Immunotherapy platform using biodegradable artificial Antigen-Presenting Cells

OCR Number: OCR 4791

Description:
Efficient T-cell stimulation and proliferation response to specific antigens is a goal of immunotherapy against infectious diseases and cancer. One of the ways to achieve this is by adoptive immunotherapy. Adoptive immunotherapy involves the infusion of antigen specific T-cells expanded ex vivo. However, its use in clinical settings has been limited due to the issues related to the quality, expense, and time involved in their isolation and culture. In addition, customized isolation must be carried out of individual patients, since T-cells only recognize antigens associated with self MHC, thereby limiting the general application of this therapy.

Yale’s technology mimics physiological antigen presentation with biodegradable nano- or microparticles constructed from poly(lactide-co-glycolic acid) (PLGA), whose safety has been established for use in humans. The modular design of our polymeric artificial Antigen-Presenting Cells (aAPCs) system involves flexible addition and subtraction of functional elements including antigen-specific and polymeric T-cell receptor activators, co-stimulatory and adhesion molecules, and cytokines for exquisite controlled release. The antigens can be tumor, viral, bacterial, parasite, allergens environmental or self antigens.

Value Proposition: The global market for immunotherapies to treat cancer was worth $19.6 billion in 2006. At a compound annual growth rate of 9.5%, the global market will be worth more than $37.2 billion by 2012.

Advantages: Current artificial cellular or acellular APCs have the risk for potential infection and tumorigenicity, and lack biocompatibility. Our system not only overcomes these limitations but also is capable of generating tunable aAPCs for stimulating and expanding primary T cells. These aAPCs represent true “off-the-shelf” technology amenable to long-term storage and primed for immediate use.

Field of Application: This system has applications to cancer immunotherapy as well as the treatment of autoimmune diseases.
Fig. 1 Paracrine delivery of Interleukin-2 (IL-2) increases T-cell expansion as compared to exogenous IL-2 addition

Publications:


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