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# Films and Particles for Local Delivery of Chemotherapy and Prevention of Tumor Recurrence

## Presenter:

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# The Standard of Care to Prevent Tumor Recurrence

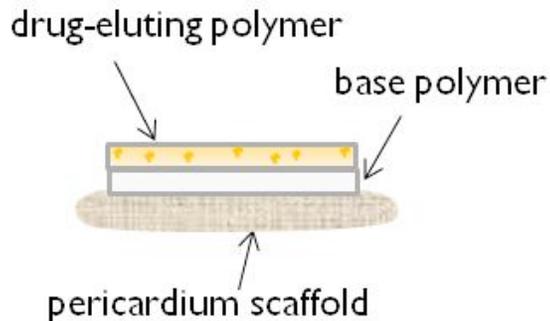
1. The standard of care for most localized tumors is surgical resection.
2. Intravenous chemotherapy and/or radiation are often used in conjunction with resection.
3. Localized tumor recurrence is a potentially life-threatening problem. In lung cancer, approximately 9%-16% of surgically removed stage-I cancers recur.
4. Preventative care against recurrence **does not exist** for the majority of cancers.



# Two polymer platforms

- The invention relates to drug-eluting polymer platforms that deliver chemotherapy locally and regionally

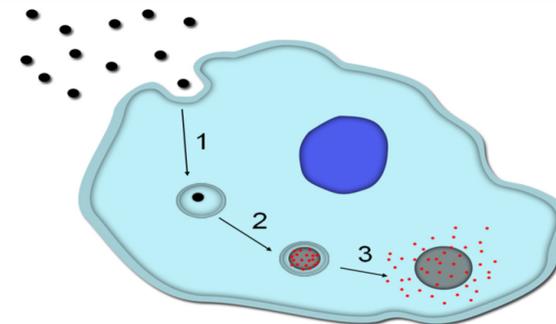
## Local Delivery



## Film

## Local and Regional Delivery

nanoparticles



1) enter endosome (pH = 4)

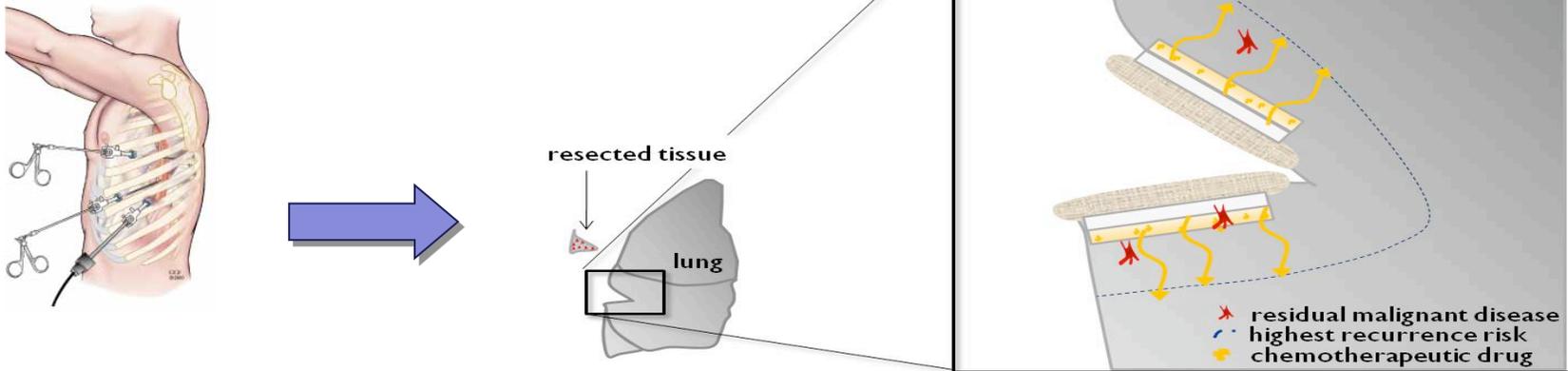
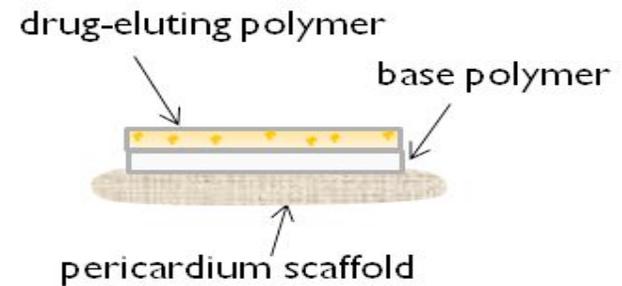
2) nanoparticle swelling

