ragweed pollen protein extract (RGW), followed by a 5-week break for any inflammation to resolve, before becoming pregnant. Their offspring were challenged with RGW intranasally at 4 weeks of age, which resulted in mast cell degranulation in the lungs and airway hyperreactivity in response to a broncho-constricting stimulus. This response was not seen in control groups that included non-sensitized dams or offspring challenged with a nonspecific antigen, or when mice were challenged after 6 weeks of age. The results indicate that allergic dams can transfer sensitization to their offspring in an antigen-specific, time-limited manner.

Antibody transfer from mother to fetus is mediated by the neonatal Fc receptor for IgG (FcRN). However, recent in vitro evidence indicates that FcRN might also transfer IgE in complex with IgG. When the active RGW sensitization protocol was carried out in FcRN-deficient mice, their offspring did not mount an allergic airway response to RGW. Similarly, in the passive immunization model, IgE could not be detected on fetal mast cells of FcRN-deficient dams. TNP-specific IgE, but not TNP-specific IgG, could sensitize offspring to neonatal TNP exposure. Thus, IgE, transferred by FcRN, is sufficient for allergen sensitization in offspring.

In humans, the authors used multicolour flow cytometry to describe a subset of mature mast cells that is present in human fetal skin by the second trimester of pregnancy. Importantly, human fetal skin was shown to contain granulated mast cells that colocalize with IgE.

In summary, the data indicate that prenatal exposure to maternal allergen-specific IgE in mice, even when induced weeks before pregnancy, can affect the immune response to a first exposure to the same allergen after birth, which suggests that predisposition to allergic disease may be determined in part before conception.

Kirsty Minton

ORIGINAL ARTICLE Msallam, R. et al. Fetal mast cells mediate postnatal allergic responses dependent on maternal IgE. *Science* **370**, 941–950 (2020)

subset at day 3 for adoptive transfer experiments. When injected into the eyes of mice with optic nerve injury, only the immature neutrophil subset induced marked RGC survival and axon regeneration. Nerve growth factor and insulin-like growth factor 1, which were elevated in conditioned medium from Ly6G^{low} neutrophil cultures and in vitreous fluid on days 3 and 5 following zymosan injection, were found to be partly responsible for the neuroprotective and pro-regenerative properties of immature neutrophils.


Credit: Fredrik Skold/Alamy

Last, the authors showed neuro-regenerative effects of Ly6G^{low} neutrophils also in the setting of spinal cord injury. Severed dorsal column axons regrew in mice that had received Ly6G^{low} neutrophils by injection into the sciatic nerve but not in mice receiving Ly6G^{hi} neutrophils. Finally, a human promyelocytic cell line, with features characteristic of the mouse Ly6G^{low} immature neutrophils, could stimulate regrowth of severed RGC axons following adoptive transfer into mice and promote neurite outgrowth by human cortical neurons in co-cultures.

These findings support a growing body of literature revealing heterogeneity and functional subspecialization of neutrophils and a potential new avenue for the treatment of CNS injury.

Lucy Bird

ORIGINAL ARTICLE Sas, A. R. et al. A new neutrophil subset promotes CNS neuron survival and axon regeneration. *Nat. Immunol.* **21**, 1496–1505 (2020)

IN BRIEF

COVID-19

B cell persistence and evolution to SARS-CoV-2

Deciphering the persistence of memory responses to COVID-19 will aid in understanding long-term protection. A preprint by Gaebler et al. presents a longitudinal analysis of SARS-CoV-2-specific humoral responses in 87 patients at 1.3 and 6.2 months after infection. Although antibody titres and neutralizing capacity declined over time, memory B cells specific for the receptor-binding domain of SARS-CoV-2 spike protein persisted up to 6 months after infection. These memory B cells display changes in clonal composition and can generate antibodies with increased neutralization potency and breadth. Consistent with continued antibody evolution, intestinal biopsies showed persistence of SARS-CoV-2 antigens 3 months after infection in some individuals. These data suggest that the persistence of memory B cells that continue to evolv e could provide effective humoral responses upon virus re-exposure.

ORIGINAL ARTICLE Gaebler, C. et al. Evolution of antibody immunity to SARS-CoV-2. Preprint at *bioRxiv* https://doi.org/10.1101/2020.11.03.367391 (2020)

COVID-19

Mapping host restriction of SARS-CoV-2

In this preprint, Martin-Sancho et al. identify 65 interferon-stimulated genes (ISGs) as cellular host restriction factors against SARS-CoV-2, with 37 of these significantly impairing viral replication. These ISGs include endosomal factors and nucleic acid-binding proteins, which may inhibit viral entry and suppress RNA replication, but the majority of them are ER- or Golgi-resident proteins, which suggests that they impact viral translation, lipid membrane composition and vesicle transport. BST2, which tethers newly synthesized viruses to the plasma membrane and impairs virus release, is identified as a potent restriction factor for SARS-CoV-2 and is found to be counteracted by the accessory protein ORF7a, expression of which rescues virus release. This study draws a comprehensive map of cellular host defence mechanisms against SARS-CoV-2.

ORIGINAL ARTICLE Martin-Sancho, L. et al. Functional landscape of SARS-CoV-2 cellular restriction. Preprint at *bioRxiv* https://doi.org/10.1101/2020.09.29.319566 (2020)

COVID-19

Cross-viral protection against SARS-CoV-2?

T cell cross-reactivity against SARS-CoV-2 has previously been shown in unexposed individuals. These T cells are thought to arise through exposure to other related coronaviruses such as those causing the common cold. In this preprint, Mahajan et al. used the algorithm 'OncoPeptVAC' to predict SARS-CoV-2 immunodominant peptides, some of which induced in vitro responses by T cells isolated from both healthy, unexposed individuals and convalescent patients. The predicted epitopes induced higher levels of CD8$^+$ T cell activation than did overlapping peptide pools of spike protein. T cell receptor (TCR) repertoire profiling of peptide-expanded cultures showed clonal expansion of multiple public TCR sequences recognizing peptides from HCMV, HHV-5 and influenza A virus. This suggests that exposure to these other viruses induces SARS-CoV-2-reactive T cells, which may confer protection against COVID-19.

ORIGINAL ARTICLE Mahajan, S. et al. Immunodominant T-cell epitopes from the SARS-CoV-2 spike antigen reveal robust pre-existing T-cell immunity in unexposed individuals. Preprint at *bioRxiv* https://doi.org/10.1101/2020.11.03.367375 (2020)

Aljawharah Alrubayyi, Ester Gea-Mallorquí and Sophie G. Reed
The Oxford–Cardiff COVID-19 Literature Consortium, University of Oxford, Oxford, UK
e-mail: covid19lit@medsci.ox.ac.uk