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Medical application of a nano-capsule derived from a viral capsid protein

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Development of protein-based delivery-carriers for diagnosis and therapy has progressed by using viral capsid protein. Simian virus 40 (SV40) is a small non-enveloped DNA virus of polyomaviridae. The capsid structure of SV40 is 45 nm in diameter and is formed by 72 copies of pentamers composed of five VP1 major capsid proteins (360 molecules in total). When expressed in insect cells using recombinant Baculovirus, VP1 is self-assembled into virus-like particles (VLPs) of 45 nm in diameter as the naturally assembled SV40 virus capsid. VLPs isolated from the cells are disassembled *in vitro* into VP1-pentamers by the addition of DTT and EGTA. These VP1-pentamers are self-reassembled *in vitro* into VLPs under appropriate conditions. In this reassembly, VLPs can encapsulate various materials such as DNA and proteins. It is also possible to modify VP1 for providing VLPs with the ability of targeting of specific cell. It was recently indicated that SV40 VLPs could be a promising vaccine platform. Thus, VP1 has a great potential for developing a variety of nano-capsule for medical application. In this presentation, we summarize our technology using SV40 VP1 for medical application and show an application of SV40 VP1 as an efficient vaccine nano-capsule. Indeed, vaccination of SV40 VP1 nano-capsule inserted HLA-A2 restricted cytotoxic T lymphocyte (CTL) epitope of GILGFVFTL of influenza virus matrix protein 1(M1) efficiently induced CTLs against M1 with fifty times more than classical incomplete Freund's adjuvant method.

Biography

Masaaki Kawano has been engaged in the study of the *in vitro* assembly of Simian virus 40 (SV40) virus-like particles (VLPs) composed of VP1 capsid for 10 years, from the beginning of his career. He has currently focused on the development of a novel vaccine carrier consisting of SV40 VP1 for cytotoxic T lymphocyte (CTL)-based vaccines against latent infection and cancer.

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