

# **BME464L Project (Fall 2013, Palmeri)**

## **Liver Bile Duct Biopsy Guidance Device (Interventional Radiology)**

### **Clinical Problem**

Gaining needle access to the bile ducts in human liver is currently plagued by high radiation dose to the operator (interventional radiologist) and patient from the use of x-ray fluoroscopy to visualize the needles in situ. Bile ducts, though, have different physiologic properties (e.g., electrical conductivity and pH) [1-6] that could allow them to be localized using electronic devices instead of ionizing radiation.

### **Project Objective**

Design a device that can be attached to a bile duct biopsy needle that can indicate when the needle tip has pierced into, but not through, a bile duct surrounded by liver parenchyma.

### **Clinical Contact**

Dr. Paul Suhocki, M.D. ([paul.suhocki@duke.edu](mailto:paul.suhocki@duke.edu))

### **References**

- [1] Electrical conductivity of tissue at frequencies below 1 MHz, Physics in Medicine and Biology 2009;54:4863-4878
- [2] Penetration of electromagnetic fields of an open-ended coaxial probe between 1 MHz and 1 GHz in dielectric skin measurements, Physics in Medicine and Biology 1999;44:N169-N176
- [3] Bile in the Esophagus – Model for a Bile Acid Sensor, J Gastrointestin Surg 2010;14:S6-S8
- [4] In Vivo Microdialysis Sampling in the Bile, Blood and Liver of Rats to Study the Disposition of Phenol, Pharmaceutical Research 1993;10: 335-342
- [5] Validation studies of Bilitec 2000: an ambulatory duodenogastric reflux monitoring system
- [6] Related patent: “A catheter for measurement of electrochemical properties of bodily fluids”