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Friedman et al.

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(54) **FERRITIN NANOPARTICLE COMPOSITIONS AND METHODS TO MODULATE CELL ACTIVITY**

(58) **Field of Classification Search**
CPC A61K 41/0052; A61K 41/0028; A61K 47/6929; A61K 38/1767; A61K 38/1709;
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(56) **References Cited**

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U.S. PATENT DOCUMENTS

8,435,762 B2 5/2013 Sternson et al.
8,957,036 B2 2/2015 Cascio et al.
(Continued)

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OTHER PUBLICATIONS

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

Huang et al (Nature Nanotechnology, Letters, pp. 602-606) (Year: 2010).*

(Continued)

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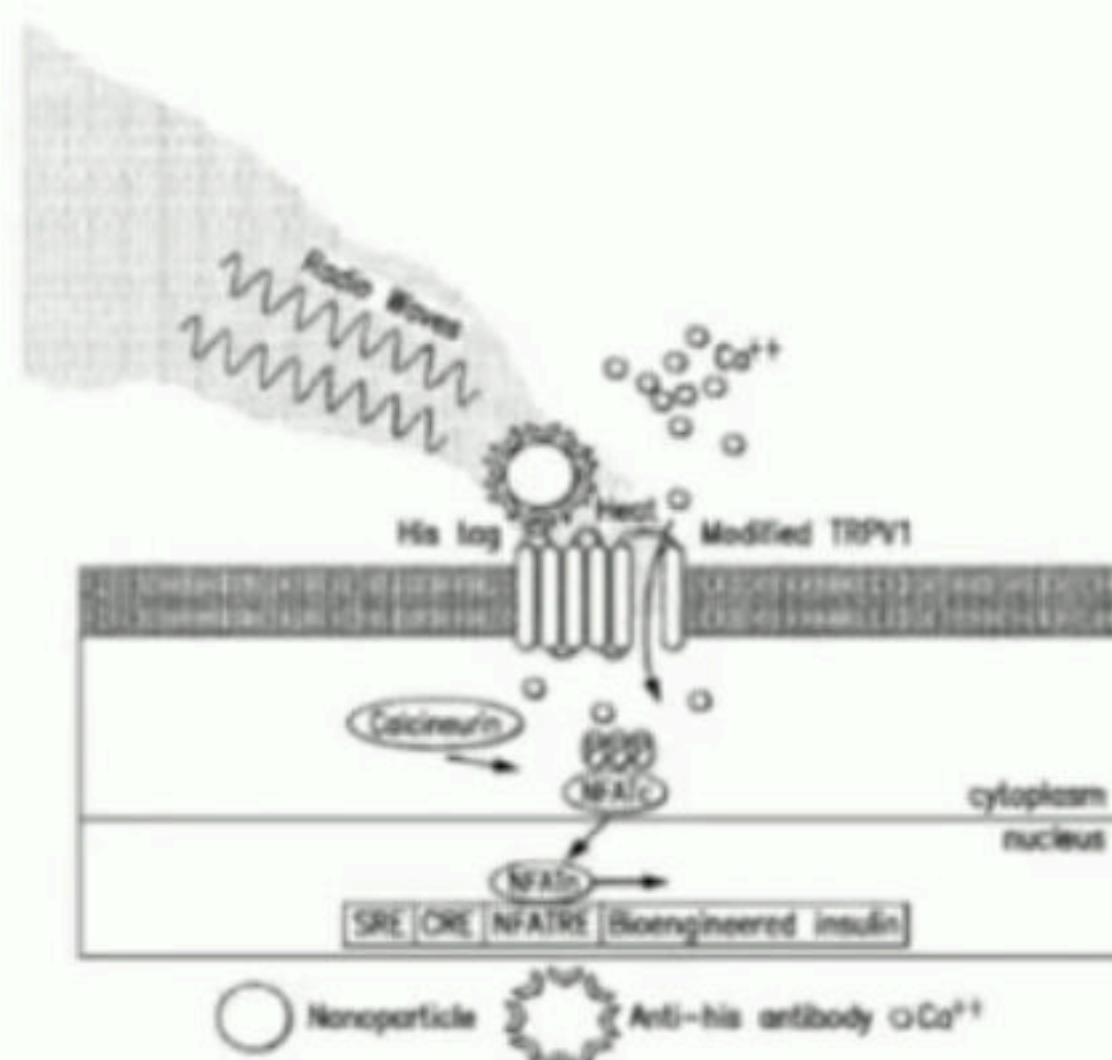
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A61K 41/00 (2020.01)
A61K 9/16 (2006.01)
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CPC A61K 41/0052 (2013.01); A61K 9/16 (2013.01); A61K 9/167 (2013.01); A61K 9/1611 (2013.01);
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(57) **ABSTRACT**

The present invention provides methods and compositions for the remote control of cell function based on the use of radiofrequency waves to excite nanoparticles targeted to specific cell types. The nanoparticles may be applied to the target cell extracellularly and/or expressed intracellularly. The cell type of interest expresses a temperature sensitive channel wherein excitation of the nanoparticles results in a localized temperature increase that is transduced into a cellular response. Such cellular responses may include, for example, increases in gene expression resulting in production of one or more physiologically active proteins. The expression of such proteins can be used to treat a variety of different inherited or acquired diseases or disorders in a subject. Accordingly, the invention provides a generic approach for treatment of any disease associated with a protein deficiency.

14 Claims, 56 Drawing Sheets



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