T-Pharmacytes for the Eradication of Latent HIV Reservoirs

Technology #15960

Applications

This invention uses latency activation combined with a potent immune response to eliminate viral reservoirs for treatment of infections such as human immunodeficiency virus (HIV).

Problem Addressed

Infected resting memory CD4+ T-cells are thought to re-seed systemic infection after cessation of antiviral therapy making it difficult to cure viral infections like HIV. Cells in this resting state do not produce virus and thus neither die by viral cytopathic mechanisms nor are effectively targeted by the immune system. Latency-reversing drugs (LRDs) that induce HIV expression from and thus expose viral reservoirs have decreased cells harboring inducible provirus, but cannot successfully eradicate infection. Current strategies have failed due to the incomplete ability of LRDs to effectively reach reservoirs of virus in tissues and the insufficiency of virus reactivation or endogenous immune responses to eliminate infected cells upon transient latency reversal. This invention addresses these issues for improved treatment of latent viral infections.

Technology

Drug-loaded nanoparticles (NPs) are coupled to the surface of CD8+ T-cells, creating drug-delivery effector cells named T-Pharmacytes by the inventors. These cells, with their intrinsic tissue homing patterns, will deliver LRDs into the tissue sites where infected cells reside, and promote sustained, high dosing levels in these tissues. This invention uses a superagonist form of the cytokine interleukin-15, IL-15SA, a LDR that is more potent and less toxic than the earlier discovered interleukin-2 (IL-2). IL-15SA released from pharmacytes will stimulate viral transcription in latently-infected CD4+ T-cells and effector functions of the carrier cytotoxic T-lymphocyte (CTL); HIV antigen expression by the infected cell will trigger recognition of viral peptides by the pharmacyte CTL, leading to killing of the infected target cell. Antiretrovirals will be co-administered to block residual progeny virus. Retention of the NP-CTLs at sites of antigen recognition will provide a positive feedback loop leading to additional drug release in reservoir sites where HIV is detected.

Advantages

- Efficiently eliminates viral reservoirs
- Continuously targets tissues with infected cells due to positive feedback loop

Categories For This Invention:

Life Sciences
Biomaterials
Micro/nanoparticles (Biomaterials)
Biotechnology

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Health
Clinical Applications
Infectious Disease
Therapeutics
Antiviral
Drug Delivery

Intellectual Property:

Methods and Compositions for Localized Delivery of Agents to Virally Infected Cells and Tissues
Issued US Patent
9,415,070

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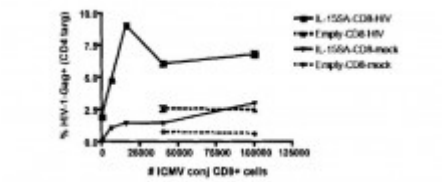
Image Gallery:



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