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Preparation and Applications of Polyrotaxanes Bearing Mixed Cyclodextrin Species

A novel method quickly produces highly water-soluble cyclodextrin-containing polyrotaxanes that act as molecular shuttles, efficiently transporting cholesterol-disposal agents into cells.

Niemann-Pick disease type C is a lysosomal storage disease that hinders the body's ability to rid cells of excess cholesterol. Previously, there were no known treatments for the disease, but recent clinical trials have shown that hydroxypropyl-beta-cyclodextrin can delay symptoms and is currently going through clinical trials. However, current methods of cyclodextrin-carrying materials are very slow and actually transporting the cyclodextrin into the cell has proven difficult.

Researchers at Purdue University have developed a method of producing cyclodextrin that quickly produces material in large quantities that are highly water-soluble and can easily transport through the cell membrane. This process creates cyclodextrin-containing polyrotaxanes; the rotaxane acts as a molecular shuttle to deliver the cyclodextrin to the cell and help dispose of the excess cholesterol. Current methods attempt to use non-aqueous solvents, but this method creates highly water-soluble polyrotaxanes that are highly threaded with the cyclodextrins. This technology could potentially be part of the treatment for Niemann-Pick disease type C as it has already proven effective in in vitro models.

Advantages:

-Faster production

-More highly-threaded materials

-Yields products that are highly water-soluble

Potential Applications:

-Potential as part of treatment for Niemann-Pick disease type C

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Category

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Pharmaceuticals/Pharmaceutical Manufacturing & Methods

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