Introduction
Center for Future Technologies in Cancer Care

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New Therapies

Linda McCulloch
Immunotherapy, Brain Cancer Remission

William Burhans
Targeted Therapy, Remission from BRCA-positive prostate cancer

Andrew Levy
Immunotherapy, Leukemia Remission

How New Cancer Treatments Are Shaping Lives

By THE NEW YORK TIMES MAGAZINE  MAY 15, 2016
Precision Medicine

“Precision medicine is not the future of cancer care, it is the present. This study reinforces that the more we personalize treatment to the patient and the tumor, the better the outcomes – even in the earliest phases of research,” said Don S. Dizon, MD, FACP.

• Who will benefit most from these new therapies?
• How can we improve healthcare delivery to impact the most patients?
• Will these new therapies and their cost worsen health disparities?
Point of Care and the New Cancer Care

• In order to reduce costs, it will be necessary to have the following information accessible to clinicians and their patients
  • Inexpensive sequencing data of primary and metastatic tumors.
  • Tumors monitored molecularly throughout the course of treatment.
  • Assessment of therapy earlier in treatment. Early detection of new acquired mutations that might enable resistance.
  • Management of these tests throughout the course of care.
  • High touch patient management with fewer office visits.
  • Putting quality of life issues front and center.
Disparities in Cancer Care

Documented cancer health disparities include:

- a higher incidence of a particularly aggressive form of breast cancer (the triple-negative subtype) among African American women than women of other racial/ethnic groups
- substantially higher rates of prostate cancer incidence and death among African American men than men of other racial/ethnic groups
- higher rates of kidney cancer among American Indian and Alaska Natives than other racial/ethnic groups
- higher rates of liver cancer among Asian and Pacific Islanders than other racial/ethnic groups
- higher rates of cervical cancer incidence and death among Hispanic and African American women than women of other racial/ethnic groups
Global Disparities in Cancer Care

Areas to address global health disparities in cancer care include:

- Tobacco Control
- Obesity, Diet and Exercise
- Vaccines
- Prevention, Early Detection, Treatment
- Palliative Care

Means to address these disparities:

- Mobile Health Applications
- EMRs
- Point of Care Diagnosis and Risk Stratification
- Treatment Monitoring
- Quality of Life Technologies

CFTCC is focused on the identification, prototyping and early clinical assessment of innovative point of care technologies for the treatment, screening, diagnosis and monitoring of cancers.

We aid investigators in the assessment of early stage technologies in terms of clinical needs, market demands and setting appropriateness.

The Center has as strong emphasis on prototyping activities.
Summary of Prototype Projects to Date

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project #1</td>
<td>Project #2</td>
<td>Project #3</td>
<td>Project #4</td>
<td>Project #5</td>
</tr>
</tbody>
</table>
Progress of Projects Through the Center

Workshops → Scientific Publications → Regulatory Consulting → Startup

Hackathons → Training Core

Symposia → Admin Core

Clinical Needs Core → Alpha Core

RFA Process → Prototyping

Locating Clinical Sample Sets → Beta Core → Transition

IP Consulting → Industry Partners

Federal Funding → Licensing

Press → Social Media
Alpha Prototyping Core

Equipment

- Microarray
- Laser Cutter
- Wax printer
- Cutter Plotter
- Real-Time PCR System
- 3-D Printer
- Desktop mill
- Laminator
- Stereomicroscope

Other facilities

- Class 1000 cleanroom
- Precision Measurement Laboratory
- EPIC machine shop
- BSL 2 Lab Access
A New Wearable Optical Probe for Chemotherapy Monitoring.

**PI:** Darren Roblyer, Boston University, Biomedical Engineering

**Co-PI:** Alexis Sauer-Budge, Fraunhofer CFI

**Motivation**

- **Standard of Care**
  - **Diagnosis**
    - Stage II/III
    - Locally Advanced
  - **Neoadjuvant Systemic Therapy**

**Problem:**

- It can take months to determine chemosensitivity with current methods

**Barrier:**

- Adaptive Therapy Requires Better Feedback

**Our Solution:**

- Wearable Diffuse Optical Imaging

The Wearable probe will be placed on the skin of a breast cancer patient over a known tumor location. Continuous measurements will be taken during chemotherapy infusions.

The Wearable probe is designed to conform to breast tissue.

It measures tumor metabolism during chemotherapy for early response prediction.

**LEDs (750nm, 850nm)**

**Optical Sensor**

**Probe Housing**

**Flex Circuit**

**Concentration of water**

**Tumor (4.5cm)**

**Pathologic Complete Response**

**Partial Response**

**Non-Response**

**Before Chemo**

**After Chemo**

**Adapted from Zakhireh et al., 2008**

- **Improved 5-year survival**
- **Little or no benefit to toxic side-effects broad chemoresistance**

**Boston University College of Engineering**

Biomedical Optical Technologies Lab
Center Outreach

**Facebook**
- CFTCC

**Twitter**
- @CFTCC_NIBIB
- @DrKlapperich

**Workshops and Training**
- Photonics Center, Boston
- Fraunhofer CMI
- Alpha Prototyping Core

**Web Based Resources and Archives**
- [www.bu.edu/CFTCC](http://www.bu.edu/CFTCC)
- [www.POCTRN.org](http://www.POCTRN.org)