

Researchers create new strategy for highly-selective chemotherapy delivery

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UC Irvine researchers have created a new approach that vastly improves the targeting of chemotherapeutic drugs to specific cells and organs.

Kenneth Longmuir, associate professor of physiology & biophysics, and Richard Robertson, professor of anatomy & neurobiology, used liposomes, small spheres (less-than 100 nanometer in diameter) of naturally-occurring lipid molecules, as "packages" for the cancer chemotherapeutic agent doxorubicin, and a small peptide molecule to "address" the package to the targeted tissue.

Using this technology, the research team demonstrated that the doxorubicin was directed almost entirely to the targeted site with virtually no uptake by other organs, including lung, kidney and heart.

Their study appears online in the *International Journal of Pharmaceutics*.

Their approach is based on the fact that all tissues and organs, including all tumors, are surrounded by a dense region of sugar-containing molecules called polysaccharides. Most importantly, the particular chemical composition of the polysaccharides is different in each tissue and organ of the body. The chemical compositions of the polysaccharides of tumor regions are also different from normal tissue.

The research team developed a nanocarrier system that can recognize specific types of polysaccharide, and has demonstrated effective, organ-specific delivery of nanocarriers, and their therapeutic contents, based

upon this polysaccharide-targeting approach.

In their study, the researchers used a peptide derived from a protein found in the microorganism *Plasmodium*, which is an organism well-known for its exceptional ability to exclusively target the polysaccharides of liver following entry into the bloodstream.

The drug doxorubicin is a chemotherapeutic agent commonly used as treatment for a variety of cancers. Although it is an effective anti-cancer agent, the usefulness of doxorubicin is compromised by its serious side effects on normal tissue. When administered in a chemotherapeutic regimen, doxorubicin distributes widely in the body, including the heart, rather than specifically in tumor regions.

The serious heart damage that results from systemic administration places limits on the dosage that a patient can receive. By encapsulating doxorubicin into a liposome package and including a peptide targeting message on the carrier, Longmuir, Robertson and co-workers demonstrated that doxorubicin can be effectively delivered to the liver, and away from the heart, with a specificity of greater than 100:1.

The next step in this investigation is to test the properties of the delivery system in several experimental cancer models. Liposomes with peptides are being developed that specifically address the unique features of tumors, in order to rapidly and effectively deliver chemotherapeutic agents to [tumor](#) regions.

Source: University of California - Irvine

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