TAU Scientists Attempts to Treat Skin Cancer with Nanotechnology

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Researchers at Tel Aviv University have designed a drug delivery system for the treatment of skin cancer melanoma that relies on nanotechnology, according to a university statement.

The "nanocarrier" is made up of biocompatible and biodegradable polymer, which is comprised of "repeating units of glutamic acids" (PGA - polyglutamic acid), and packages two different families of drugs together that have both been proven to be effective in the treatment of melanoma: BRAF inhibitors (Dabrafenib) and MEK inhibitors (Selumetinib).

"One of the major obstacles of the biological treatments is that after a while, the cancer cells develop resistance to the drugs," said leading researcher Prof. Ronit Satchi-Fainaro from the Department of Physiology and Pharmacology at the Sackler School of Medicine. "We assume that by precise delivery of two or more targeted drugs that will attack the cancer cells forcefully and simultaneously from different directions, we can delay or even prevent the acquisition of this drug-resistance."

Their findings were published in the August 2020 issue of Advanced Therapeutics as the cover article.

"In this project, we looked for a solution to a problem often associated with drug cocktails," Satchi-Fainaro said. "Today, most oncological treatments are administered in the form of cocktails of several medications. However, despite the fact that all drugs are administered to the patient simultaneously, they do not reach the tumor at the same time, due to differences in basic parameters – like how long they survive in the bloodstream (i.e. half-life), and the time it takes each drug to reach the tumor tissue. Thus, in most cases, the medications do not work concurrently, which prevents them from attaining optimal synergistic activity."

In order to address these issues, the researchers teamed the two families of drugs together with the intention of introducing them to the tumor via a nanocarrier – which itself is biodegradable, and made up of amino acids.

The researchers tested the medications against the levels and forms of toxicity they produced, as well as the tolerance of cancer cells with regard to the treatment – in order to "ensure maximum effectiveness, minimal toxicity and optimal synergistic activity." Considering the introduction method, being a mix of two different drugs, lower dosages of the cancer treatment medications are needed than when using each independently.

"The next step was using chemical modifications to enable bonding between the polymeric carrier and the chosen drugs. This combined system can travel through the body with total safety, inflicting no damage to healthy tissues," Tel Aviv University explained in a statement. "Upon reaching the cancer cells, the nanocarrier encounters proteins of the cathepsins enzyme family, which are highly activated in malignant tumors. The proteins degrade the polymer, releasing the drugs which become active and join forces to attack the tumor." "It's like several passengers riding in one cab and getting off together at the same address. They all arrive at the same destination, right at the same time," said Satchi-Fainaro.

The researchers have tested the method on mice, which showed promising results, the university noted. Within the animal study, the researchers found that the drug could be administered in lower doses, and that the treatment in itself is much safer and effective than independent treatments using a different administration method.

"In this project, we developed an innovative drug delivery system for treating melanoma, delivering two proven medications and releasing them simultaneously at the tumor site. The treatment proved both safer and more effective than the same medications administered as a cocktail. Moreover, our new platform is highly modular and can be used for delivering a vast range of medications. We believe that its potential for enhancing therapeutics for different diseases is practically endless," concluded Satchi-Fainaro.

Read the original article on The Jerusalem Post.