# IN BRIEF

## DENDRITIC CELLS

### Cutting edge: B220$^+$CCR9$^-$ dendritic cells are not plasmacytoid dendritic cells but are precursors of conventional dendritic cells

Segura, E. *et al. J. Immunol.* 1 Jul 2009 (doi:10.4049/jimmunol.0901524)

A study published by Eugene Butcher and colleagues in *Nature Immunology* last year suggested that differential expression of CC-chemokine receptor 9 (CCR9) could distinguish functional subsets of plasmacytoid dendritic cells (pDCs). However, in this study, José Villadangos and colleagues show that CD11c$^+$B220$^+$ cells that lack CCR9 expression cannot be classified as pDCs. The CCR9$^-$ cells did not express some classical pDC markers but they did express markers of conventional DCs, and did not produce interferon-α after stimulation. The B220$^+$CCR9$^-$ cells were also functionally comparable to conventional DCs in terms of their ability to present exogenous antigens on MHC class I and II molecules. B220$^+$CCR9$^-$ cells differentiated into the two main populations of conventional splenic DCs after adoptive transfer *in vivo*. These results indicate that B220$^+$CCR9$^-$ cells are not pDCs but precursors of conventional DCs.

## T CELL DIFFERENTIATION

### Human dendritic cells induce the differentiation of interleukin-21-producing T follicular helper-like cells through interleukin-12

Schmitt, N. *et al. Immunity* 11 Jul 2009 (doi:10.1016/j.immuni.2009.04.016)

This paper extends our knowledge of the developmental pathway of human T follicular helper ($T_{FH}$) cells, which provide help for antibody-producing B cells in germinal centres by producing interleukin-21 (IL-21). The authors showed that IL-12 produced by activated dendritic cells (DCs) can induce naive CD4$^+$ T cells to secrete IL-21 *in vitro*. IL-12 is a potent inducer of $T_H1$ cells, and indeed most of the IL-21-producing cells also produced interferon-γ (IFNγ); however, there was also a small population of IFNγ$^-$IL-21$^+$ cells that lacked T-bet expression. Human CD4$^+$ T cells primed in the presence of IL-12 could induce naive B cells to produce immunoglobulins. IL-12 could also induce memory CD4$^+$ T cells to produce IL-21. This role for IL-12 in the induction of IL-21-producing $T_{FH}$ cells is not shared by mice, in which IL-6 and IL-21 have been shown to be important for $T_{FH}$ cell development.

## TUMOUR IMMUNOLOGY

### Blockade of CTLA-4 on both effector and regulatory T cell compartments contributes to the antitumor activity of anti-CTLA-4 antibodies

Peggs, K. S. *et al. J. Exp. Med.* 6 Jul 2009 (doi:10.1084/jem.20082492)

Antibodies that block cytotoxic T lymphocyte antigen 4 (CTLA4) have been used to increase antitumour immune responses, but it is unclear whether effector T cells or regulatory T ($T_{Reg}$) cells are the target of this inhibition. The authors carried out suppression assays using combinations of effector and $T_{Reg}$ cells from wild-type or transgenic mice that expressed human CTLA4. Blocking CTLA4 on wild-type effector T cells with an antibody that targets mouse CTLA4 resulted in increased baseline effector T cell proliferation, but blocking CTLA4 on $T_{Reg}$ cells had a more modest effect; blocking both T cell subsets indicated a potential additive effect. Blocking CTLA4 on both effector and $T_{Reg}$ cells *in vivo* also had the highest antitumour activity and mouse survival rates, indicating that targeting both T cell subsets would have the greatest benefit during cancer immunotherapy.