Mayo Clinic
Translational Nanomedicine Program: targeted drug delivery and individualized medicine

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Our Mission:

To develop a collaborative platform for basic research and application of nanoscience in medicine
Our current focus

- Nanoscale biosensors for cancer and other diseases for early detection and prevention.
- Nanomaterial as vector for drug delivery and therapeutics.
- Nanomaterial-Biology interphase: Cell biology, PK/PD, Toxicity etc.
Creation of multifunctional nanoplatfrom
Involvement of Nanomaterial in healthcare

- Thermal ablation
- Tissue engineering
- Drug delivery
- Therapeutics
- Nanomaterial in Healthcare
- Diagnostics
- Imaging
- Sensors
Current unmet challenges for PDAC:

• The majority of patients diagnosed with adenocarcinoma of the pancreas have advanced disease at presentation, with only 20% surviving beyond one year.

• More than 80% of patients are unresectable and advanced stage.

• Even among the 10% to 15% of patients who present with localized disease, only 20% will be alive 5 years post surgical resection.

• Systemic therapy for PDAC to date has failed to provide more than a very modest survival benefit for patients with advanced disease.
The challenges contd:

- Historical 5-fluorouracil has been replaced by single agent gemcitabine since 1997.
- Numerous combinations using gemcitabine as a backbone have been tested in clinical trials; unfortunately, none of the combinations including the ones with biological agents was proved to be significantly superior to gemcitabine alone.

What are the strategies we should take to make PaCA as a chronic disease and eventually complete remission?
Targeted delivery of gemcitabine to pancreatic adenocarcinoma using cetuximab as a targeting agent.

Targeted delivery of a low dose Gem significantly inhibits tumor growth in vivo.

Gem - 2.0 mg/kg
C225 - 4.0 mg/kg

Figure 12. Therapeutic efficacy of different groups in orthotopic model of pancreatic cancer in vivo.
Ongoing program on PDAC

• Understanding PDCA initiation: from mice models to patient samples

• Unintentional weight loss: exosomes in pancreatic cancer

• Implication of Nanomedicine (therapy and biomarker):
  Development of precision or targeted therapies
  Development of new strategies to find biomarkers in real-time that can help to design and validate the therapeutic decision

• Development of new small molecule inhibitors that can target specific pathways: GIPC

• Newly annotated primary tumors, PDX tumors and corresponding cell lines with exosome, transcriptome and other genomic data
Targeting GAIP interacting protein C-terminus: a new strategies to inhibit pancreatic cancer growth
GIPC PDZ-targeting peptides and downstream molecules and PDAC genomic subtypes
Application of SWNT in diagnostics and therapeutics efficacy in real-time

- Pancreatic Cancer as model system due to unmet clinical need: no therapy is working/ no early detection/prediction
- Plasma exosomes as biomarkers
- Real time assessments to predict therapeutic outcome before it is too late
Questions!!