3) release of drug within cell

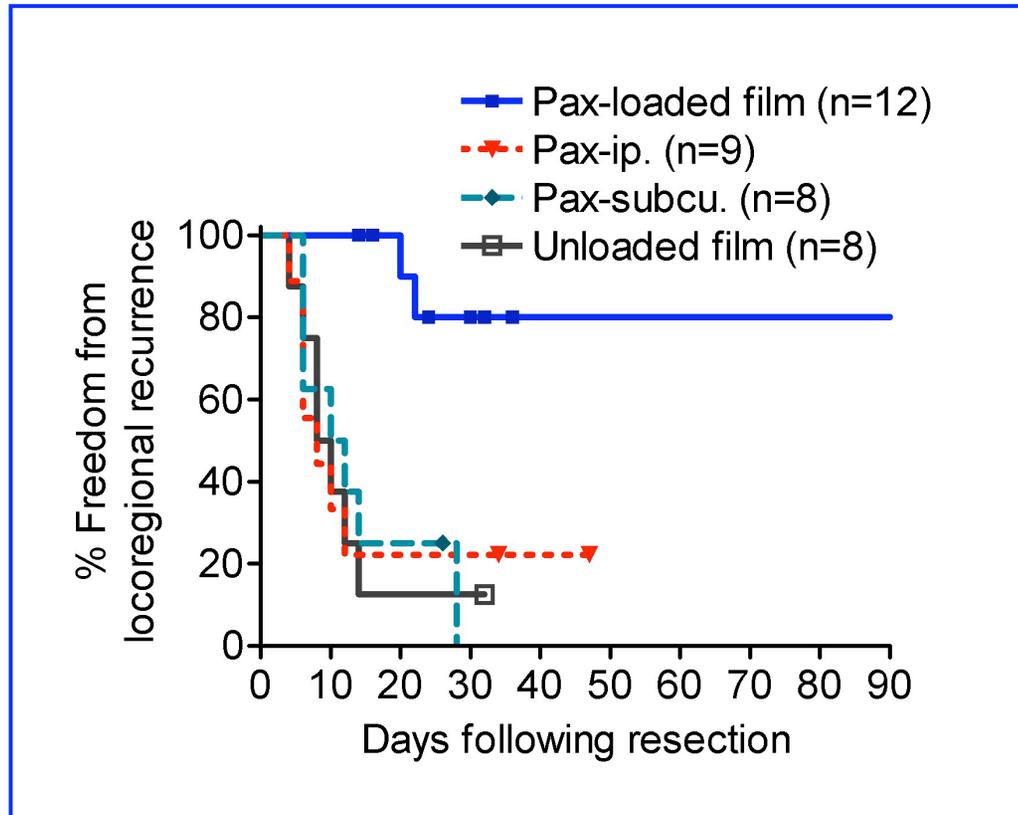
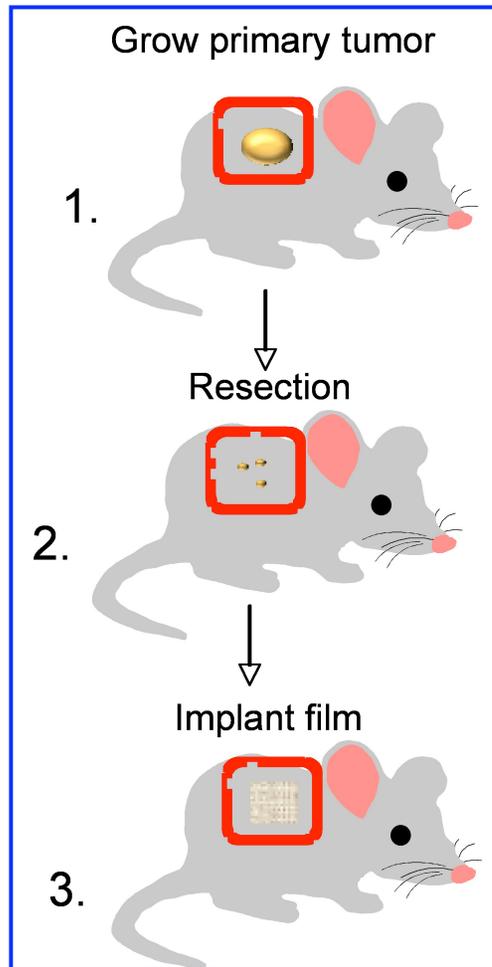
## Nanoparticle

