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Actuating Bile Duct Stents for Cancer Patients

A new two-region stent uses phase-transforming cellular materials to mimic natural bile flow regulation, preventing bacterial growth and enabling uninterrupted cancer treatment.

Researchers at Purdue University have designed a stent in the common biliary duct (CBD) that promotes bile flow during cancer treatment and prevents bacterial growth. Biliary cancer can put pressure on the CBD and limit its opening and restrict the function of the sphincter of Oddi (SO). This can lead to bacterial infection and interruption of cancer treatment. SO is a one-way valve at the intersection of the CBD and the duodenum. A stent is usually installed to hold the ducts open when constricted by a tumoral mass. Current stent technologies keep the biliary duct open; however, they cannot replicate the SO and prevent or hinder bacterial infections. The Purdue researchers' two-region stent utilizes phase-transforming cellular materials to keep the biliary duct open yet limit the growth of bacteria by emulating the characteristics of the SO. The first region of the stent promotes one-way flow of bile, and the second region expands and shrinks in response to changes in pressure, similar to the SO. Combined, these characteristics prevent bacterial infections and promote unhindered bile flow, allowing cancer treatments to continue unimpeded.

Technology Validation: The initial design has been demonstrated to be feasible with computational models.

Related Publications:

Kristiaan Hector, "The role of energy dissipation, superelasticity, and shape memory effects in architected materials for engineering applications", PhD Thesis, December 2022.

Advantages:

- Promotes bile flow

- Limits bacterial growth

Technology ID
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Category
Materials Science & Nanotechnology/Biomedical & Bioinspired Materials

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View online

- Biodegradable

- Easy installation due to self-expansion

- Prevents Jaundice

TRL: 2

Intellectual Property:

Provisional-Patent, 2021-06-18, United States | Utility Patent, 2022-06-18, United States

Keywords: Biliary stent, common biliary duct, bile flow promotion, bacterial growth prevention, sphincter of Oddi emulation, phase-transforming cellular materials, cancer treatment support, biodegradable stent, self-expanding stent, jaundice prevention, Bile Duct Cancer, Bile Duct Stent, Biliary Tree, Biomedical Engineering, Phase Transforming Cellular Materials, Sphincter of Oddi