the scientists observed the macrophages at work, crawling over, between and around the alveolar spaces in search of bacteria and viruses.

"It makes sense that macrophages would move around, but we could only hypothesize this because we couldn't see them in action. Now we can," says Dr. Paul Kubes, Ph.D., principal investigator. "There are many more alveoli in the lungs than macrophages, and these tiny cleaners are very efficient at servicing every air sac."

The researchers say the job the macrophages do is quite simple. Think of a hotel, where there are more rooms than cleaning staff. The staff use hallways to clean and keep things in order. Inside the lungs, there is a corridor that provides a space between the alveoli. The macrophages use this space to move around to destroy any foreign particles including bacteria and viruses impacting the [air sacs](#).

The scientists needed to conquer three major obstacles in order to capture live images of this immune cell at work. The team needed to develop a way to capture an image from air to liquid to air again, they needed to stabilize the lungs long enough to get a clear picture, and they needed to find a way to identify and mark the macrophages.

"This work is a culmination of years of research by scientists around the world. We pulled everything together, combining and refining many [imaging techniques](#)," says Arpan Neupane, Ph.D. candidate and first author on the study. "Even six years ago, this would not have been possible."

The ability to see macrophages at work has revealed something else: the scientists watched as the powerful cleaners became paralyzed and

stopped doing their important job.

"We know when someone is battling a serious infection, especially a respiratory virus like flu or COVID-19, they often develop a secondary infection which can lead to death," says Kubes. "With this new imaging technique, we were able to see what's happening with the macrophages during this process."

It turns out, at a certain point during the battle against infections, the efficient cleaners become paralyzed making it easier for new infections to take root and flourish.

"The next step in our research is to find out why this is happening so that we can develop targeted therapies to kick start the macrophages into action again," says Kubes.

More information: Arpan Sharma Neupane et al, Patrolling Alveolar Macrophages Conceal Bacteria from the Immune System to Maintain Homeostasis, *Cell* (2020). [DOI: 10.1016/j.cell.2020.08.020](https://doi.org/10.1016/j.cell.2020.08.020)

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