# Platform 1: Films

- **Controlled release of chemotherapy for 50+ days**
- **Strong, flexible polymer platform**
- **Applied at time of surgery**
- **Significantly decreased side effects**
- **Ease of administration**
- **Delivers directly to disease site**
- **Adaptable to soft tissue**



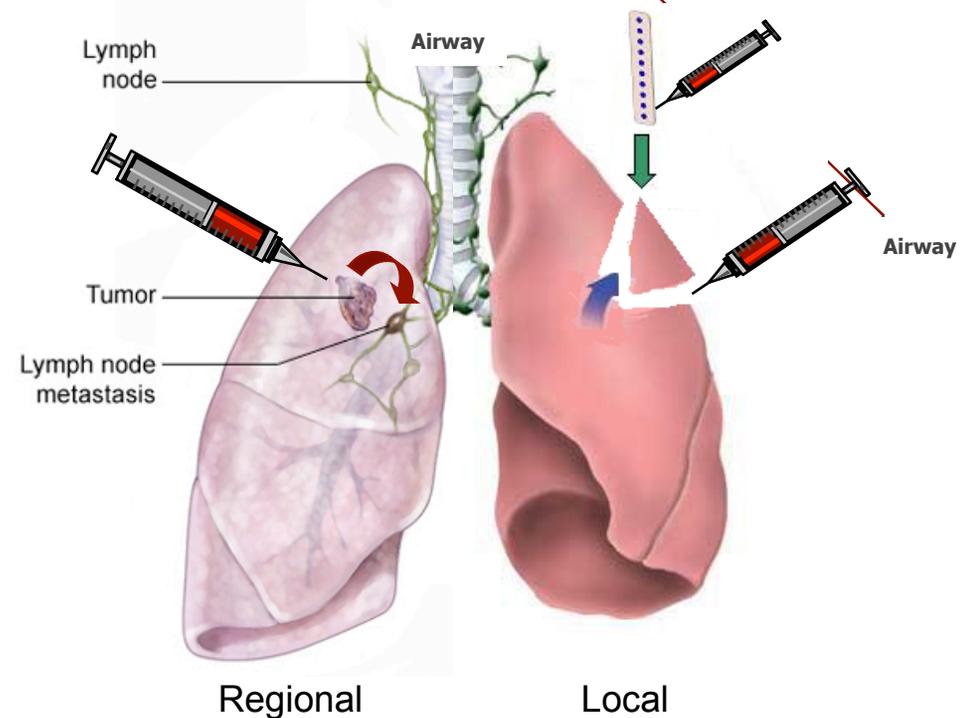
# Platform 1: Films



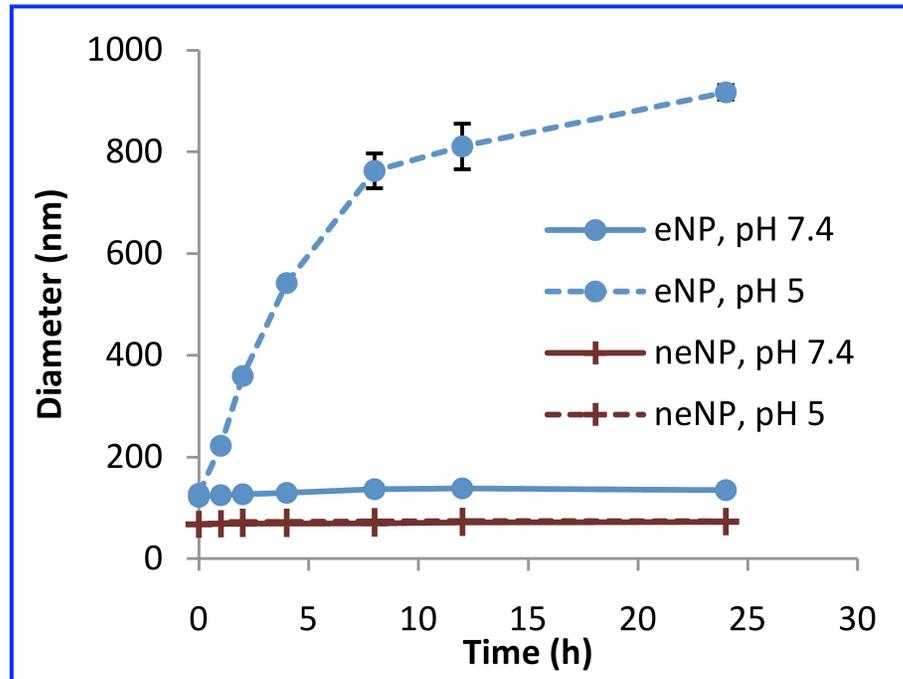
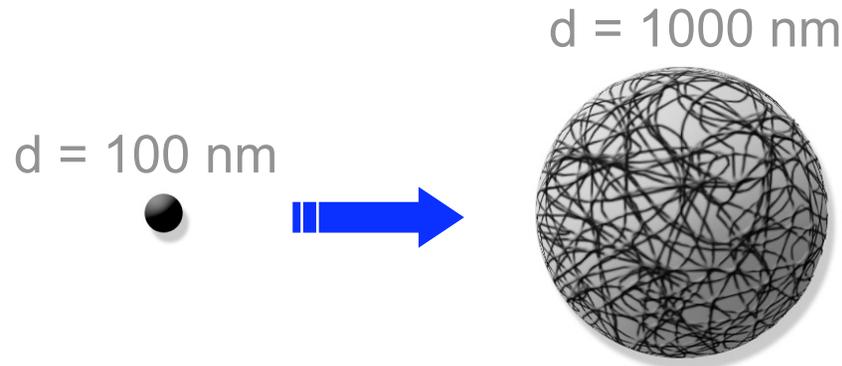
Paclitaxel Loaded Films

