

Urease-powered Nanobots For Radionuclide Bladder Cancer Therapy

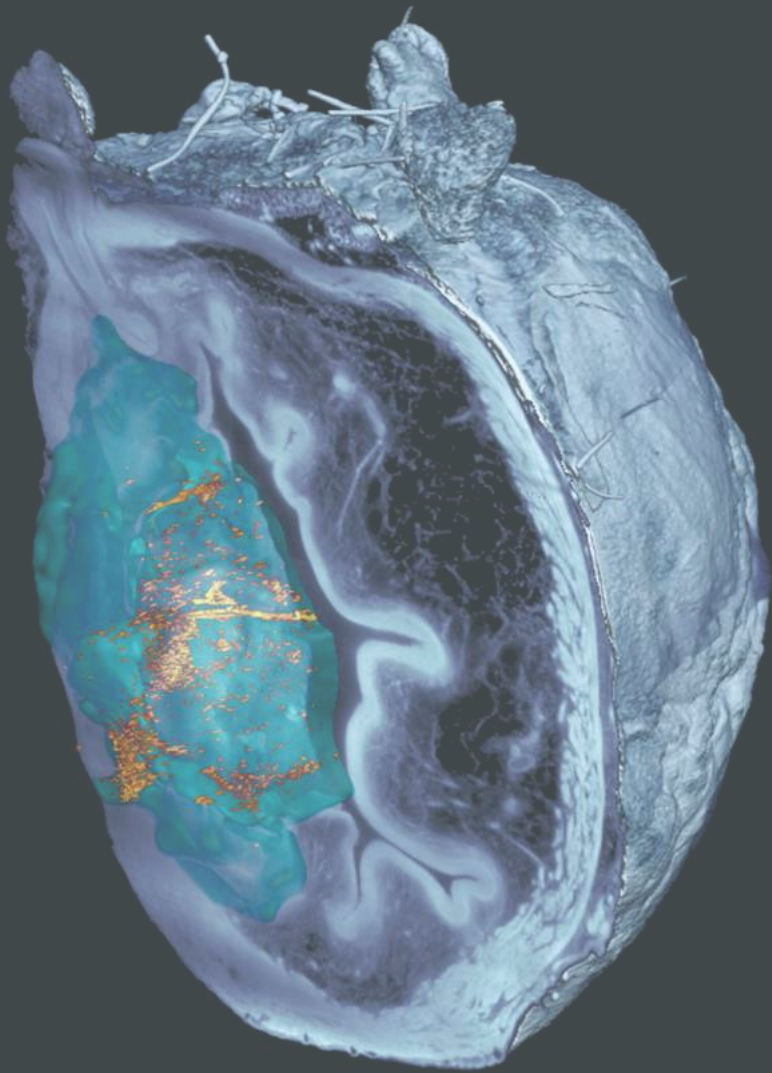
Meritxell Serra-Casablanca

PhD Candidate in Biotechnology at the Institute for Bioengineering of Catalonia



INTEGRATING
Delivery Science
ACROSS DISCIPLINES



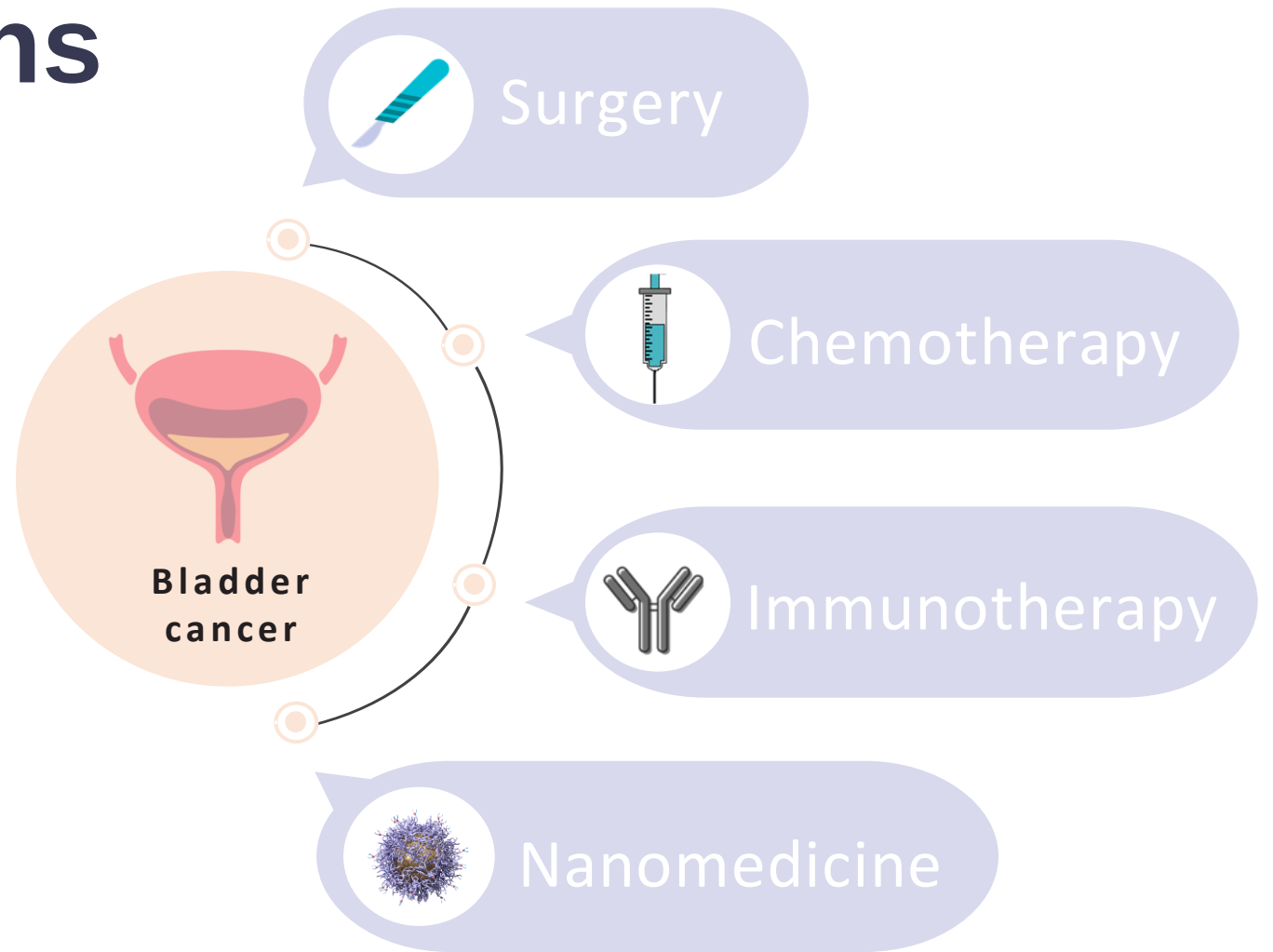


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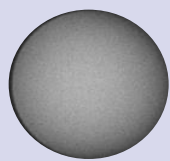
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Treatment options for patients



Urease-powered nanobots



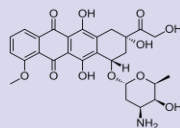
MSNPs



Urease (motion)



