Adjuvants: Immunostimulatory
Rebecca Helson, London, UK

Immune-potentiating adjuvants are thought to activate the innate immune system via toll-like receptors (TLRs) or pattern recognition receptors (PRR). Cooperation between these two components is desirable in directing the balance of humoral and cell-mediated immunity associated with the acquired immune response.

Monophosphoryl lipid A (MPL)
MPL is a non-toxic component derived from lipopolysaccharide (LPS) of bacterial cell walls and interacts with TLR-4 and TLR-2, inducing a Th1-skewed response. MPL is thought to directly activate macrophages resulting in the induction of IFN-γ and IL-2. However, it is not as potent at inducing antibody responses.

Unmethylated CpG dinucleotides
Unmethylated CpG dinucleotides are recognised by the innate immune system, as they are under-represented and methylated in vertebrate DNA. The immune response to unmethylated CpG has been linked in humans to the activation of TLR-9. Interactions result in the maturation of dendritic cells, upregulation of MHC class II to produce professional antigen presenting cells, induction of Th1 cytokines and triggering B-cell proliferation.

Saponins
Saponins are derived from the bark of a Chilean tree, Quillaja saponaria, so unlike other immunostimulatory adjuvants, is not pathogen derived. A highly purified fraction called QS21 is a potent adjuvant for the induction of a Th1-dominated response, including CTLs. Saponins are thought to form pores in cell membranes that allow antigens to gain access to the endogenous presentation pathway resulting in presentation by MHC class I and hence CTL activation.

Cytokines
Cytokines can also be used directly to modify or redirect the immune response. However as they are proteins, they have a short half life and, are generally very expensive.