

In Brief

A gene therapy approach using platelets to deliver a protein of interest. The method induces immune tolerance towards a previously immunogenic protein. Studies in hemophilia animal models demonstrate effectiveness.

Description

Inventors discovered a novel use for platelets as a protein expression vehicle for the delivery of proteins not well tolerated. Like a shell game at a carnival, platelets can be used as the shell to hide proteins from the immune system. A lentiviral-based gene therapy has been tested using both clotting factors or ovalbumin, a non-specific protein, in mice. One particular problem hemophiliacs is the development of inhibitory antibodies to clotting proteins. This gene therapy approach resolves the development of antibody inhibitors.

Approach is useful when it is critical to establish immune tolerance, such as in patients with severe allergies, auto-immune diseases, specific protein deficiencies and in transplant. Conditions include: Bernard Soulier Syndrome, achondroplasia, lysosomal storage diseases, sickle cell disease, Coeliac disease, diabetes, lupus, Sjogren's syndrome, Churg-Strauss Syndrome, Hashimoto's thyroiditis, Graves' disease, idiopathic thrombocytopenia purpura, arthritis, allergies, solid organ transplantation, and bone marrow transplantation.

Benefits

- A permanent gene therapy approach
- Induction of immune tolerance to proteins that were previously immunogenic
- Use of a natural cell type that circulates throughout the body
- Delivery using platelets, a short lived cell, may offer safety advantages

Inventor [Qizhen Shi](#)

Patent protection

[US20140356387A1](#), Method for inducing immune tolerance through targeted gene expression

Publications

Chen, Y., Schroeder, J.A., Kuether, E.L., Zhang, G., and Shi, Q. Lentivirus-mediated platelet gene therapy corrects bleeding diathesis and induces humoral immune tolerance in hemophilia B mice. *Mol Ther.* 2014; 22(1):169-77. [PMCID: PMC3978792](#)

Schroeder, J.A., Chen, Y., Fang, J., Wilcox, D.A., and Shi, Q. *In vivo* enrichment of manipulated platelets corrects the murine hemophilic phenotype and induces immune tolerance even using a low multiplicity of infectious. *J Thromb Haemost.* 2014 Aug; 12(8):1283-93. [PMCID: PMC4127102.](#)