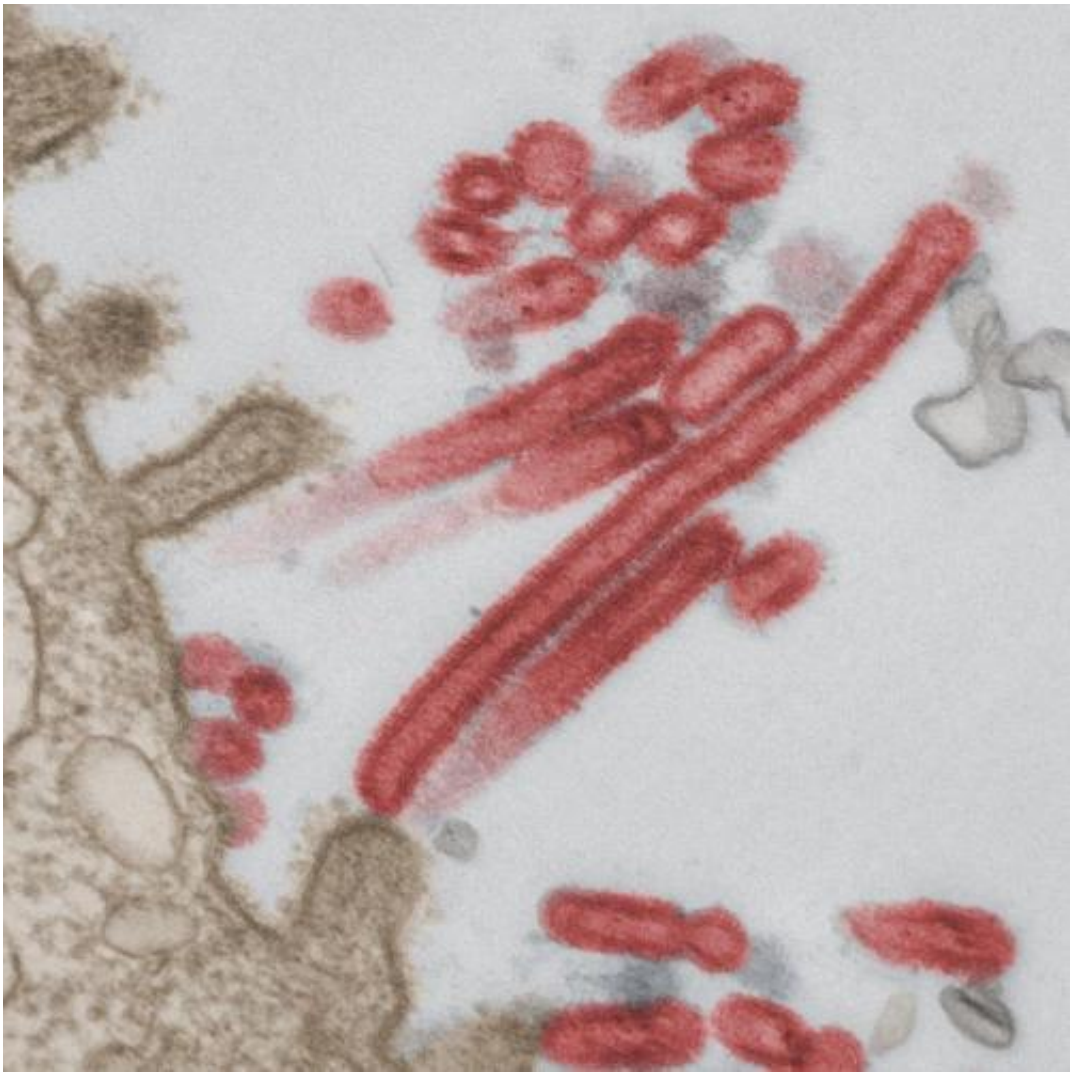
IL-27 balances the immune response to influenza and reduces lung damage

