New system developed that can switch on immune cells to attack cancer cells

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Researchers have developed an artificial structure that mimics the cell membrane, which can switch on immune cells to attack and destroy a designated target. This method has potential to be used as a future cancer immunotherapy treatment as well as providing more insight into how immune cells are activated to find and kill cancer cells. The findings are presented today at the Joint Congress of the British and Dutch Societies for Immunology, taking place in Liverpool, UK.

Immunotherapies—which make the body's own immune system attack cancer cells—are one of the most promising new forms of cancer treatment. For these to be effective, we need to understand how the immune system identifies cancer cells and reacts to them. This requires the protein (or antigen) on the tumour cells to be presented for inspection by antigen presenting cells (APCs), a group of immune cells that are responsible for co-ordinating the immune response. They effectively assess threats to the body by gathering information from proteins they encounter. They then use this information to instruct the immune system's T cells which proteins they should react against, thus starting the immune responses. Although natural APCs produced by the human body have been used for immunotherapies, they need to be developed separately for each individual, which is costly, time consuming and has only shown variable results.

PhD student Loek Eggermont and team from the Figdor lab at Radboud University Medical Centre in The Netherlands sought to solve this problem by developing artificial antigen presenting cells instead. They

developed a filamentous polymer scaffold, with a nanoworm-like structure, that mimics the cell membrane of antigen presenting cells. This scaffold has various T cell activating proteins embedded in it. Through in vitro studies, they found that these artificial APCs are able to activate human T cells, influencing both their proliferation and differentiation. They also found that different receptors on T cells must be triggered in close proximity to one another by proteins attached to artificial APCs to achieve optimal activation of the T cells.

These findings help us better understand the mechanisms behind T cell activation - ie what signals these cells need to start attacking cancer cells—and as well as providing a promising avenue of research for developing more efficient immunotherapies. The team now aim to make this polymer more specific to cancer proteins, so that it will induce T cells to only attack cancer cells. Following this, the system then needs to be tested in a mouse model as a first assessment of whether it can be used to treat cancer in vivo effectively.

Researcher Loek Eggermont from Radboud University Medical Centre said: "Cancer immunotherapy strongly depends on proper activation of immune cells, such as T cells, to find and destroy the tumour cells. Right now, immunotherapies to fight cancer mostly depend on non-specific activation of the immune system.

"We have shown that an artificial antigen presenting cell can be effective in activating T cells in in vitro studies. Our findings also help us to better understand the mechanisms behind this T cell activation. Although more studies are now needed to see if this system works in animal models, we hope that it might one day lead towards development of new off-the-shelf cancer immunotherapies."

Provided by British Society For Immunology