IFNα could limit HIV infection of macrophages by inducing the expression of cytidine deaminases that can target HIV DNA. Indeed, IFNα was found to increase the amount of APOBEC3G (both mRNA and protein) expressed by human primary monocyte-derived macrophages, and this increase correlated with a decrease in viral replication. IFNα was also shown to induce the expression of several other members of the APOBEC3 family: APOBEC3A and APOBEC3F. The promoters of the genes encoding these three APOBEC3 proteins were found to contain IFN-stimulated response elements (ISREs), indicating that IFNα regulates the amount of these APOBEC3 proteins that are expressed by macrophages by inducing transcription. Because APOBEC3F has similar anti-HIV activity to APOBEC3G, the induction of these two APOBEC3 proteins is likely to provide another mechanism by which IFNα inhibits the infection of macrophages by HIV. Consistent with this notion, knockdown of *Apobec3G* expression by small interfering RNA markedly reduced the ability of low doses of IFNα to inhibit the infection of macrophages by HIV, although at high doses of IFNα, inhibition of infection was still observed, probably because other IFNα-induced antiviral mechanisms were activated.

These data indicate that IFNα induction of APOBEC3G expression by macrophages tips the delicate balance between APOBEC3G and Vif in favour of APOBEC3G, and that this is one mechanism by which IFNα mediates its anti-HIV effects in macrophages. Because APOBEC3G has also recently been shown to inhibit the replication of hepatitis B virus, the authors suggest that IFNα-mediated induction of APOBEC3G expression by macrophages might be a widely used antiviral host-defence mechanism.

Karen Honey

ORIGINAL RESEARCH PAPER Peng, G., Lei, K. J., Jin, W., Greenwell-Wild, T. & Wahl, S. M. Induction of APOBEC3 family proteins, a defensive maneuver underlying interferon-induced anti-HIV-1 activity. *J. Exp. Med.* **203**, 41–46 (2006)
FURTHER READING Harris, R. S. & Liddament, M. T. Retroviral restriction by APOBEC proteins. *Nature Rev. Immunol.* **4**, 868–877 (2004)

complete commitment to the T-cell lineage, rearrange T-cell receptor (TCR) gene loci to generate functional TCR chains (the first main checkpoint in T-cell development), and become committed to the αβ or γδ T-cell lineage — cells could be divided into two populations on the basis of CD27 expression: $CD27^{low}$ cells (denoted DN3a cells) and $CD27^{hi}$ cells (denoted DN3b cells). The authors showed that DN3a cells can give rise to DN3b cells and that the upregulation of CD27 expression marks the transition between cells that are committed to the T-cell lineage but have not passed the developmental checkpoint at which successful rearrangement of TCR gene loci is tested (that is, DN3a cells) and cells that have passed this checkpoint and are committed to become either αβ or γδ T cells (that is, DN3b cells).

The identification of CD27 as a marker for the earliest αβ and γδ T-lineage cells allowed the authors to purify and characterize these populations. Analysis of gene-expression programmes showed differential regulation of various factors. The ratio of mRNA encoding the anti-apoptotic proteins BCL-2 (B-cell lymphoma 2) to BCL-X_L was found to be markedly lower in αβ T-lineage cells than in γδ T-lineage cells. In addition, mRNA encoding the transcription factors EGR2 (early growth response 2) and EGR3 was detectable only in γδ T-lineage cells, and the two lineages also showed differential expression of several other transcription factors: RUNX3 (runt-related transcription factor 3), HEB (HeLa E-box-binding protein) and some Ikaros-family members.

This study therefore points to some of the early regulators of αβ and γδ T-cell-lineage development and provides a method for the separation of these cells at an early point of divergence, which should help to further define these pathways.

Davina Dadley-Moore

ORIGINAL RESEARCH PAPER Taghon, T., Yui, M. A., Pant, R., Diamond, R. A. & Rothenberg, E. V. Developmental and molecular characterization of emerging β- and γδ-selected pre-T cells in the adult mouse thymus. *Immunity* **24**, 53–64 (2006)

IN BRIEF

CELL MIGRATION

Lymphocyte transcellular migration occurs through recruitment of endothelial ICAM-1 to caveola- and F-actin-rich domains.

Millán, J. *et al. Nature Cell Biol.* **8**, 113–123 (2006)

Vimentin function in lymphocyte adhesion and transcellular migration.

Nieminen, M. *et al. Nature Cell Biol.* **8**, 156–162 (2006)

The recruitment of leukocytes from the blood to the tissues requires that they migrate across the endothelium. Although transendothleial migration can occur by both paracellular and transcellular routes, most studies have focused on determining the mechanisms of paracellular migration. However, two studies published in *Nature Cell Biology* now analyse the mechanisms of transcellular transendothelial migration. Anne Ridley and colleagues observed that when T cells interacted with endothelial cells, the T cells extended protrusions into the endothelial cells at F-actin- and caveolin 1-enriched regions. Furthermore, T cells undergoing transcellular transendothelial migration were surrounded by caveolin 1, F-actin and intercellular adhesion molecule 1 (ICAM1). Importantly, reducing the level of expression of caveolin 1 resulted in a dose-dependent decrease in transcellular transendothelial migration. By contrast, Sirpa Jalkanen and colleagues showed that when peripheral-blood mononuclear cells (PBMCs) and endothelial cells interact, vimentin intermediate filaments from both cells form a complex, highly dynamic network that anchors the cellular adhesion molecules. This network was found to be important for transcellular transendothelial migration; vimentin-deficient PBMCs showed a decreased ability to cross endothelial cells *in vitro* and to home to mesenteric lymph nodes and the spleen. These data define two molecular pathways by which transcellular transendothelial migration can occur and future studies will be required to determine whether these processes are connected or independent.

NEUROIMMUNOLOGY

Immune cells contribute to the maintenance of neurogenesis and spatial learning abilities in adulthood.

Ziv, Y. *et al. Nature Neurosci.* **9**, 268–275 (2006)

Boosting your immune system might boost your brain power. Autoimmune T cells, which are present in healthy individuals, are known to promote neuronal survival and renewal following injury to the central nervous system (CNS), and Michal Schwartz and colleagues propose that this might reflect a normal, homeostatic role for T cells in adult neurogenesis (and therefore learning and memory). After 6 weeks, normal rats that were housed in enriched environments showed a greater degree of neurogenesis than rats that were housed in standard cages, but this natural increase in neurogenesis by environmental stimulation did not occur in immunodeficient mice. Furthermore, genetically engineered mice with an excess of T cells specific for a CNS autoantigen showed both increased neurogenesis and improved learning and memory in water-maze tests compared with their wild-type counterparts.