Therminator: Nanotechnology for the treatment of melanoma

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The Invention

The invention consists of a bio-molecular complex consisting of cells with strong tumor tropism (ECFCs) containing gold nanoparticles (AuNPs) that can give off effective thermal energy for cauterizing melanomas. The invention identifies a subpopulation of endothelial cell progenitors (called ECFCs, Endothelial Colonies-Forming Cells) that can be appropriately labeled and combined with gold nanoparticles for the treatment of melanomas. The cells, taken from human umbilical cord blood, are combined with stabilized, compositionally controlled nanoparticles and retain their functional characteristics of endothelial cells (migration, proliferation, angiogenesis). In animal experimentation, such a biomolecular complex spontaneously localizes in melanoma 18 to 24 hours after injection, exploiting the known CXCR4 (expressed by ECFCs)-SDF-1 molecular system produced by the tumor mass. The bio-molecular complex is found to be present in the primary tumor and its metastases 18 hours after injection and over the next 25 days. Au-NP-ECFC-enriched tumors, and their metastases, can be revealed by SPECT or photoacoustic effect (diagnosis). Stimulated with a pulsed laser beam, the complex reacts by releasing heat, which cauterizes the tumor mass by inducing coagulative necrosis (therapy).

The Team

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Industrial application

The patented technology has already been tested in preclinical phase for the following applications:

1. Diagnosis of primary melanoma;
2. Diagnosis of melanoma metastasis;
3. Treatment of primary melanoma;
4. Treatment of melanoma metastasis;
5. Diagnosis and treatment of all cancers and their metastases whose microenvironment releases SDF-1, the cytokine that attracts ECFCs equipped with the receptor for SDF-1 (CXCR4) into the tumor masses.

The advantages of the technology are many, among which:

1. Long shelf life of the bio-molecular complex;
2. Ease of preparation;
3. Low cost;
4. Use of ECFCs from the same patient (personalized therapy), to avoid rejection;
5. Identification of the complex by photoacoustic effect or SPECT tomography.

Possible Developments

The patent is available for outright assignment, as well as for exclusive and non-exclusive licensing. Licenses are available for the remaining term of the patent titles.

The Research Group is available for new collaborative and third-party research activities, in-depth technical investigations, scientific advice, also aimed at raising the TRL of the technology.

The TRL of the invention is 4.

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