Nanomedicine & Cancer

Overview

Improve Diagnostics

- Nanowires
- Cantilevers
- Cancer imaging

Cancer Therapy

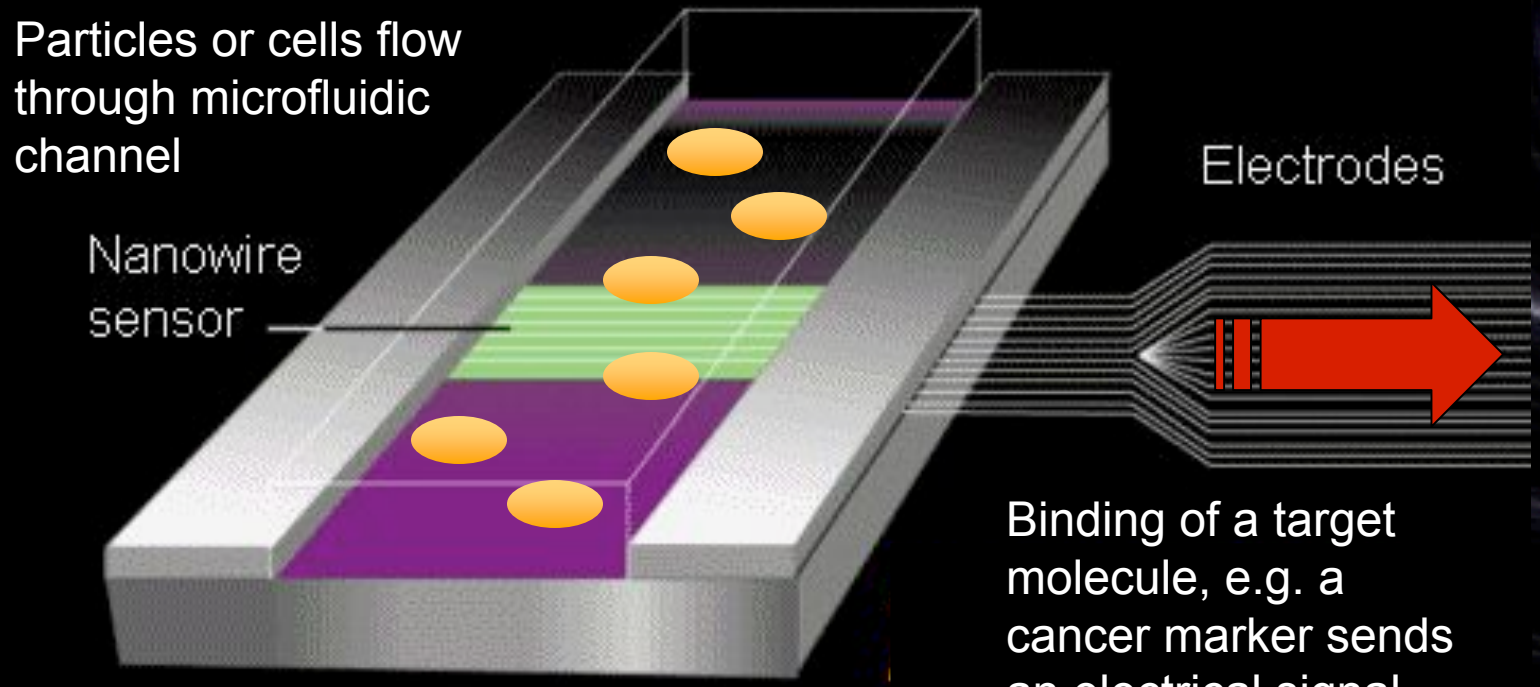
- Nanoshells
- Nanoparticles
- Targeting

Societal Implications

Improve diagnostics

Nanowires

- Nanowires in a microfluidic channel
- Antibodies or oligonucleotides bound to nanowires
- Change in binding will form an electrical signal that is detected

