Influenza during pregnancy predisposes offspring to increased susceptibility to infection

The research department "Viral Zoonoses - One Health" at the Leibniz Institute for Experimental Virology (HPI) in Hamburg, headed by Prof. Gülşah Gabriel, professor at the University of Veterinary Medicine Hannover (TiHo), has used a new animal model to investigate whether offspring of influenza A virus-infected mothers are more susceptible to other infections later in life. The results have now been published in the renowned journal "Nature Communications".

Pregnant women are among the highest risk group for severe, sometimes fatal, influenza infections. Whether influenza contracted during pregnancy also affects the later health of the offspring was not known until now.

The study, now published in Nature Communications, uses a new two-hit mouse model to show that moderate influenza during pregnancy increases the offspring’s susceptibility to infection from other viruses as well as bacteria, especially early in life.

The underlying mechanisms for this are diverse. Three factors in particular play an important role:

1. An influenza virus-induced immune activation in the lungs,
2. a low birth weight, and
3. a functional impairment of fetal alveolar macrophages to recognize and eliminate infections.

Key molecules that lead to this increased risk in the offspring of influenza-infected mothers, such as inflammatory cytokines in the mother’s lungs, are also induced by other respiratory viruses (including SARS-CoV-2).

"From human studies, several independent indications already suggest that infants whose mothers had influenza during pregnancy are at increased risk of infection during their first months of life. Until now, these have been association studies. The findings in the new animal model now show for the first time that there is a clear causality here between the viral infection in pregnancy and the increased vulnerability of the offspring to infection," explains Prof. Gülşah Gabriel, Head of the HPI research department "Viral Zoonoses - One Health" and Professor at the University of Veterinary Medicine Hannover.

"These studies repeatedly show that pregnant women need special protection in epidemics and pandemics to protect themselves, but also the next generation," emphasizes Prof. Gülşah Gabriel the importance of the findings obtained in the study.

The HPI/TiHo-led study involved numerous scientific institutions, including the Imperial College London, the Helmholtz Zentrum München and the Research Center Borstel.

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