

Task of the Invention

The task of the invention is to improve the production of effector molecules by peripheral white blood cell in a patient suffering from cancer (hematologic and oncologic tumors) or infectious diseases or immune-mediated diseases like autoimmune diseases and degenerative diseases. This will improve the outcome of cellular immune therapy in patients suffering from cancer (hematologic and oncologic tumors) or infectious diseases or immune cell-mediated diseases like autoimmune diseases and degenerative diseases.

Summary

- 10 In one aspect, the present disclosure refers to a method for the activation of immune cells by incubating them with at least one short-chain fatty acid so that the immune cells are activated so that they can increase the production of effector molecules, characterized in that the immune cells are immune cells with synthetic receptors, and wherein the activation of the immune cells by short-chain fatty acids is performed *in vitro*.
- 15 In one aspect, the present disclosure refers to use of an immune cell activated by the method of the invention in the manufacture of a medicament for the treatment of a disease selected from the group consisting of a tumor, an immune mediated disease, a degenerative disease and an infectious disease characterized in that the at least one short-chain fatty acid enhances a cellular immune therapy.
- 20 In one aspect, the present disclosure refers to use of an immune cell activated by the method of the invention in the manufacture of a medicament for the treatment of a disease selected from the group consisting of a tumor, an immune mediated disease, a degenerative disease and an infectious disease characterized in that the tumor is a pancreatic tumor.
- 25 In one aspect, the present disclosure refers to a method for the cultivation of T cells by incubating them with short-chain fatty acid pentanoate so that the T cells are activated and the production of effector molecules is increased, wherein T cells which are incubated with the short-chain fatty acid pentanoate are chimeric antigen receptor (CAR) T cells.

Solution of the Task

- 30 Claim 1 solves the task of the invention. The invention describes a method for the cultivation of T cells by incubating them with short-chain fatty acids (SCFAs) like pentanoate, butyrate or a composition of short-chain fatty acids comprising pentanoate and/or butyrate so that the T cells are activated and the production of effector molecules is increased. The invention involves improving the cultivation of
- 35 T cells by incubating them with short-chain fatty acid (SCFA) pentanoate after isolation from peripheral white blood cells. Those incubated peripheral white blood cells are reinjected to the same patient. The effect is that these cells are activated and the production of effector molecules in the patient is increased. This increases the chances of success of tumor therapy.
- 40 Collectively, we claim that low-abundant commensal bacterial species such as *M. massiliensis* and their selective metabolites such as pentanoate, rather than broadly distributed and abundant commensals, are used as specific microbial therapeutics for targeting human tumors.
- 45 We claim a medical preparation for use in mammals, in particular in humans suffering from cancer (hematologic and oncologic tumors) or infectious diseases or

immune-mediated diseases like autoimmune diseases and degenerative diseases, comprising at least one short-chain fatty acid (SCFA) like pentanoate, butyrate, characterised in that the at least one short-chain fatty acid (SCFA) activate immune cells and enhances the production of effector molecules.

- 5 The short-chain fatty acids like pentanoate and/or butyrate can be used as salts, for example as sodium salt (Na^+ -salt) or in another acceptable pharmaceutical preparation.

Claims

1. Method for the activation of immune cells by incubating them with at least one short-chain fatty acid so that the immune cells are activated so that they can increase the production of effector molecules, characterized in that the immune cells are immune cells with synthetic receptors,
5 and wherein the activation of the immune cells by short-chain fatty acids is performed *in vitro*.
2. Method according to claim 1 characterized in that the short-chain fatty acid comprises pentanoate or a pharmaceutical acceptable derivative thereof.
- 10 3. Method according to claim 1 or 2 characterized in that the short-chain fatty acid comprises pentanoate and butyrate or pharmaceutical acceptable compositions thereof.
4. Method according to any one of claims 1 to 3 characterized in that the at least one short-chain fatty acid is produced by at least one species of bacteria.
- 15 5. Method according to claim 4 characterized in that the at least one short-chain fatty acid is produced by the bacterium *Megasphaera massiliensis*.
6. Method according to claim 4 or 5 characterized in that the at least one short-chain fatty acid is produced by a group of bacteria comprising at least the bacteria *Megasphaera massiliensis*, *Megasphaera elsdenii*,
20 *Faecalibacterium prausnitzii* and *Anaerostipes hadrus*.
7. Use of an immune cell activated by the method of any one of claims 1 to 6 in the manufacture of a medicament for the treatment of a disease selected from the group consisting of a tumor, an immune mediated disease, a degenerative disease and an infectious disease characterized in that the at
25 least one short-chain fatty acid enhances a cellular immune therapy.
8. Use of an immune cell activated by the method of any one of claims 1 to 6 in the manufacture of a medicament for the treatment of a disease selected from the group consisting of a tumor, an immune mediated disease, a degenerative disease and an infectious disease characterized in that the
30 tumor is a pancreatic tumor.
9. Method for the cultivation of T cells by incubating them with short-chain fatty acid pentanoate so that the T cells are activated and the production of

effector molecules is increased, wherein T cells which are incubated with the short-chain fatty acid pentanoate are chimeric antigen receptor (CAR) T cells.