# Platform 2: Nanoparticles

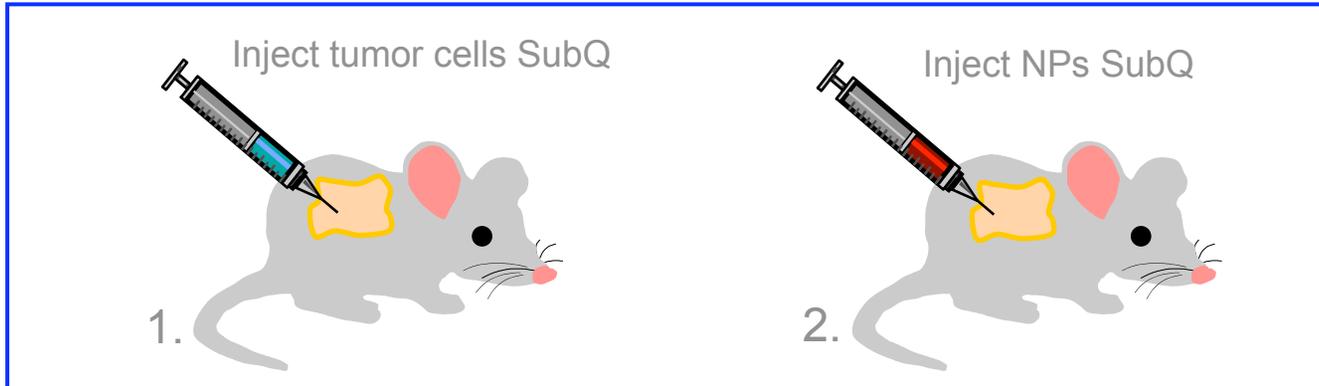
- **Local:** single interoperative injection at surgical margin
- **Regional:** administered near tumor for targeting of lymph nodes or migrate from margin to lymph nodes
- PH-responsive nanoparticles enter and expand inside cells
- Large amount of drug is released **ONLY** inside the cells
- **Significantly decreased side effects**
- **Adaptable to soft tissue**



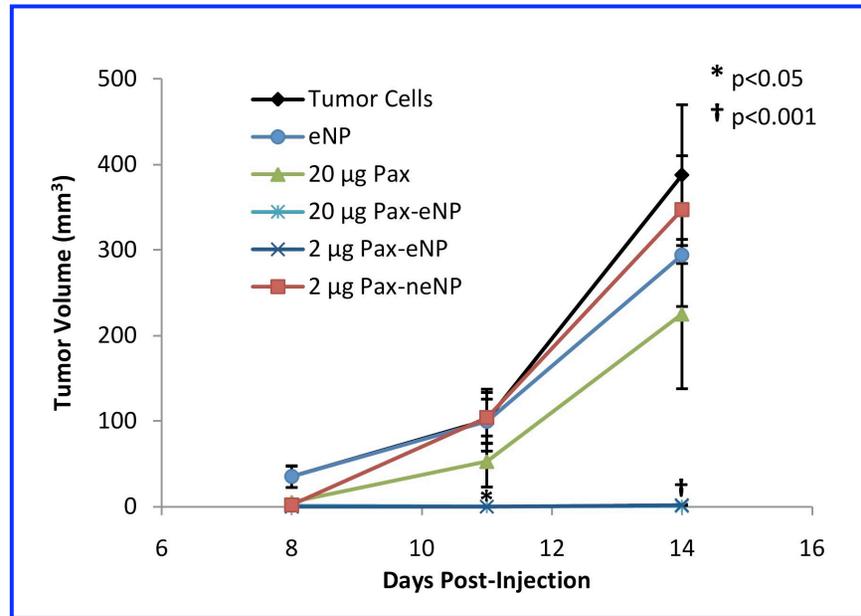
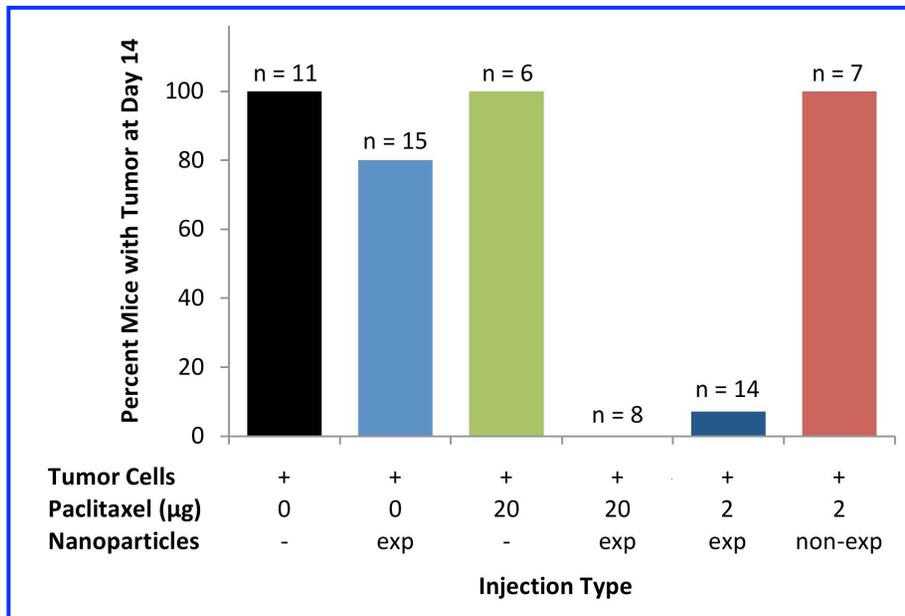
# Platform 2: Nanoparticles



