Scientists develop 3D-printed implant that could deliver personalized treatment

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Southwest Research Institute (SwRI) and The University of Texas at San Antonio (UTSA) are developing a 3D printed implant that, when injected in a patient's body, could deliver a personalized dose of medicine to treat infections as well as ailments such as arthritis, cancer and AIDS. The project, led by Albert Zwiener of SwRI's Chemistry and Chemical Engineering Division and Dr. Lyle Hood of UTSA's College of Engineering, is supported by a $125,000 grant from the Connecting through Research Partnerships (Connect) program.

For a drug to be effective, patients must take a minimum amount, but not so much that it makes them ill or causes serious harm. As a result of those limitations, someone who needs frequent doses of a specific medicine either has to take a pill each day or visit a doctor for treatment. To remedy this, the SwRI-UTSA team is working to create an implantable device that can deliver a controlled, personalized dose of medicine over several weeks.

"The implant addresses a specific patient's illness in addition to their medical history and other health issues," Zwiener said. "We inject this non-invasive device into the body to deliver medicine over a significant period of time."

The design, which Zwiener and Hood created with UTSA graduate research assistant Priya Jain, incorporates complex geometries to personalize each device to an individual's ailment and takes advantage of the selective timing and release of the compound. The team will create the device with a specialized 3D printer at UTSA that can print biodegradable materials.

This makes removal of the implant unnecessary, as it will simply dissolve inside the body when the treatment is complete.

The implant is also engineered to trigger localized immunotherapy for cancer treatments. Immunotherapy enlists the body to attack cancerous tumors. The SwRI-UTSA team believes that the device's localized treatment capabilities can trigger the body to destroy the invasive cancer.

"If clinically translated, this would allow for doctors and pharmacists to print specific dosages to meet patient's needs," Hood said. "In immunotherapy, most strategies employ systemic circulation through an IV line, much like chemotherapy. This can cause issues with immune reactions far away from the intended target. We hope that by delivering locally, we can keep acute effects constrained to the diseased region."

While the implant is ideal for cancer treatment, it's designed to be drug agnostic, meaning that it can work with any type of drug and could have a significant impact on a wide array of diseases and ailments.

Source:

https://www.swri.org/press-release/swri-utsa-minimally-invasive-medicinal-implant