Increasing glycopolymer-based drug delivery success

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Glycopolymer technology is opening up a myriad of new opportunities for disease therapy. European research is investigating novel production strategies for polymers to bring about more efficient targeted drug delivery.

Carbohydrates have been hailed as vital molecules in the human body. They are responsible for biological communication events involved in cellular recognition, inflammation and pathogen infection.

In the treatment of diseases, chemotherapy for example is normally not

site-specific. To improve the location-finding ability of drugs to avoid unnecessary damage during therapy, ligands (carbohydrates and peptides) for the recognition of malignant cells could be a promising research avenue. Moreover, many studies have shown that lectins on cell-cell surfaces mediate interactions and result in better cellular uptake.

The 'Polymer conjugation of peptides/salmon calcitonin for increased efficacy' (Wbawba) project focused on the production of and characterisation of A-functional comb polymers by living radical polymerisation techniques. A second strand of the research involved synthesis of sugar-carrying polymers (glycopolymers) and their lectin-binding properties were then investigated.

Wbawba scientists developed a new rapid online polymerisation monitoring technique. In parallel, they used a rapid gel permeation chromatography (GPC) technique to follow copper (Cu)0-mediated polymerisation by monitoring molecular weight.

Optimisation of the conjugation of the polymer chain and a peptide was achieved by a base-catalysed thiol-ene click reaction. Click chemistry joins together small units very rapidly and generates polymers extremely quickly. The optimum catalysts, reaction time and other required conditions were determined by this systematic structure-property relationship study.

The Wbawba project has also tested a small library of glycopolymers for their specific lectin recognition properties. These polymers show great promise for disease therapy and significantly inhibit the binding of dendritic cell lectins to the human immunodeficiency virus (HIV) isolated glycoprotein gp120, a step in the virus entry into the cell.

Future research planned by the Wbawba during and further to the life of the project will involve investigation of alternative synthesis techniques

of glycopolymers that show improved binding to specific lectins.

Work of the Wbawba project has so far provided a basis for the development of glycopolymer-based disease therapies. Based on molecular recognition at the cell surface, the scientists have designed and efficiently produced glycopolymers that will target diseased cells specifically.

Provided by CORDIS