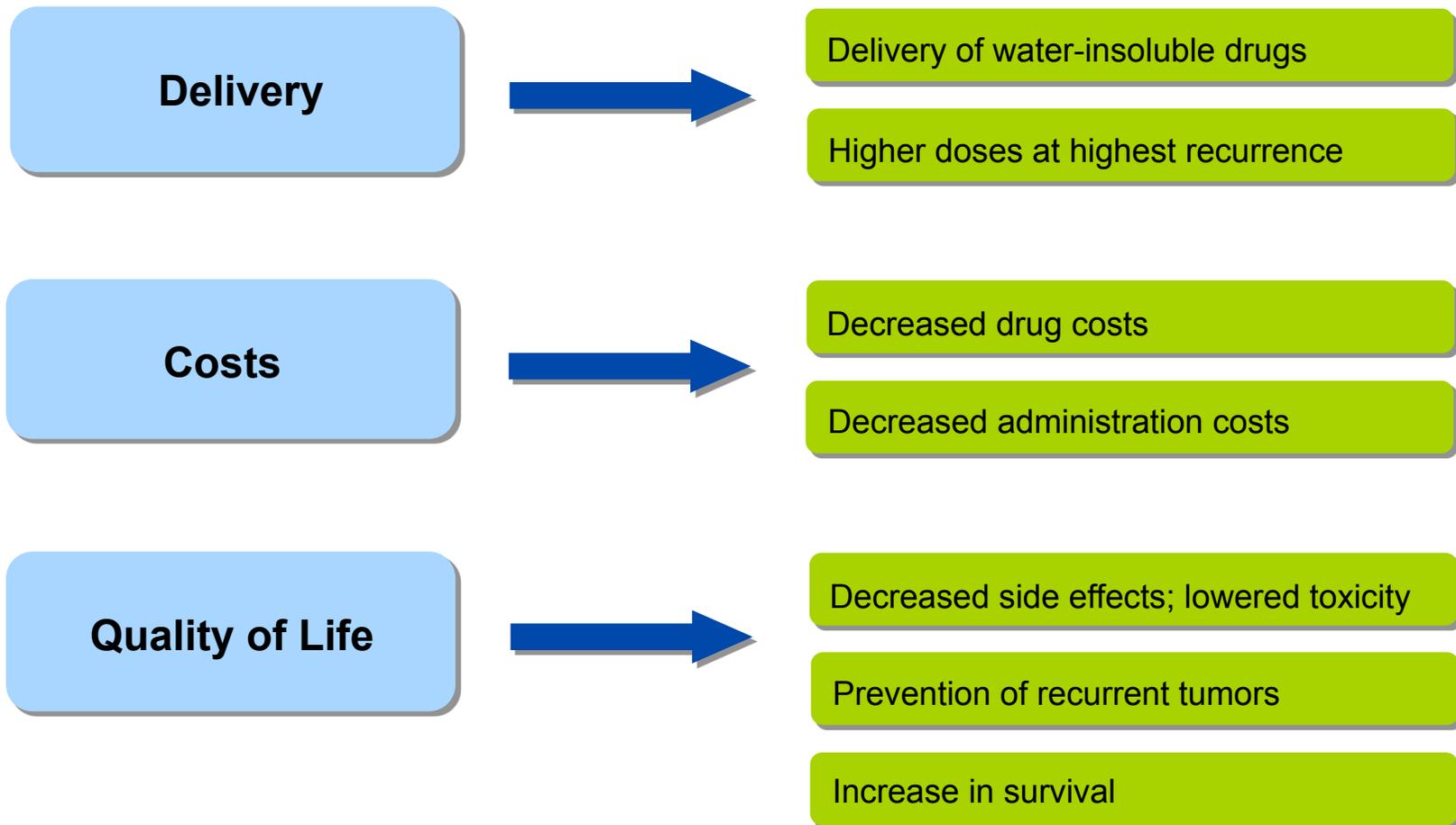
# Platform 2: Mouse Model



6-8 week old C57Bl/6 female mice & 750,000 LLC tumor cells



# Potential Benefits



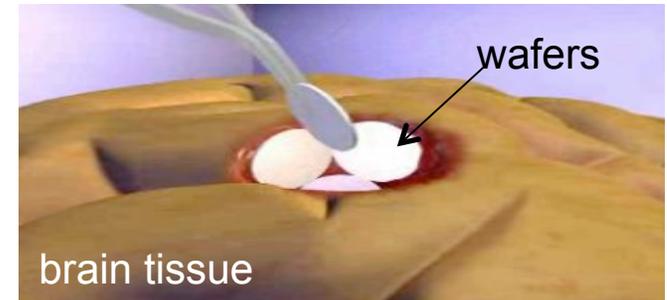
# Intellectual Property Status

- **Films and Particles for Delayed and Locoregional Delivery of Agents**
  - PCT Application No. PCT/US2007/070159, filed 5/2007. with priority date of 5/2006, converted in US, EP, CA.
- Specific Claims include:
  - Polymers
  - Preparative procedures
  - Unique drug release behaviors
  - Modes of administration
  - Applications
- **Provisional application filed 2008**

# Existing Approaches

- **MGI Pharma's Gliadel Wafer (approved only for brain cancer):**

- Rigid, drug-loaded dime-sized polymer
- Modest impact on survival (weeks)
- Short-term release (peak at 3 days)



- **Current FDA Approved Therapies Utilizing Nano-Particles:**

- Drug nanocrystals
  - Rapamune® (rapamycin): immunosuppressant
  - Emend® (aprepitant): prevents nausea and vomiting
  - Abraxane™ (paclitaxel): anticancer drug nanocrystals stabilized by human serum albumin
- Stealth® Liposomes
  - Doxil® (doxorubicin HCl): ovarian cancer
  - DaunoXome® (daunorubicin citrate): advanced HIV-related Kaposi's sarcoma

# Next Steps and Funding

- Coulter foundation funding for film platform: prototyping, development and large animal study
