Improved Drug Delivery Using Targeted Polymeric Nanoparticles

Targeted Drug Delivery

- HER2 for chemotherapy
- Dendritic Cells for Immunotherapy

Available for Collaboration

Principal Inventor:

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Industry Collaborators:

- Quest PharmaTech Inc.
- Genentech
- Alberta Research Chemicals Inc.
- Oncothyreon (formerly Biomira)

Funding:

- Canadian Breast Cancer Foundation, NSERC Discovery Grant, SHRF New Investigator Establishment Grant

Publications:


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Research Focus: Dr. Haddadi’s research program focuses on overcoming the ongoing challenges in cancer therapy. The main emphasis of her research group is to develop new biomedical and pharmaceutical nanotechnology strategies to achieve the critical issues in cancer chemo-immunotherapy. Her research activities are in the following areas:

- Formulation and characterization of polymeric nanomaterials and protein therapeutics
- siRNA/Oligonucleotide delivery in cancer treatment
- Targeted delivery systems for pharmaceutical applications (topical, iv. or sc. administration)
- Receptor-mediated nanoparticles for vaccine delivery
- Receptor-based tumor targeting for chemotherapy

Targeted Therapeutic for Breast Cancer: Human epidermal growth factor receptor-2 (HER2) overexpresses in around 30% of breast cancers that creates an opportunity to design HER2 targeted therapeutic drug delivery system. Ongoing research is critical in the development of novel molecular targeted approaches that will have a clinical benefit in HER2- positive breast cancer and minimize unwanted drug-related toxicities and ultimately enhance patient outcomes.

Example of Industry Collaboration: Dr. Haddadi’s research lab focuses on drug delivery and targeted therapy to improve the efficiency and biological fate of the drugs and minimize their side effects. In a recent collaboration with Genentech, they have developed a targeted PLGA nanoparticle modified with Trastuzumab that carries the docetaxel to the HER2 positive breast cancer. This novel formulation has shown selective targeting to the site and significant inhibition of HER2 expression compared to the conventional formulations of docetaxel and trastuzumab (Herceptin) in the market (Fig. 1).

Figure 1.

Comparison of HER2 expression levels of breast cancer cell lines after treating both cell types with various formulations. The novel formulation NP-Doc-TmAb significantly reduces HER2 expression in a SKBR-3 cell line.