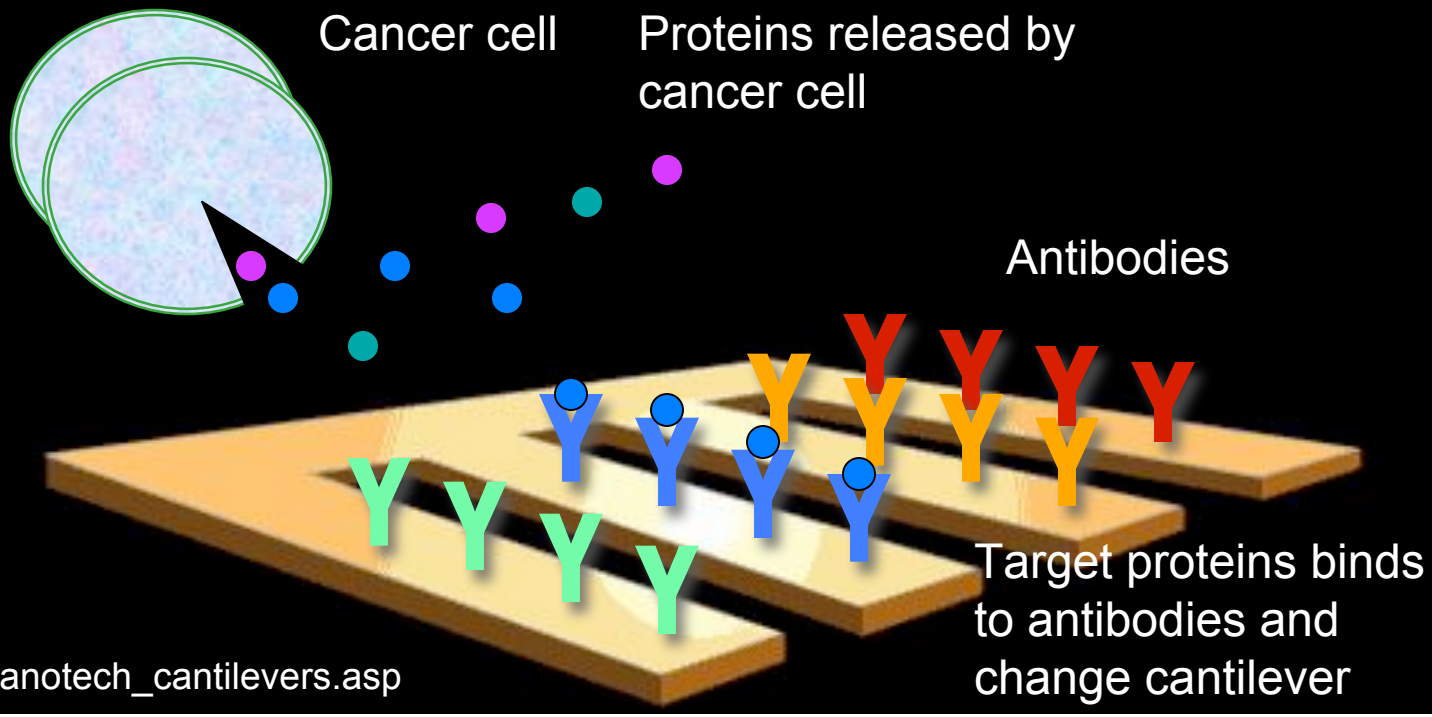


http://nano.cancer.gov/nanotech_nanowires.asp

Improve diagnostics

Cantilevers

- Built using semiconductor lithographic techniques
- "Springboards" coated with antibodies
- Bound cancer marker e.g. protein changes physical property of cantilever