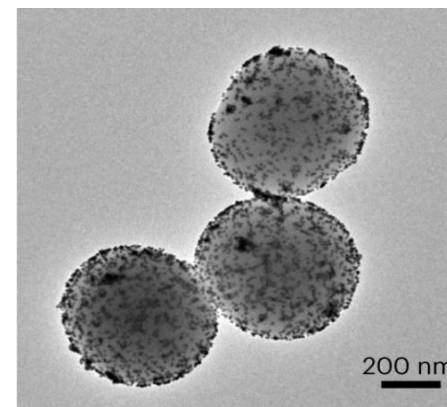
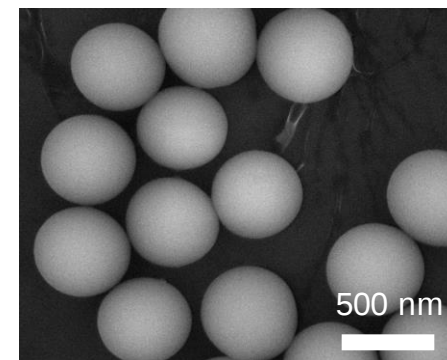
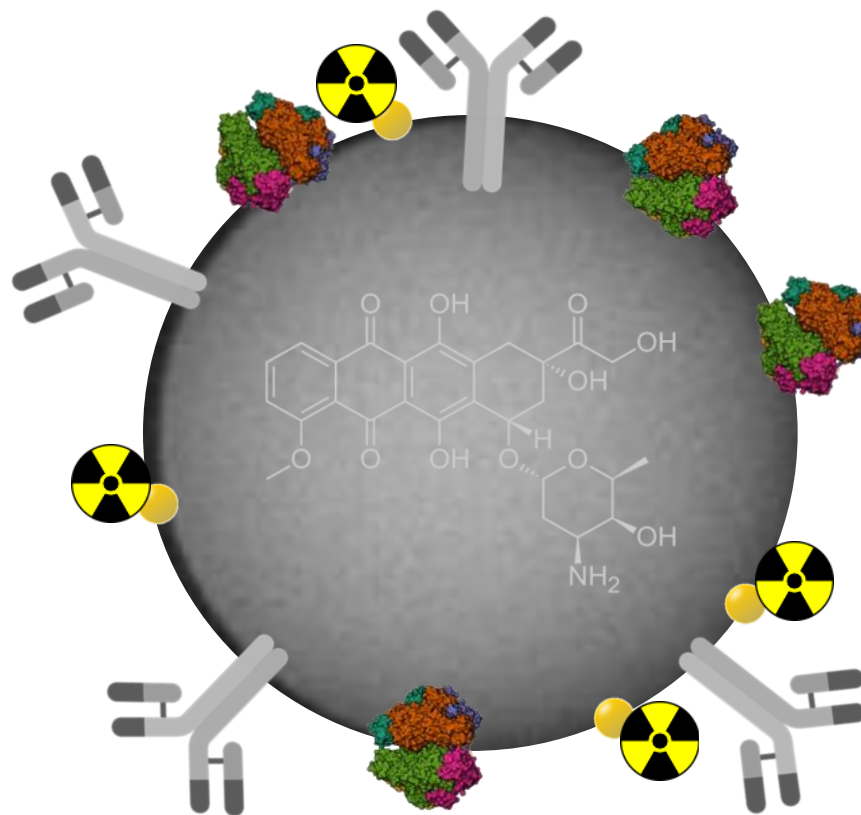
Antibody (targeting)

