A new application of plant virus nanoparticles as drug delivery in breast cancer - DTU Orbit (08/11/2017)

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Nanoparticles based on non-pathogenic viruses have opened up a novel sector in nanotechnology. Viral nanoparticles based on plant viruses have clear advantages over any synthetic nanoparticles as they are biocompatible and biodegradable self-assembled and can be produced inexpensively on a large scale. From several such under-development platforms, only a few have been characterized in the target-specific drugs into the cells. Potato virus X is presented as a carrier of the chemotherapeutic drug Herceptin that is currently used as a targeted therapy in (HER2+) breast cancer patients. Here, we used nanoparticles formed from the potato virus X to conjugate the Herceptin (Trastuzumab) monoclonal antibody as a new option in specific targeting of breast cancer. Bioconjugation was performed by EDC/sulfo-n-hydroxysuccinimide (sulfo-NHS) in a two-step protocol. Then, the efficiency of conjugation was investigated by different methods, including sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE), Western blot, ELISA, Zetasizer, and transmission electron microscopy. SDS-PAGE and Western blot analysis confirmed an 82-kDa protein band that resulted from conjugation of potato virus X (PVX) coat protein (27 kDa) to heavy chain of Herceptin (55 kDa). Zeta potential values for conjugated particles, PVX, and HER were −7.05, −21.4, and −1.48, respectively. We investigated the efficiency of PVX-Herceptin to induce SK-OV-3 and SK-BR-3 cells (HER2 positive cell lines) apoptosis. We therefore counted cells and measured apoptosis by flow cytometry assay, then compared with Herceptin alone. Based on our data, we confirmed the conjugation of PVX and Herceptin. This study suggests that the PVX-Herceptin conjugates enable Herceptin to become more potential therapeutic tools.

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