

Title

DNA vaccine technology based on nanoparticle encapsulating DNA (and having adjuvant effect on dendritic cell activity)

Background and Purpose of Research

Delivery of antigen protein-encoding DNA into the nuclear of target immune cells, in particular, of antigen-presenting dendritic cells leads to antigen presentation on these cells. Thus event then stimulates the immune-responses *in vivo* in antigen-dependent manner. The presentation of cancer cell-specific antigens (i.e. polypeptides) on the surface of dendritic cells is one of the key technologies for an immune therapy against malignant tumor.

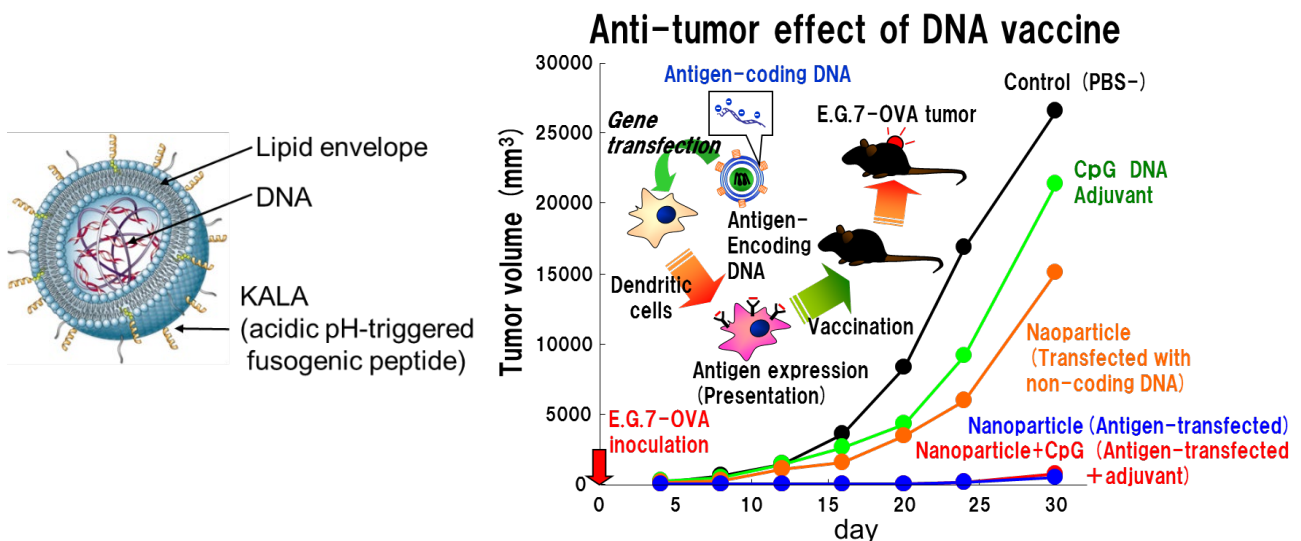
However, the transfection efficiency of DNA in dendritic cells is poor in conventional methods. Thus, the purpose of this research is to control the intracellular trafficking of DNA for the nuclear targeting of nucleus in dendritic cells.

Summary of Research Results

Researchers developed a nanoparticle, in those surface the surface the lipid derivative of α -helical peptides were modified to induce membrane fusion in pH neutral environment. This nanoparticle enabled efficient uptake of DNA into dendritic cells for the high gene expression. Another unexpected finding was that the particle confer the immune-stimulative activity in dendritic cells: the cytokine production of type I interferons were enhanced by the transfection.

As a result, a high antitumor effect was obtained by immunization of a mouse by dendritic cells those were preliminarily transfected by the antigen-encoded DNA. Further, the activation of antigen-specific cytotoxic T-lymphoma activity sufficient for the tumor suppression was achieved with small dose of DNA (<1/100 of conventional methods such as electroporation).

Researchers have plans to further improve this technology for an efficient antigen expression and immune activation to achieve an antigen-specific cell-mediated immunity with a high level of safety.





Patent Status

JP 2012-511688 (JP 5794541)

US 13/641,812 (US 8981044)

Advantages

Not only attains efficient delivery of DNA into dendritic cells, but also attains activation of dendritic cells. As such, obtains a high level of antitumor effect.

Applications

DNA vaccine for cancer therapy, infectious disease preventive vaccine for farm animals and companion animals, adjuvant (immune stimulator).

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