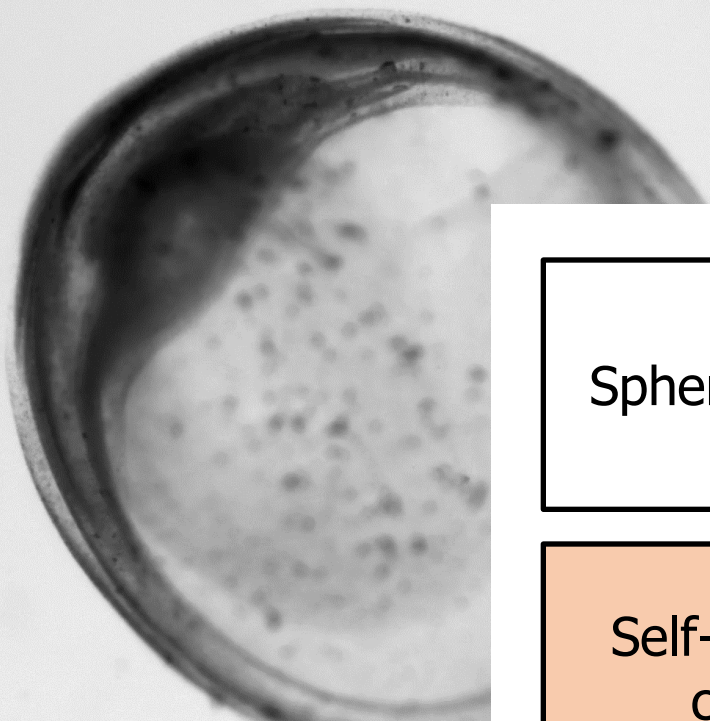


Chemotherapeutic drug



Radionuclide
functionalized
onto AuNPs





NANOBOTS

Spherical MSNPs

Enzyme catalysis
to obtain active
motion

Drug delivery
systems

Self-propulsion
capacity

Targeted to
cancer cells

Collective
displacement

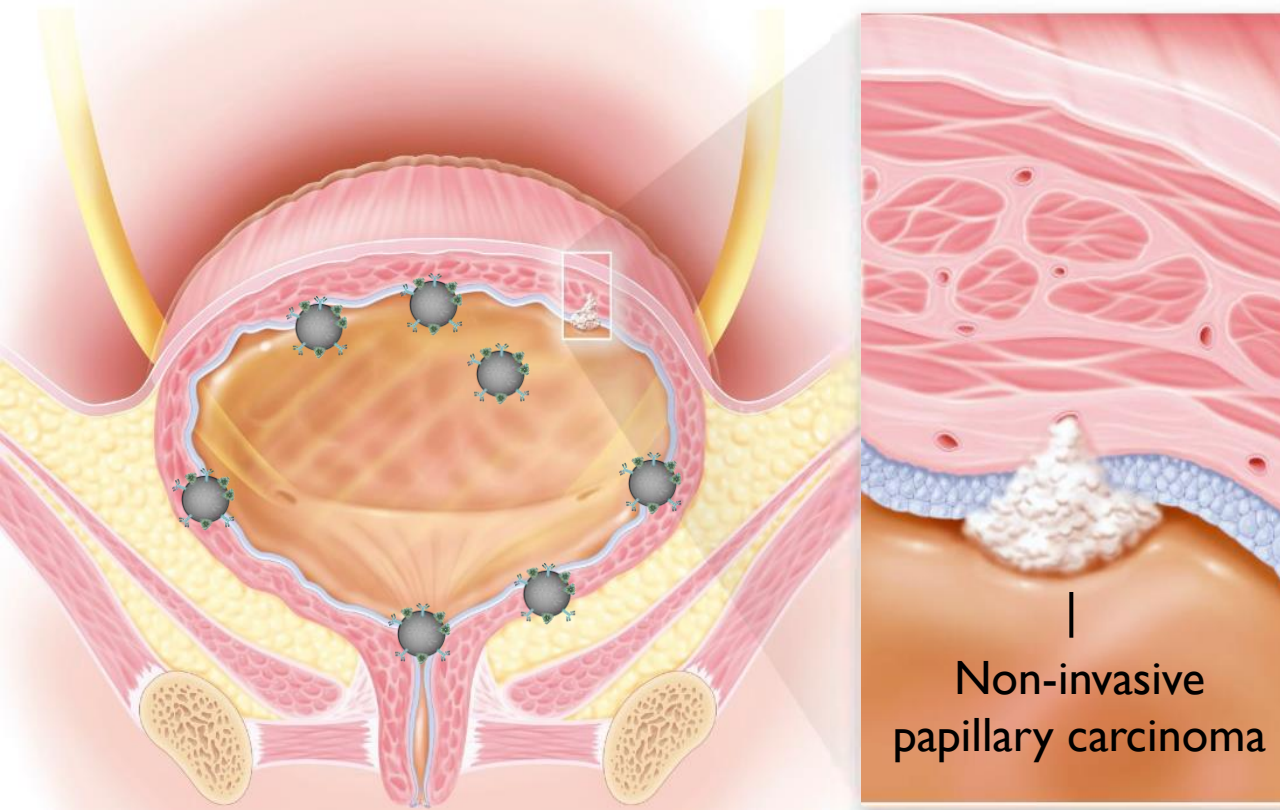
Penetration
capacity

Fluid mixing

Biocompatible

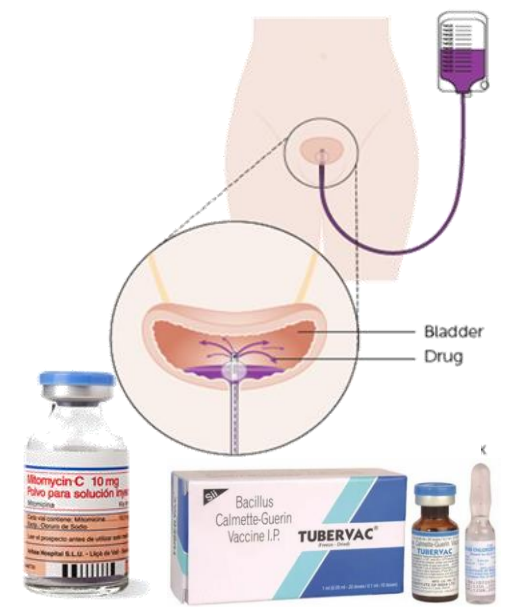


BLADDER CANCER



9th
MOST COMMON
TYPE OF CANCER

HIGH
RATE OF
RECURRENCE
