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## ABSTRACT

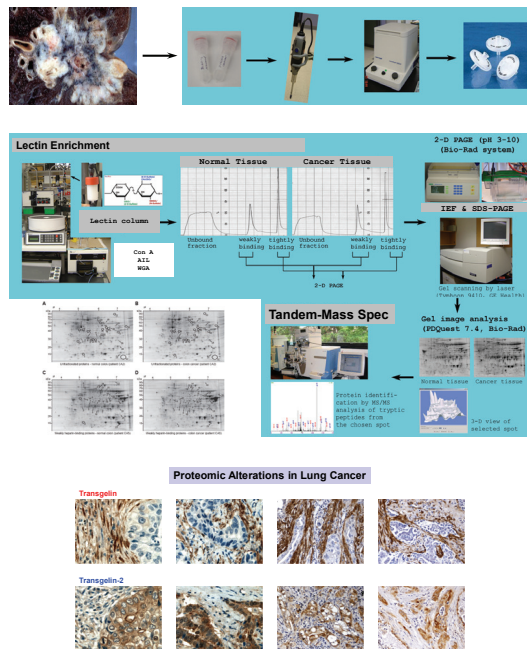
**Background**  
Highest quality BioBanking of human specimens (tissues, biofluids) is of utmost importance for life science research and the future of personalized medicine. We show that the **pathologist** is central to the successful establishment of high-content, high-quality, deeply annotated biospecimen collection, preservation, and analysis. Active intraoperative pathology consultation and infrastructure for rapid specimen procurement are shown to be key elements of success.

**Methods**  
We use several of our ongoing tissue-based research projects on human colorectal and lung adenocarcinomas to illustrate the critical steps necessary to make BioBanking a success at a large academic medical center. Our projects use a combination of techniques, including high-resolution mass spectrometry and sophisticated biochemical prefractionation enrichment strategies, such as lectin glycoarrays, for discovery of proteomic aberrations in cancer. In particular, preservation of the integrity of posttranslational modifications in tissue samples, such as phosphorylation or glycosylation, requires careful selection and implementation of workflows and understanding the stringent requirements of all scientific tools that will be applied to the specimens downstream. Furthermore, it is critical that today's samples are collected with the prospect of preserving the entirety of the captured physiome as intact as possible to allow for studies using novel methods that may not even be envisioned at the time of collection (future-proofing).

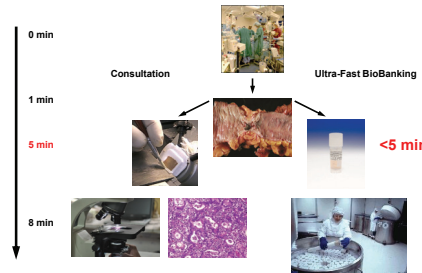
**Results**  
We have begun to use specifically adapted BioBanking workflows to include primary disease tissue cultures as a springboard to overcome the time-static snapshot paradigm of current diagnostic medicine. We are working towards **predictive functional ex vivo interrogation of patient tumor tissue** to guide targeted molecular therapies (such as EGFR inhibition in lung cancers) based on individualized tumor sensitivities and tumor response heterogeneity. We have termed this time-domain advance into personalized dynamic disease management **4-D Pathology**.

**Outlook**  
Our own specific scientific examples highlight the central role of the academic pathologist as the key physician-scientist that will make high-quality BioBanking an invaluable resource for the next generation of molecular diagnostics and disease-centered research.

## Tissue-Based Proteomics



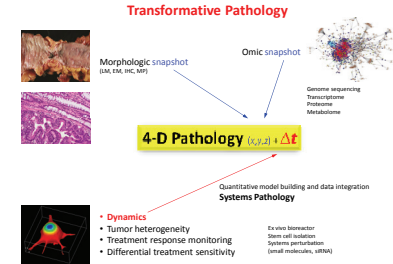
## Intraoperative Pathology Consultation: The Gateway To BioBanking



### Moving Transformative Pathology Forward Intraoperative Consultation in Pathology

- Intraoperative Pathology ("Frozen Section Pathology") provides high-value, real-time diagnostic decision making information during surgery or other interventional procedures (e.g., image-guided biopsies) and is a *springboard for moving the future of pathology forward*
- Essential for BioBanking (speed of sample procurement, quality of material, achieving highest banking rates)
- Critical for the future of molecular diagnostic medicine (functional assay development, triaging, real-time assay development – genomic/transcriptomic/proteomic etc., therapy response prediction and monitoring)
- Critical for patient care (real time feedback)
- Critical for real-time personalized therapeutic/diagnostic decision making within the health care team (pathologists, surgeons, medical oncologists, radiation oncologists)

## 4-D Pathology – Personalized Dynamic Disease Management



## Scientific Examples – High-Quality BioSpecimens

