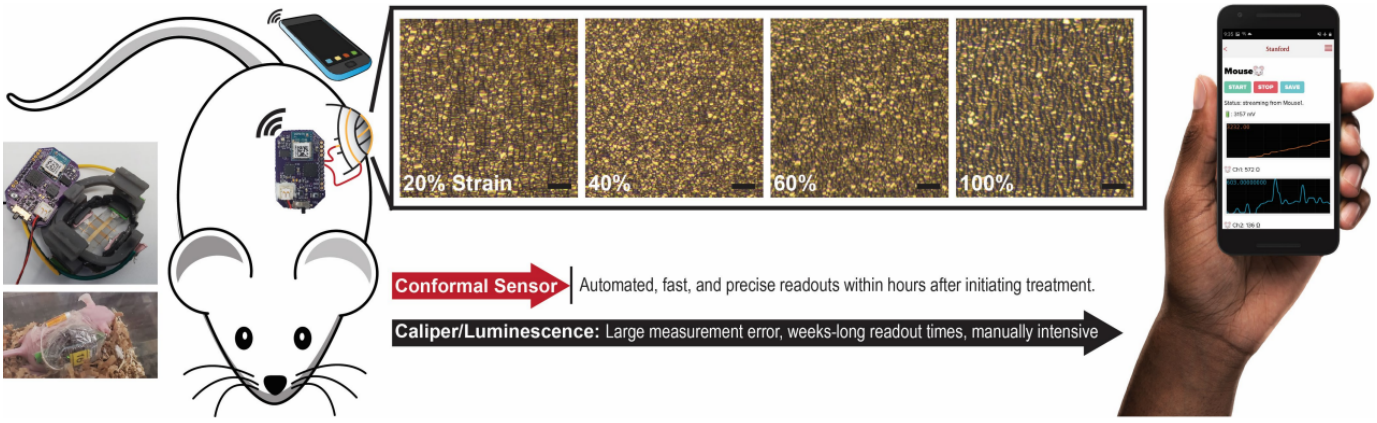
Docket #: S21-277

Flexible Electronic Strain Sensor for Real-Time Monitoring of Tumor Progression

Using advances in flexible electronics, researchers at Stanford have developed a stretchable strain sensor for monitoring solid tumor size progression on or near the skin in real time. The sensor continuously measures, records, and broadcasts tumor volume changes at a 10 ?m scale resolution – approximately the size of a single cell – and is capable of reading out cancer treatment efficacy studies within hours after therapy initiation. Such automated tumor measurements could revolutionize cancer treatment and screening throughput. Currently, tumor shrinkage is a key metric for establishing the efficacy of cancer treatments but measurement tools such as CT scanners and calipers provide only brief snapshots of the dynamic geometric changes occurring in vivo. Moreover, they are unable to detect the micrometer-scale volumetric transformations occurring at minute timescales. The new platform technology from Stanford is called FAST (Flexible Autonomous Sensors measuring Tumor volume progression) and is scalable, fully automated, and eliminates guesswork associated with conventional methods.



Overview of Flexible Autonomous Sensors measuring Tumor volume progression (FAST) technology (image credit: the inventors)

Stage of Development

Using mouse models with subcutaneously implanted lung cancer or B-cell lymphoma tumors, the sensors discerned a significant change in the tumor volumes of treated mice within five hours after small molecule therapy or immunotherapy initiation. Histology, caliper measurements, and luminescence imaging over a one-week treatment period validated the data from the continuous sensor.

Applications

- Wireless FAST technology for real-time monitoring of tumor size progression can be applied to tumors on or near the skin.
- Obtaining real-time tumor progression datasets to help expedite and automate the screening of cancer therapies in vivo.

Advantages

- This sensor achieves three main advances over other common tumor measurement tools such as calipers and imagers:
    - Because the sensor remains in place over the entire measurement period and takes measurements every five minutes, it is possible to generate a 4-D, time-dependent dataset that **eliminates any guesswork** on measurement timing.
    - The sensor possesses the capability of detecting size changes that fall within the error of caliper and imaging measurements, allowing for **more precise readouts** that catch smaller tumor volume changes.
    - The sensor is **entirely autonomous**, reducing the costs and labor associated with performing measurements and enabling direct data comparisons between operators.

Publications

- Abramson, Alex, et al. "A flexible electronic strain sensor for the real-time monitoring of tumor progression." *bioRxiv* (2021).

Innovators

- Alex Abramson
- Zhenan Bao

Licensing Contact

Evan Elder

Senior Licensing Associate

Email