Surface-Enhanced Raman Scattering Nanoparticles for Improved Resection of Non-Muscle Invasive Bladder Cancer

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This is an abridged summary.
Bladder cancer is a worldwide public health concern

- 165,000 people died of bladder cancer worldwide in 2012
- Non-muscle invasive bladder cancer (NMIBC; Stage Tis, Ta, T1):
  - 70-80% of cases (remainder are invading muscle)
  - Median recurrence time of 1-2 years

http://www.nature.com/nrc/journal/v15/n1/fig_tab/nrc3817_F1.html
Current standard of care for non-muscle invasive bladder cancer is transurethral resection

Major problem: white light cystoscopy often cannot detect low grade/stage lesions

Where’s the lesion?

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These cancers were localized with PDD, which has low specificity

Cancer that is missed can lead to recurrence; we need better ways to localize “invisible” bladder cancer.

How can we better detect non-muscle invasive bladder cancer?
We propose that surface-enhanced Raman scattering (SERS) particles targeted to bladder will enable more accurate localization and resection of bladder cancer.

**Nanoparticle Targets**

- **CD47** – immunomodulatory, “don’t eat me”
  - Sens./Spec. = 80-90%
- **CA9** – pH regulation
  - Sens./Spec. = 80-90%

**Results:**

- Both non-specific (passive) and antibody-mediated (active) binding of NPs is greater in tumor than control samples
- This could facilitate more complete resection of bladder cancer