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Getting to the Core of Anti-Tumor Activity

By sciencebase, Section News -Hotlist
Posted on Thu Jun 15, 2006 at 05:27:30 AM PST

Many of the side effects of medicinal drugs come from giving a large dose to the whole body in order to get a necessary concentration to the diseased area (e.g., tumors). The ability to target a drug to a specific location allows for decreased dosage, improved effectiveness, and fewer side effects. Professor Kenneth S. Suslick and graduate student Elizabeth M. Dibbern have recently made a new type of core-shell polymer microsphere to address this problem. These spheres are made from polymerized glutamic acid, a standard amino acid found in all proteins, and therefore very biocompatible.

As reported in the current issue of the Journal of the American Chemical Society, these protein microspheres are made using high intensity ultrasound which violently agitates liquids to make an emulsion. An emulsion is a stable mixture of two phases that otherwise would not be together, for example, mayonnaise: oil and water don't mix, but agitation disperses the oil droplets into the water and an egg stabilizes the droplets. Rather than using a wisk, these researchers use ultrasound (at frequencies of a dog whistle, but intensities beyond a jet engine) to mix the oil and water while the biocompatible polymer stabilizes the emulsion and forms permanent microspheres. The polyglutamic acid forms a protein shell that is held together by hydrogen bonding and ion pair networks. The shell is useful because it can be modified to target specific tissue types by attaching antibodies or other receptor targeting agents to it. The core is important because it can carry many different drugs and imaging agents (e.g., anti-tumor drugs like Taxol or diagnostic imaging agents for MRI).
The microspheres are smaller than the core-shell microspheres produced previously, which is important because smaller sized particles can be injected into the blood stream safely, but later extravasate, or leak out of the capillaries, into tissues and tumors. Importantly, these spheres are stable under conditions found in the human body (e.g. pH, ionic strength, temperature). This work was funded by the National Institute of Health.

SOURCE: Ken Suslick

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