Polymer nanoparticle overcomes anticancer drug resistance

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In a nanotechnology two-for-one, researchers at the Johns Hopkins University Center of Cancer Nanotechnology Excellence (Hopkins CCNE) have created a polymer nanoparticle that overcomes tumor resistance to the common anticancer agent doxorubicin and that protects the heart against drug-triggered damage, a therapy-ending side effect that limits doxorubicin's effectiveness. This novel nanoparticle incorporates both doxorubicin and curcumin, a major component of the bright yellow spice turmeric.

This work was led by Anirban Maitra, a principal investigator in the Hopkins CCNE. Dr. Maitra and his colleagues published the results of their work in the journal *Oncotarget*.

Numerous studies over the past few years have shown that high doses of curcumin can overcome the resistance to multiple anticancer agents that many, if not most, tumors develop over time. Curcumin, however, is poorly soluble in the blood stream and as a result, getting high enough levels of this agent to tumors has proven challenging. Dr. Maitra's approach to solving this problem has been to use polymer nanoparticles to deliver curcumin to tumors. He and his colleagues have published several papers over the past two years describing the development and behavior of their curcumin-nanoparticle formulation and its ability to make drug-resistant tumors susceptible to chemotherapy.

In their current paper, the investigators discuss how they prepared a polymer nanoparticle containing both curcumin and doxorubicin. Both in

vitro and animal tests demonstrated that this formulation had striking anticancer activity in models of multiple myeloma, leukemia, and prostate and ovarian cancers. Perhaps equally important, the animals treated with the nanoparticle did not experience any cardiac toxicity or bone marrow suppression, even at cumulative doses that normally trigger cardiac toxicity by free doxorubicin or liposome-encapsulated doxorubicin, which was the first nanoparticle drug approved for use in treating cancer in humans and is widely used in treating breast cancer. Further examination of the heart-protecting characteristics of this formulation showed that encapsulating doxorubicin in a polymer nanoparticle spared heart muscle cells from oxidative stress normally triggered by doxorubicin.

This work is detailed in a paper titled, “A composite polymer nanoparticle overcomes multidrug resistance and ameliorates doxorubicin-associated cardiomyopathy.” An abstract of this paper is available at the journal's website.

More information: Abstract: www.impactjournals.com/oncotar … article&op=view&path%5b%5d=543

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