Regulatory T Cells

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As the name suggests regulatory T cells (also called Tregs) are T cells which have a role in regulating or suppressing other cells in the immune system. Tregs control the immune response to self and foreign particles (antigens) and help prevent autoimmune disease. Tregs produced by a normal thymus are termed ‘natural’. Treg formed by differentiation of naive T cells outside the thymus, i.e. the periphery, or in cell culture are called ‘adaptive’.

Natural Treg are characterised as expressing both the CD4 T cell co-receptor and CD25, which is a component of the IL-2 receptor. Treg are thus CD4+CD25+. Expression of the nuclear transcription factor Forkhead box P3 (FoxP3) is the defining property which determines natural Treg development and function.

FoxP3 is crucial for maintaining suppression of the immune system. Naturally occurring mutations in the FOXP3 gene can result in self-reactive lymphocytes that cause a rare but severe disease IPEX (Immune Dysregulation, Polyendocrinopathy, Enteropathy, X-Linked) in humans and scurvy in mice.

Tregs suppress activation, proliferation and cytokine production of CD4+ T cells and CD8+ T cells, and are thought to suppress B cells and dendritic cells. Tregs can produce soluble messengers which have a suppressive function, including TGF-beta, IL-10 and adenosine. Additional markers of natural Tregs are CD152 (CTLA-4) and GITR (glucocorticoid-induced TNF receptor), although it should be noted that these are also expressed by other T-cell types periodically (e.g. activated T cells) so they are not in themselves unequivocally diagnostic. However, the role of these markers on other T cells is not clearly defined. T cells without a specialised regulatory capacity may also compete for resources such as growth factors and MHC class II stimulation and thus have a regulatory role via this general mechanism of competition.