New Tools in Biomedical Research: Tissue Arrays

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Getting to the Core of Tissue Microarrays

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Goals

- Define tissue microarrays (TMAs)
- Describe TMA construction methods
- Discuss advantages of and uses for TMAs
- Consider when it is appropriate to use TMAs
- Discuss design considerations & analysis options
- Provide website addresses for TMAs

What is a TMA?

- An array of cores taken from "donor" tissue blocks which are inserted into an "acceptor" block in a defined layout.
  - Usually from paraffin embedded tissue.*
  - Can hold anywhere from 2 to 2000 cores.
  - Manual or automatic construction.

Manual Construction of TMAs

Large Corer with Acceptor Mold & Acceptor Blocks

Manual Construction of TMAs:

Small Corer with Acceptor & Donor Blocks

Manual Construction of TMAs:

Marked Slides with Donor Blocks & Sections of TMAs

Manual Construction of TMAs:

Placing the core in the acceptor block

Other ways to construct TMAs

- **Low Cost, Low Tech - placement of manually dissected pieces of tissue in a normal paraffin mold.**
- **High Cost, High Tech - commercial automatic and manual arrayers.**
  http://www.beecherinstruments.com/
  http://www.chemicon.com/

Section of a typical TMA

Advantages and Disadvantages of TMAs

- **Maximizes tissue use**
- **Minimizes reagent costs**
- **Minimizes labor costs**
- **Maximizes consistency**
- **Maximizes quality control**
- **Some damage to donor block**
- **Specialized equipment**
- **Requires pathologist's time**
- **Assumes homogeneity**
- **Difficult to analyze w/o digital microscopy**

Appropriate Use of TMAs

If you can do it with a conventional section, you can do it with a TMA.*

Histology, IHC, FISH, ISH

*** THE FINE PRINT - Some Restrictions May Apply**

1. **Not for heterogeneous tissues**
2. **Samples may be lost due to core "drop out"**
3. **Information may be lost due to lack of context.**
4. **Samples may be difficult to analyze.**

Design Considerations

- **Adequate representation of tissue vs. Preservation of clinical donor block**
- **Small cores vs. Large cores**
- **Multiple cores from each sample on one array vs. Single cores on duplicate arrays**
- **Maximize # of sections from each array vs. Preserving optimal antigenicity**

Analysis Options

- **Manual, Real-time Analysis - unwieldy with high density arrays, doable with low density arrays**
- **Automated, Digital Analysis - desirable for high density arrays. Several commercially available platforms (Bacus Labs, Chromavision, Zeiss, Aperio/DAKO, and others)**

Informational and Educational Web-links for TMAs

- **http://www.the-scientist.com/yr2002/oct/lcprofile1_021028.html**
- **http://www.nhgri.nih.gov/DIR/CGB/TMA/**
- **http://ccr.cancer.gov/tech_initiatives/tarp/**
- **http://pluto3.nci.nih.gov/tissue/default.htm**
- **http://genome-www.stanford.edu/TMA/**
- **http://icg.cpmc.columbia.edu/cattoretti/Protocol/immunohistochemistry/TissueArray.html**

Commercial Web-links for TMAs

- **http://www.molecularhistology.com/microarray07.htm**
- **http://www.ihcworld.com/tissuearray.htm**
- **http://www.chromavision.com/**
- **http://www.bacuslabs.com/**
- **http://www.aperio.com/home.asp**
- **http://www.beecherinstruments.com/**
- **http://www.zymed.com/products/75-xxxx/75-4033.html?emmuno10**