

Nanogold-loaded sharp-edged carbon bullets as gene carriers

EXECUTIVE SUMMARY

A process for making sharp edged carbon bullets, embedded with nanogold particles for gene delivery applications - with a capacity to carry more DNA cargo and perform efficient transformation when compared to conventional gene delivery methods

BACKGROUND

With increasing research being directed towards genetic manipulation, the requirement for the ideal gene delivery vehicle is becoming vital. Carriers that can overcome current limitations of viral (toxicity, limited cargo capacity, quality control etc.) and other non-viral vectors (used mostly in animal cells) are required. There are very few options in gene carriers for plant cells.

TECHNOLOGY DESCRIPTION

NCL scientists have developed a process for the preparation of carbon embedded nano gold particles with sharp edges which can be used as gene carriers. The bullets are sharp enough to penetrate hard material, with less damage (a comparatively lower force of 0.1-0.2 nN required for penetration) and can be delivered with a convenient delivery gun. Intracellular gold particles (biogenic) synthesized by a fungus in situ, embedded on a carbonaceous matrix.

MARKET POTENTIAL

- The market for gene therapy (a major field for gene delivery applications) is expected to face a growth to \$5.7 billion in 2011¹

¹<http://www.outsourcing-pharma.com/Preclinical-Research/Gene-therapy-market-suffers-growth-setbacks>

VALUE/ADVANTAGES

- Preparation process is very simple and easy to implement
- The carbon matrix forms 95% of the carrier reducing the amount of gold needed and the plasmid used per transformation
- Advantages of usage of gold particles- High DNA packing density, better transformation efficiency, low nuclease degradation, being in nano scale, higher surface area is obtained- more gene cargo handled
- Advantages of usage of carbon support- Inert and less damage causing- wound caused due to penetration healed faster, better piercing capacity, for example, can effectively pierce hard plant cell walls, less force required to penetrate the plasma membrane as compared to silver nano needles

APPLICATIONS

- Gene therapy/ improved gene delivery for research and other applications
- Potential applications
- DNA based immunization, to study gene function and its regulation, to establish various disease models, metal ion removal, fuel cells, anti bacterial applications, catalysis

TECHNOLOGY STATUS

- Demonstrated at the lab scale
- Ready to be licensed
- Patent application filed: PCT # [IN2010/000513](#)
- Prasad, B.L.V. et al. (2010) Nanogold-Loaded Sharp-Edged Carbon Bullets as Plant-Gene Carriers, *Advanced Functional Materials*, 20, 2416-2423 ([link](#))

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