May 8 2014



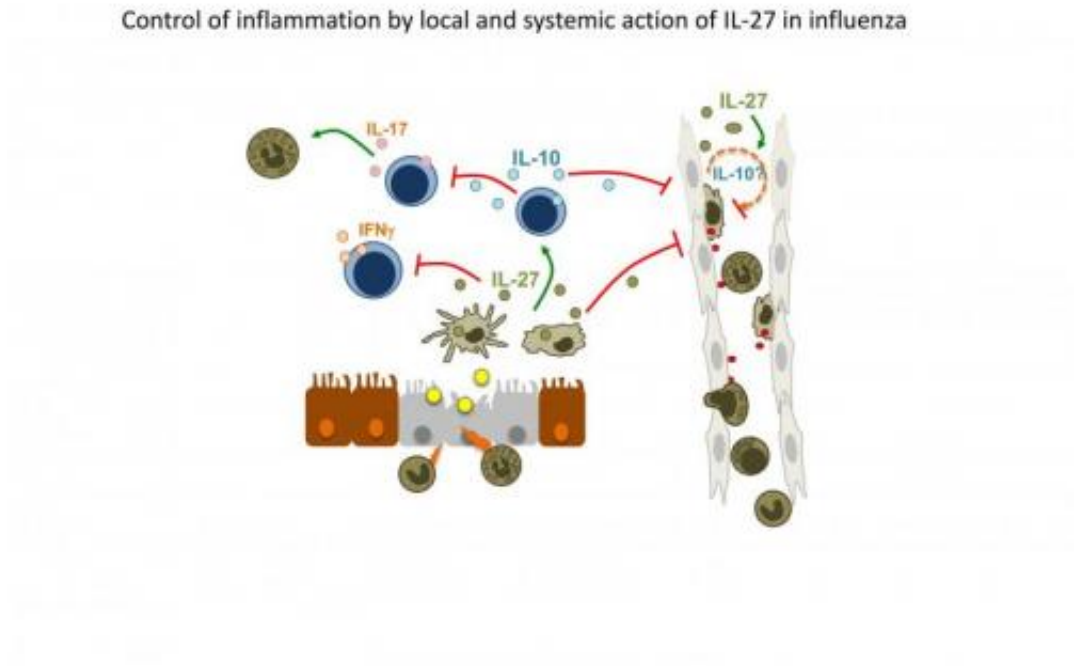
This is a colorized EM picture of a budding influenza virus in human lung tissue. Credit: RKI colleagues Gudrun Holland and Michael Laue, Robert-Koch-Institute, Berlin

Highly pathogenic (dangerous) influenza strains elicit a strong immune response which can lead to uncontrolled inflammation in the lung and potentially fatal lung injury. A study published on May 8th in *PLOS Pathogens* demonstrates the importance of IL-27 for the control of immunopathology—damage to the lung tissue caused by the immune system—and the therapeutic potential of well-timed IL-27 application to treat life-threatening inflammation during lung infection.

Alf Hamann, from Deutsches Rheuma-Forschungszentrum and Charité Universitätsmedizin Berlin, Germany, and colleagues, did a comprehensive analysis of IL-27 function in mice infected with a highly pathogenic influenza strain. They found that IL-27 levels in infected lungs follow, with some delay, the level of virus: they peak as viral levels are starting to decline and come down when immunopathology has resolved. This is compatible with a role for IL-27 in dampening uncontrolled inflammation at later stages of the infection, while initially allowing for a rapid immune defense.

When the researchers examined mice with disrupted IL-27 function, they found that they were more likely than normal mice likely to die when infected with the virus, and that they died as a consequence of rampant lung inflammation. This was associated with a stronger immune response and stronger immunopathology. Thus, IL-27 plays an important role in limiting destructive inflammation during the advanced stages of infection.

Having discovered the crucial role of IL-27 in regulating immunopathology, the researchers wondered whether this could be exploited for therapeutic purposes. To test the potential of IL-27 treatment, they administered recombinant IL-27 (rIL-27, that is, IL-27 produced by biotechnology) to normal mice at different times after virus infection.



Control of inflammation by local and systemic action of IL-27 in influenza. Credit: Alf Hamann et al.

When they matched the natural course of IL-27 (treatment starting at day 5 after virus infection), they found that fewer mice died, that they lost less weight, and recovered quicker than those without treatment. In contrast, mice treated with IL-27 early (starting at the day of virus infection) were doing poorly and did not recover from the infection. Although their lungs showed less extensive damage, they were not able to control overall virus levels. This shows the importance of timing, with IL-27 treatment being beneficial only during later stages of infection but harmful when given too early.

The scientists conclude that in mice "well-timed treatment with rIL-27

improved lung injury and accelerated recovery without affecting viral clearance" and continue "these data demonstrate that IL-27 has a unique role in controlling immunopathology without impacting on host defense, and might therefore represent a promising candidate for immunomodulatory therapy of viral pneumonia."

More information: Liu FDM, Kenngott EE, Schröter MF, Kühl A, Jennrich S, et al. (2014) Timed Action of IL-27 Protects from Immunopathology while Preserving Defense in Influenza. *PLoS Pathog* 10(5): e1004110. DOI: 10.1371/journal.ppat.1004110

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