NRI: Mobile Microrobots for Precision Medicine

PIs: David J. Cappelleri, Craig J. Goergen, Luis Solorio – Purdue University, West Lafayette, IN

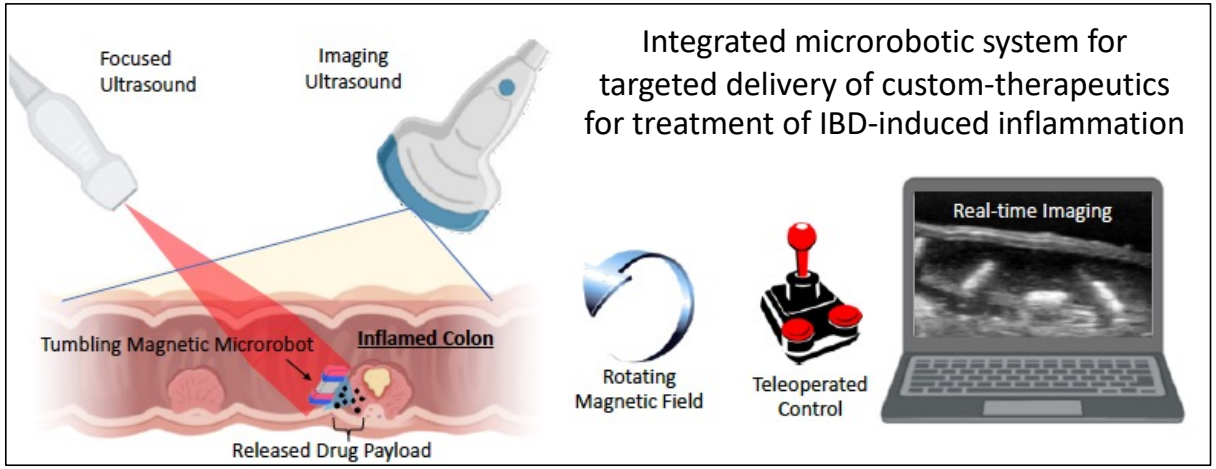
Motivation/Challenge:

- Patients with inflammatory bowel disease (IBD) are at significantly increased risk of colorectal cancer.
- Current treatment of IBD is suboptimal despite the array of available pharmacotherapeutics.
- There is an unmet clinical need for more efficacious and less toxic therapies.
- A powerful, targeted therapy that could be delivered locally with reasonable precision, would represent a major breakthrough for colorectal disease.

Hypothesis:

- A combined imaging/actuation system with high resolution, cross-compatibility, small footprint, and tissue penetration capabilities can be developed to actively guide, minimally invasive *in vivo* magnetic microrobots for the on-demand local delivery of compounds to treat IBD.

Research Approach:



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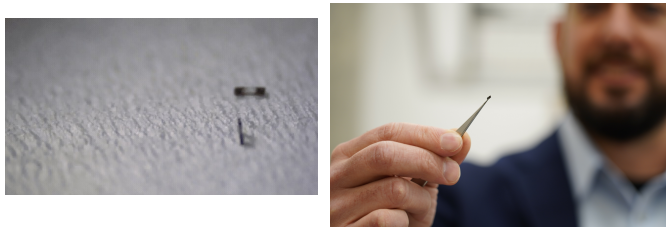
Preliminary Work:

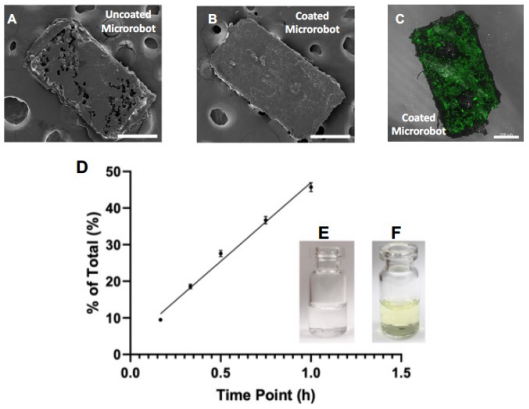


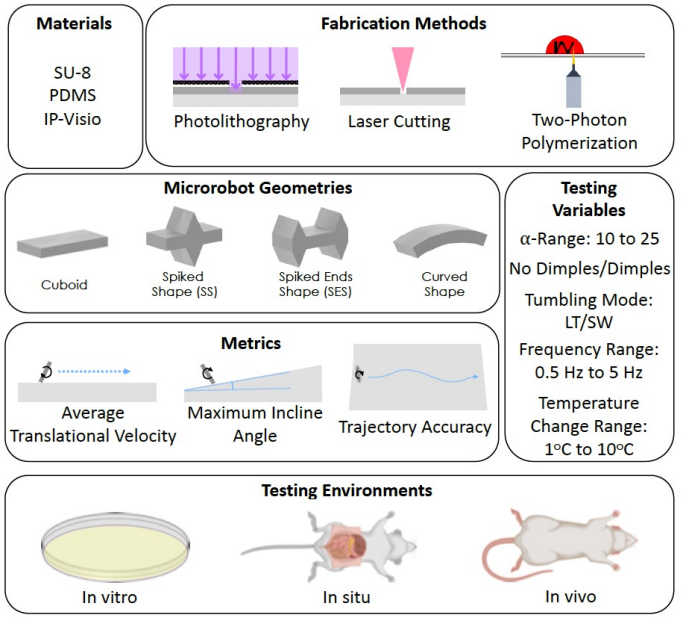
Specific Aims:

Aim 1. Design a mobile microrobot system for *in vivo* locomotion within the GI tract of rats. (Cappelleri)

Aim 2. Design a release system capable of delivering a therapeutic payload from mobile microrobots (Solorio)

Aim 3. Design a focused ultrasound heating system for active *in vivo* targeting and delivery of a therapeutic payload from mobile microrobots (Goergen)





Intellectual Merit. New class of tumbling magnetic mobile microrobots for on-demand, targeted drug delivery for precision medicine applications.

Broader Impacts: This project has great potential for impact in both the microrobotics and healthcare fields. Outreach activities K-12, undergraduate, and graduate levels.

2022 NRI & FRR Principal Investigators' Meeting
April 19-22, 2022

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