(70%)

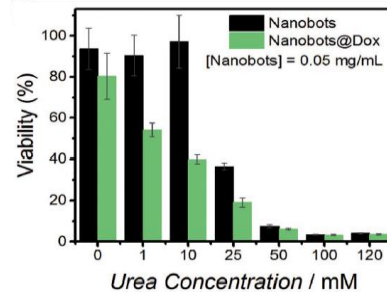
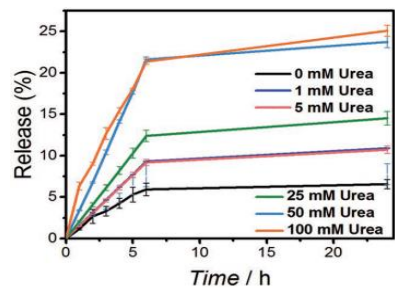
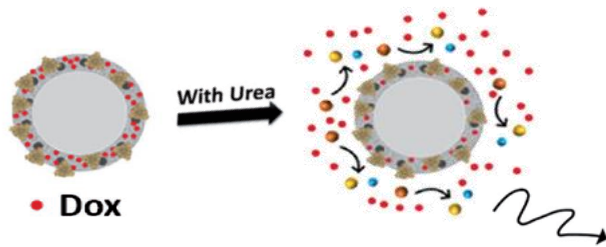


- **Sedimentation** of the therapeutic agent
- **Low tumor accumulation** and retention in the bladder

Nanobots for bladder cancer treatment

2017

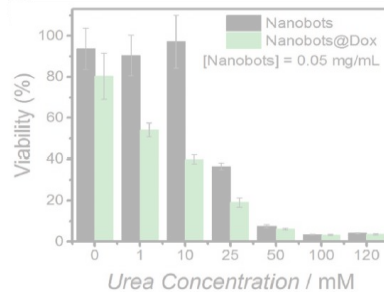
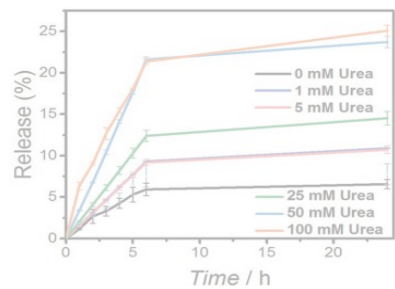
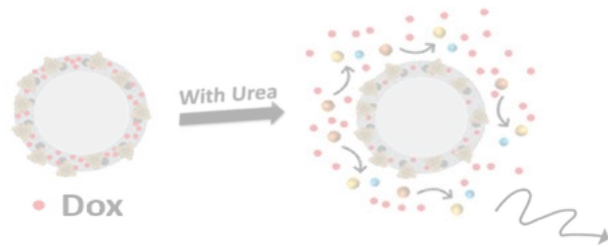
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Nanobots for bladder cancer treatment