- \$500K CIMIT funding for nanoparticle platform: prototyping, development and animal safety
- Required funding:
  - mature prototypes
  - toxicology
  - IRB
  - IND
  - incorporate, and move off-campus
  - human clinical trials, scale-up testing

# Investigators



- **Yolonda Colson, PhD, MD** (Co-inventor)



- Associate Professor of Surgery, Harvard University/Brigham and Women's Hospital, Director of Women's Lung Surgery Program
- More than **40** peer-reviewed manuscripts
- Awards include the George Clowes Development Award (American College of Surgeons), Johnson and Johnson's CIMIT Young Clinicians Award, 1<sup>st</sup> Michelle Kessler Leadership Award in Women's Health, Second Alton Ochsner Research Scholarship (American Association for Thoracic Surgery)

- **Mark Grinstaff, PhD** (Co-inventor)



- Associate Professor of Biomedical Engineering and Chemistry at Boston University.
- More than **100** peer-reviewed manuscripts
- Co-founder of companies based on novel polymer technology– HyperBranch Medical Technology, Affinergy
- Awards include the ACS Nobel Laureate Signature Award, NSF Career Award, Pew Scholar in the Biomedical Sciences, Camille Dreyfus Teacher-Scholar, and an A. P. Sloan Research Fellowship.