Nanoballs deliver drugs

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Dutch researcher Cristianne Rijcken has developed a new type of biodegradable nanoparticle. The spherical structures can encapsulate various fat-soluble medicines, which makes it easier to target tumour tissue. These nanoballs are highly promising carriers for the controlled release of anticancer drugs. Rijcken recently gained her doctorate for this research from Utrecht University.

Anticancer drugs sometimes have very harmful side effects because they do not distinguish between tumours and healthy tissue. However by encapsulating these drugs in nanoparticles, they more frequently end up in the right tissue. Due to the biodegradable nature of the nanoparticles, the drug is only released once the particles break down. The breakdown period can be adjusted by using different components for the nanostructures.

The nanoparticles consist of polyethylene glycol (PEG) chains which are attached to recently developed components: lactic acid derivatives of polymethacrylamides. These new chains possess the unique combined property of biodegradability and heat sensitivity.

By simply heating up an aqueous polymer solution, compact spherical nanoparticles smaller than 100 nanometres are spontaneously formed. The properties and life span of Rijcken's so-called ' stabilised micelles' can be completely controlled by changing the components.

Experiments have shown that various types of fat-soluble anticancer drugs could be enclosed in the core of these micelles. The enclosed

substances were only released after the lactic acid groups in the polymer had been split off, causing the nanoparticles to fall apart. The stabilised nanoballs accumulated to a larger extent in the tumours of tumour-carrying mice than traditional micelles.

The new nanostructures exhibited no side effects and are completely biodegradable, whereas the current products with anticancer drugs often also contain other toxic ingredients.

Further research is needed to determine the blood circulation and tumour accumulation of drug-containing micelles. Additionally, the development of new components as building blocks for the nanoparticles will allow an even more accurate regulation of the specificity and drug release.

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