Enhancing the efficacy of immunity-activating nucleic acid drugs

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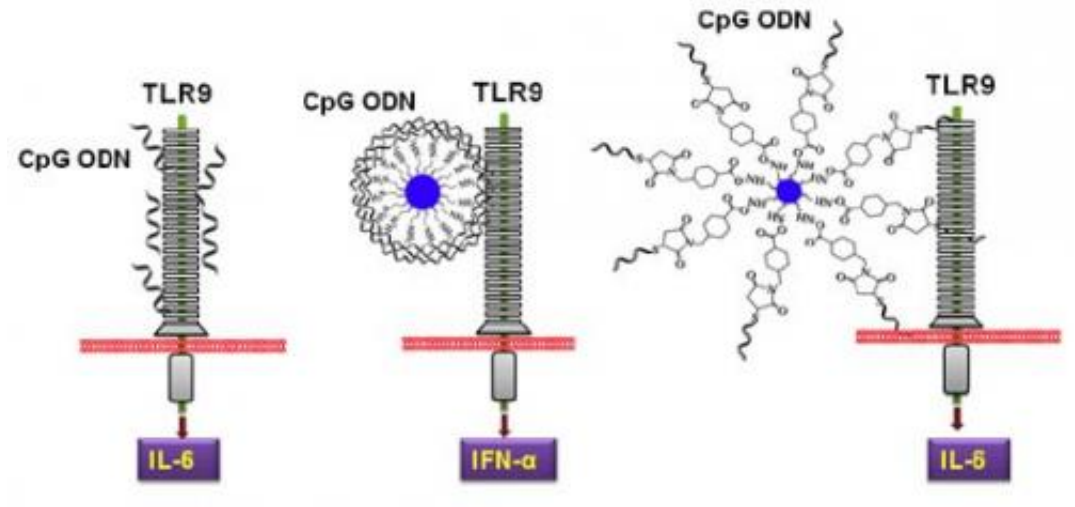

Change in efficacy of CpG ODN by use of nanoparticles. (Left) Free CpG ODN molecules induce interleukin 6 (IL-6) by interaction with TLR9. (Center) When CpG ODN is electrostatically bound to silicon nanoparticles (blue circles), induction of interferon (IFN) becomes possible. (Right) When bound only to one end of the silicon nanoparticles, CpG ODN induces IL-6 in the same manner as free CpG ODN.

(Phys.org)—The Nanotechnology Innovation Station of the National Institute for Materials Science has succeeded in development of a technology which utilizes nanoparticles to enhance the action of immunity activating nucleic acid drugs.

Nucleic acid drugs—produced by DNA or RNA—are cutting-edge

molecular target drugs that target designated proteins or base sequences with pinpoint accuracy. Nucleic acid drugs are anticipated as potential treatment for cancers, viral infections, autoimmune disorders, and allergic diseases such as pollenosis, etc. In the present research, NIMS succeeded in developing a technology which uses nanoparticles to enhance the efficacy of immunity-activating nucleic acid drugs, with the aim of application to pollenosis and similar diseases.

The nucleic drugs called CpG ODN (cytosine-phosphate-guanine oligodeoxynucleotides), which have already been developed, mainly includes two types. One is the interferon type, which primarily induces interferon. The other is the interleukin type, which induces interleukin 6. Interferon and interleukin 6 are substances that are related to immunostimulation. However, with the conventional method, it was not possible to induce interferon and interleukin 6 simultaneously, even when these two types of CpG ODN were administered simultaneously to increase immune effect.

In the present research, only the interleukin type of CpG ODN was used. This CpG ODN was bound to silicon nanoparticles by two different methods, and the two types of nanoparticles were used simultaneously. As a result, the NIMS researchers succeeded in simultaneously activating interferon and interleukin 6 at a high level for the first time.

The method, in which drugs are applied to medical treatment using nanoparticles as a carrier, is called drug delivery. In the conventional approach, the main role of the nanoparticles in drug delivery was to deliver the drug to the targeted cells or tissue and release the drug at the affected part. In the present research, the role of the nanoparticles is not limited to the drug transportation and release functions. The nanoparticles also play a critical role in enabling control of manifestation of the effect of the drug.

This achievement will make it possible to apply this drug to treatment of infectious diseases, immunotherapy for cancers, and treatment of pollenosis and other allergic diseases. Application of nucleic acid drugs other than CpG ODN can also be expected.

More information: These research results was published in *Scientific Reports*, an online journal of British Nature Publishing Group.

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