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Medical Microrobots to Treat Cancer
American Cancer Society: Cancer is the second most cause of death after heart disease in the USA.

In 2022: 1.9 million new cases were diagnosed, 609,360 death from cancer were reported (=1,670 death a day)
Microrobots offer new opportunities for cancer treatment

What is a microrobot? A microrobot is a very small robot (with dimension less than 1 millimeter) built to do specific tasks.

Why microrobots?
We need many (or *swarm*) of microrobots

**My research:** magnetic control of swarm of microrobots in a living organism for cancer treatment

*Why magnetic field?*
Do you know that heat can kill cancer cells?

Magnetic microrobots can generate heat in the cancer cells when activated using an alternating magnetic field.

When heated to temperatures ranging from 42 to 46 degree Celsius, they can kill cancer cells.

This form of cancer treatment is a promising and developing method for cancer treatment, known as magnetic hyperthermia.

Has it been done on human body?

There have been successful preliminary clinical trials using magnetic hyperthermia to treat patients with glioblastoma and prostate cancer.
The road to Success is always under construction.
What are roadblocks on human body?

- Effectively targeting magnetic microrobots to tumors that are deep inside the body and/or inaccessible tumors
  (There is a successful method to overcome this challenge on mice but not on human body)

- Low level of accumulation of microrobots in a tumor that are deep inside the body and/or inaccessible tumors
  (no method exists both on mice and human body)
What are challenges in my research?

The roadblocks yield two challenges in human blood vessels (= variable viscosity/thickness) for swarm of microrobots:

- Path following (or following a desired path)
- Resilient control
THANK YOU FOR YOUR ATTENTION