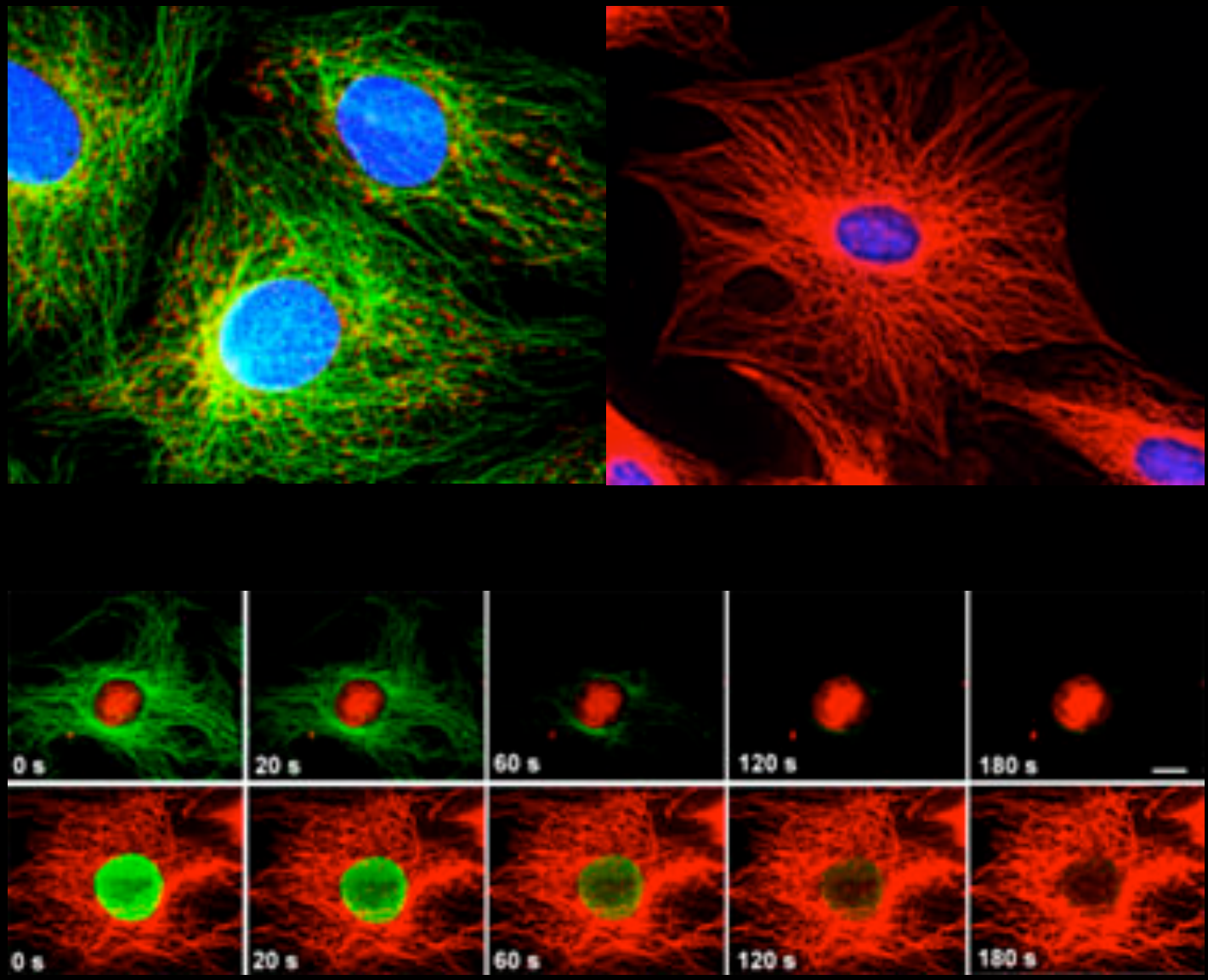


http://nano.cancer.gov/nanotech_cantilevers.asp

Improve diagnostics

Imaging

- Superparamagnetic nanoparticles for magnetic resonance imaging
- Quantum dots linked to antibodies
- Capable of detecting multiple cancer markers
- Photostable

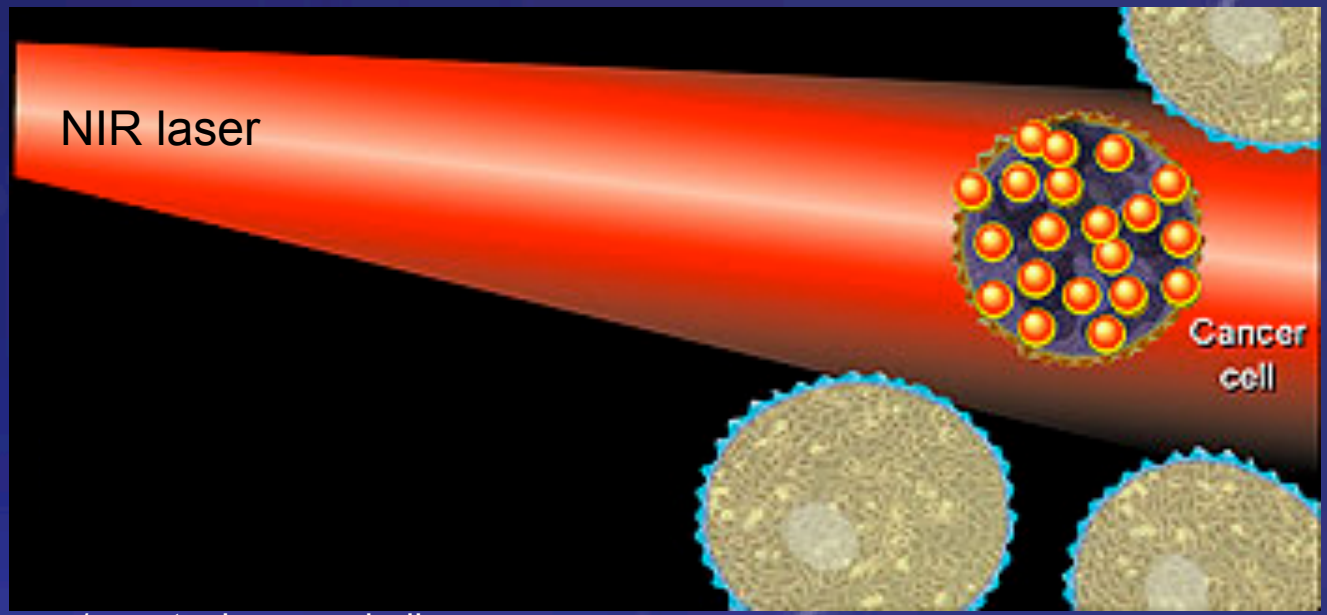


Pictures: http://www.qdots.com/live/render/content.asp?id=56

Cancer Therapy

Nanoshells

- Silica core with ultrathin metallic shell
- Optical absorption at near infrared region (NIR)
- Converts absorbed light into heat, thermal surgical blade
- Enhance permeation retention allows specificity for cancer cells

