

Ligand Functionalized Nanowires for the Activation of Lymphocytes

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Technology

The presented invention is an innovative method for improved *ex-vivo* stimulation of T cells based on ligand-functionalized nanowires for adoptive immunotherapy. This approach is considered a promising and revolutionary cancer therapy. In nature, T cells interact with Antigen Presenting Cell (APC) cells that have microscale actin-rich protrusions called “microvilli”. The topography and elasticity of microvilli not only increases the T cell-target interaction but is also assumed to play an essential role in reorganizing signaling molecules that regulate the initial T cell response. These microvilli tips are enriched with activating molecules that bind receptors on T cells and produce tight contacts with the target cell’s membrane. None of these features is present in the commercially available solutions today, that are round beads covered with antibodies, anti-CD28 and anti-CD3. In the present technology, isolated cytotoxic lymphocytes obtained from a self-donor being activated by micropillar array structure (acts as a micro-brushes) that not only activated T cells by biochemical signals (anti-CD28 and anti-CD3) but also by mechanical ones, better mimics the *in vivo* mechanism. The micro-pillar array activates and facilitates the expansion of contacting cytotoxic lymphocytes more rapidly and efficiently than current solutions exist.

Application

Ex vivo activation of T cells for immunotherapy.

Advantages

- Novel structure nanomaterials for *ex vivo* activation of T cells
- More efficient and rapid activation
- Mimics better nature
- Scalable structure for manufacturing
- Easy and robust
- Can be integrated into different format systems of T cell production
- Increase specific binding, that sometimes lack in beads
- May offer easy way of separation between activating material from the T cells that need to be introduced back to the patient. Currently, this makes regulation difficulties using beads
- Currently CAR T are produced by viral transduction, yet the tendency is to transfer to physical methods such as electrophoresis. This is not possible with beads that enter the cells during electrophoresis. The micro-pillar can resolve this problem
- Reduce the risk for self-trapping and damage that can be caused by shear forces of beads

Patents

Patent covering the following invention was filed