Digital Cancer Diagnostics & Surgeries
Unique Imaging Agents With Binary Readout:
Cancer = ON; Healthy tissue = OFF
Unmet Needs in Cancer Surgery

• Residual tumor
• Lymph nodes
• Tumor margins

Difficult to identify in real-time during surgery
Impact of Poor Cancer Surgery

- Tissue and organ damage
  Paralysis and neurological damage
  Sexual function damage
  Incontinence
  Speech and swallowing function issues

- Re-operations
  20-40% breast surgery re-operations
  Second surgeries for this alone may cost the healthcare system close to $1B annually

- Recurrence
  30% to 55% of patients with NSCLC develop recurrence and die of their disease despite “curative” resection

Effect of Inadequate tumor removal and healthy organ and nerve damage
Key Insight: Tumors Have Acidic pH

- All 256 human tumors tested were acidic
  - Tumor pH ~ 6.8
  - Blood pH = 7.4

Low tumor pH is a universal cancer hallmark across diverse cancer genotypes and histology phenotypes-
Due to well known “Warburg effect”
pH-Transistor Nanoprobe™ Binary Response

$pH_t = 6.9$
OncoNano Accuracy and Specificity Superior to State-Of-Art PET Imaging

PET imaging confounded by “brown fat” limiting resolution

Big Tumor

Small Tumor
ONM-100: Tumor Imaging Across Multiple Cancer Types

Red:
Tumors of different types and organ sites

Green:
Normal tissue background

Nature Mater., 2014, 13, 204-212
Surgical Target Market: $2B Opportunity

1. **Brain**: Incidence 22,000. Surgery in majority of cases (15,000/year).
2. **BCC/SCC Skin**: Incidence 3.5 million. 756,000/yr. treated with Mohs surgery.
3. **Melanoma**: Incidence 76,000. Virtually all treated surgically.
4. **Head and Neck**: Incidence 53,000. Surgery performed for ~50% patients.
5. **Breast**: Incidence 229,000. Virtually all treated with surgery. Lumpectomies (150,000/year).
6. **Rectal Cancer**: Incidence 40,000. Overwhelming majority treated surgically.

~1MM cancer surgeries in US ALONE every year; 5MM surgeries worldwide
Cancer Precision Medicine And Surgery: Dynamic Sectors for Deals in Last 10 Months

**GRAIL**
Spun-out from Illumina
- $900MM Series B
Precision cancer diagnostics and early detection

**SIEMENS**
Healthcare GmbH acquired NEO New Oncology AG May 17, 2016
Molecular profiling assays based on NGS (Next Generation Sequencing), both for tissue specimens and body liquids.

**OnTarget**
- funded by JJDC
- $40MM
- Oct 2017

**Robotic cancer surgery**
space very active with new entrants
New well-funded competitors looking for differentiated products

Acquired Novadaq for $700 Million Sept 2017
Competition

Genetic Heterogeneity

OncoNano

Organ of Origin

Stage of Disease

Competition

- OncoNano
Sharp Tumor Margins Due to Digital ON-OFF Effect of ONM-100

EGFR-IR Fluorescent Dye
 Traditional “analog fluorescent probe”

ONM-100
 “digital fluorescent probe”
Platform Technology With Multiple Product Opportunities

Cancer Surgery (ONM-100)

Cancer Radio nuclide-diagnostics (ONM-200)

In-Vitro Diagnostics (ONM-300)

Therapeutics (lysosome pH target, pancreatic cancer)

Monetize non-core products via partnerships
OncoNano Team Background

• Ravi Srinivasan
  PhD – CEO
  Serial healthcare entrepreneur, StrataGent Life Sciences (acquired by Corium-Nasdaq:CORI) and StemPar Sciences (IV oncology therapeutic); ForSight Vision 5 (acquired by Allergan); MIT PhD in Chemical Engineering

• Yalia Jayalakshmi
  PhD – Head Clinical Development
  Sr. Dir. Amgen/Onyx, Johnson and Johnson, Genentech. Developed Doxil, Lucentis, TNKase

• Narmada Shenoy
  PhD – Head CMC
  CMC head Sugen, Pfizer. Developed Sutent

• Duane Reaves
  MD- Regulatory consultant
  Previous Head, Division of Imaging Products FDA

• Carl Alden, PhD
  Head Toxicology
  VP Tox Millenium/Takeda. Developed Velcade, Celebrex

• Frank Lee, PhD
  Head Pharmocology
  VP Millenium/Takeda. Developed Velcade, Celebrex

• Tian Zhao
  PhD – Director of Research
  Inventor of ONM-100
Scientific Advisory Board

• Prof. Jinming Gao, PhD
  Founder, SAB Member
  Professor of UTSW
  Chair of NIH Gene and Drug Delivery Study Section
  PhD Chemistry Harvard, Post-doc MIT

• Prof. Baran Sumer, MD
  Founder, SAB Member
  Faculty and surgical oncologist at UTSW
  Head and Neck Cancer Team Leader UTSW

• Prof. Charles Balch, MD
• Key Strategic Advisor, SAB Member
  Cancer surgery and immunotherapy thought leader
  Ex-CEO ASCO, ex-CEO City of Hope Hospitals, EVP MD Anderson

• Dr. John Neiderhuber, M.D.
  Key Opinion Leader, SAB Member
  Ex-head, National Cancer Institute
  Ex-head, Department of Surgery at Stanford and Johns Hopkins

Business Advisors

• Al Guillem, Ph.D.
  Founder ZS Pharma

• Paritosh Dhawale, PhD
  Head of Imaging Business Unit, GE Healthcare

• Steven Shak, M.D.
  Founder, Genomic Health
Opportunity Summary

• Unmet Needs Addressed:
  Tumor & lymph node detection, staging and surgical imaging

• OncoNano Solutions:
  IV injectable tumor imaging products that turn ON in tumors and stay OFF in healthy tissue

• OncoNano Core Technology:
  Unique micelle nanoprobe based pH nanotransistors ultrasensitive to tumor acidity, a universal tumor biomarker (Warburg effect)

• Market:
  Cancer imaging >$5B and rapidly growing

• Competition:
  PET, CT, MRI, ultrasound plus several imaging agents all less sensitive and specific and need expensive hardware purchases

• Team:
  Experienced executives and key opinion leaders in the field founding company and driving effort

• IP:
  Invention and applications protected, IP issued

• Exit:
  Active dealmaking M&A + partnerships + IPO in market space
“Most innovative technology seen in last 25 years”

Prof. Charles Balch - ex-CEO ASCO, EVP MD Anderson, Past-president Society of Surgical Oncology