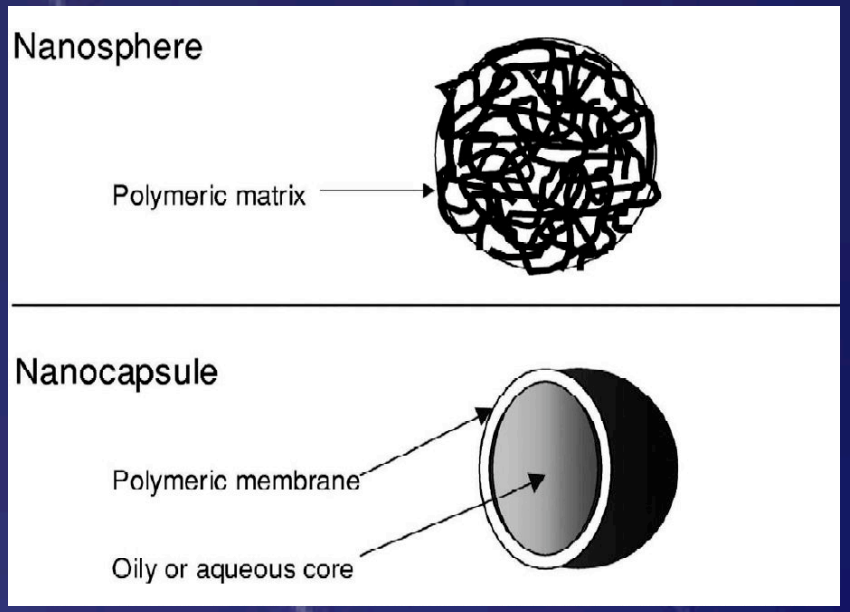


http://nano.cancer.gov/nanotech_nanoshells.asp

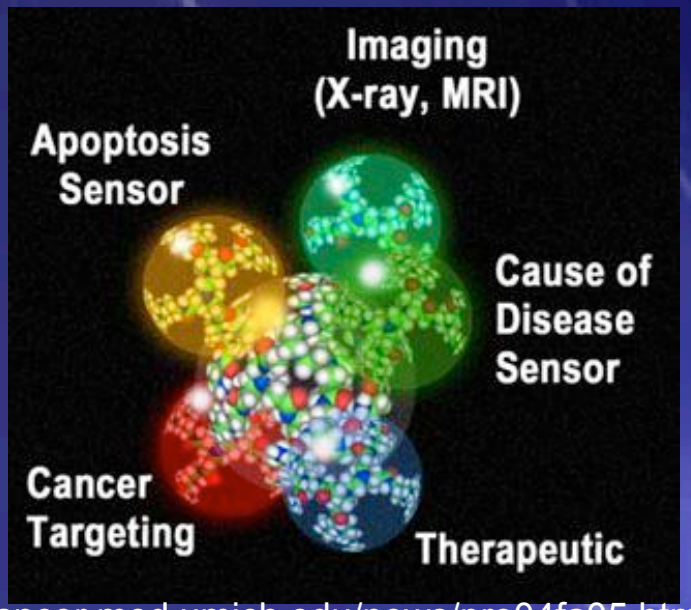
Cancer Therapy

Nanoparticles

- Nanospheres and nanocapsules
- Materials include poly(isobutylcyanoacrylate) poly(isohexylcyanoacrylate), poly(methylcyanoacrylate) and biodegradable poly(ethylcyanoacrylate)
- Dendrimers, spherical polymers from branched monomers
- Multifunctional cancer agent



I. Brigger et. al. 2002



www.cancer.med.umich.edu/news/pro04fa05.htm

Cancer Therapy

Targeting

- Specifically target nanoshells and nanoparticles to cancer cells
- Antibodies
- Receptor ligands
- Surface modifications e.g. coatings

Societal Implications

Potential toxicity

- Effects of nanoparticles and nanoshells in the body
- Evade body's immune system
- Cross blood-brain barrier
- Increase reactivity of nanoparticles

Environmental Concerns

- Excretion and disposal of nanomedicine

Definition of progress

- positive impact for everyone or the wealthy?
- increase healthcare costs