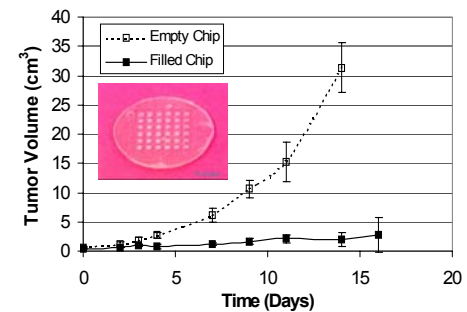
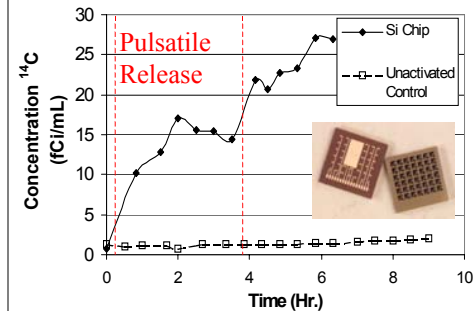
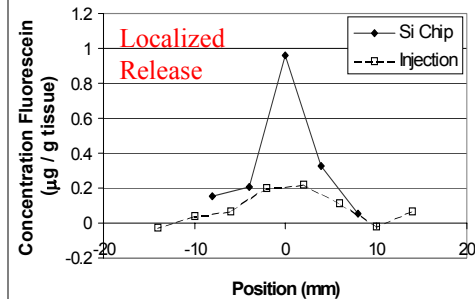


Goals and Potential Impact if Successful

An implantable, micron scale drug delivery system for controlled release of chemical substances.

- Drugs in any format (solid, liquid, gel) can be delivered.
 - Most stable / efficacious format may be used
- Miniature chips allow local delivery
 - Reduced systemic toxicity for treatment of solid tumors
 - Circumvents blood brain barrier in brain tumor therapy
- Complex release profiles of multiple chemical substances
 - Any temporal release profile with time scale longer than individual release event.
 - “Pharmacy on a Chip”
- Can mimic body’s natural production of chemical agents
 - ⇒ Potential “pacemaker” for the endocrine system



In Vivo Release Results

- Active Si Device (Left)
 - Spatial localization (top)
 - Pulsatile release (bottom)
- Passive Polymer Device (Above)
 - Effect of BCNU delivery on growth of 9L glioma in rat flank

Approach and/or Accomplishments

Active Silicon-based MEMS Device

- Device fabricated by existing silicon micromachining techniques
- Substances released from reservoirs by electrochemical corrosion of membranes
- Control of spatial and temporal release profile, *in situ* monitoring of drug release demonstrated *in vitro* and *in vivo*

Passive, Resorbable Polymer Device

- Polymer powder pressed into disc, membranes injected
- Composition, molecular weight of membranes adjusted to control temporal release profile
- *In vitro* and *in vivo* control of temporal release profile successfully demonstrated
- Delivery of BCNU effectively retards growth of 9L Glioma in rat flank

Bottlenecks and Open Research Questions

Device Reliability

- Hermetic seal must be achieved to prevent premature leakage of drug and possible loss of drug activity.
- Filling and payload formulation are important to achieving complete and timely delivery of the active substance
- Reliability of membrane activation must be ensured

Long Term In Vivo Operation

- Influence of local inflammatory response on device operation is not currently well understood.

Injectable Passive Device Format

- Best method for fabricating, filling, sealing syringe-injectable polymer device?