Orthopædic Institute for Children
IN ALLIANCE WITH UCLA Health
GROW WELL. PLAY WELL.®

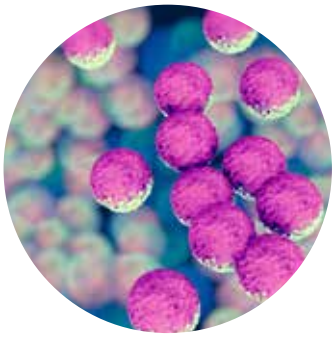
WINTER 2016

MOTION

NARROWING THE GAP BETWEEN RESEARCH AND CLINICAL CARE IN PEDIATRIC ORTHOPAEDICS

"Smart" Coating May Help Prevent Implant Infections

It's a decision no one should have to make: Stop chemotherapy so a child's immune system can fight an implant infection and risk a cancer's spread, or continue chemo knowing the infection could take the child's life? Yet up to 30% of patients who receive orthopaedic implants as part of their cancer treatment will face that scenario.



Infections also plague other high-risk patients who receive medical implants such as children with spine disorders or diabetic patients undergoing joint replacement. They lead to suffering, worse patient outcomes and higher healthcare costs. In fact, infections from hip and knee replacements alone will account for more than $8 billion of the nation's healthcare spending in 2015. Such costs, outcomes and suffering may be prevented in the future thanks to a biodegradable implant coating developed by OIC researcher Nicholas Bernthal, M.D., and his biochemistry collaborator Tatiana Segura, Ph.D.

Designed to stop infections from taking root, their "smart" coating releases antibiotics in response to changes in pH level caused by the presence of bacteria. After a month—the time period in which more than 90% of implant infections occur — the polymer-based coating will completely dissolve without causing any toxicity in the patient.

Proven safe and effective in a recent animal study, the coating holds several advantages over current antimicrobial options. Unlike antibiotics that are injected an hour before surgery, the "smart" coating doesn't bombard the entire body with medication but rather focuses on the implant site. It also outperforms existing implant coatings, which are made from non-dissolvable bone cement and release their entire antibiotic in 48 hours.

Plus, it can be used to prevent infection of any surgically implanted medical device—from orthopaedic prostheses to pacemakers.

The coating's one disadvantage is that it takes 24 hours for it to solidify, making it impractical for use in the operating room.

Thanks to a grant from a family foundation based in Palos Verdes, CA, Bernthal's team will be able to fix that. The funds will support the chemical optimization of the coating, plus tests of its effectiveness using different antibiotics against the most common pathogens.

"We need to speed up the chemical reaction so that it takes 10-15 minutes for the polymer to shift from a liquid to a solid coating," says Bernthal. "If we can make the coating in the operating room and coat the implant with the antibiotic we want, then we'll have a pretty powerful tool."

The optimized coating will be embedded with a variety of antibiotics and tested against S. aureus, Methicillin-resistant S. aureus (MRSA), Streptococcus, and P. acnes.

"If we can knock out those four bugs, that covers about 85-90% of all the infections."