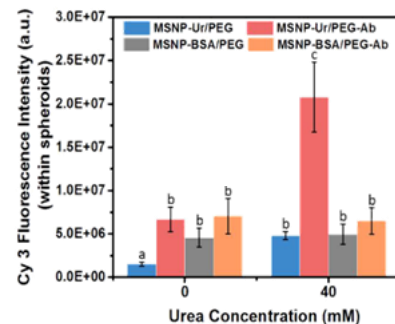
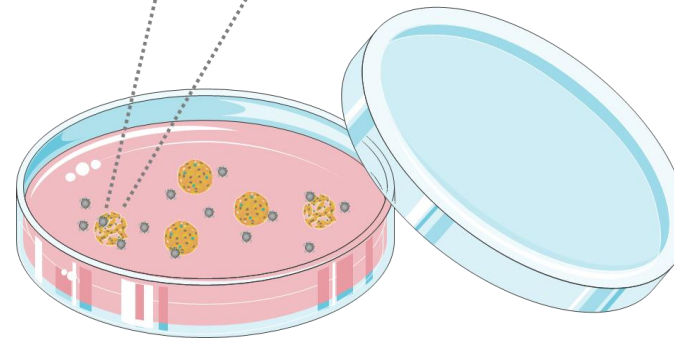
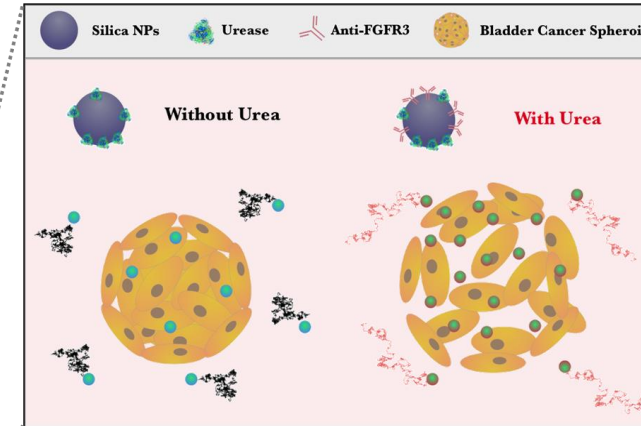
2017

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2019

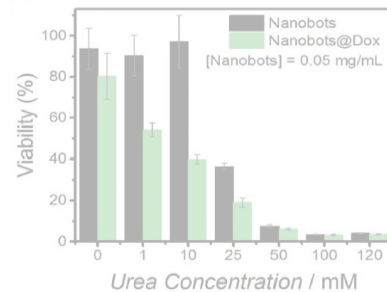
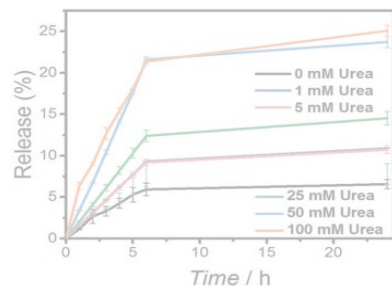
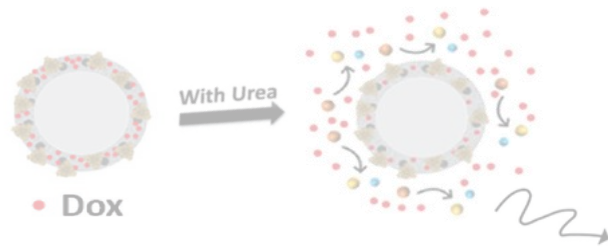
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Nanobots for bladder cancer treatment

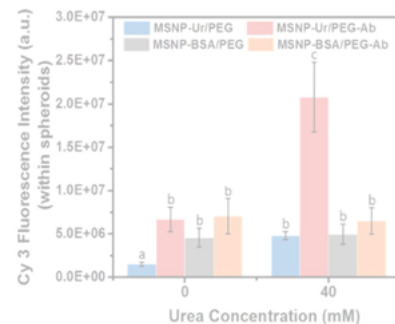
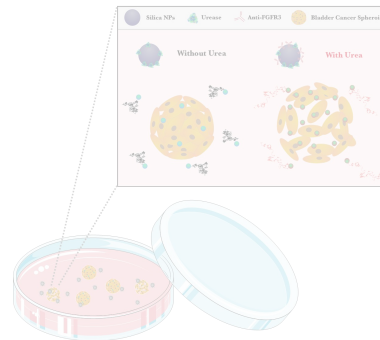
2017

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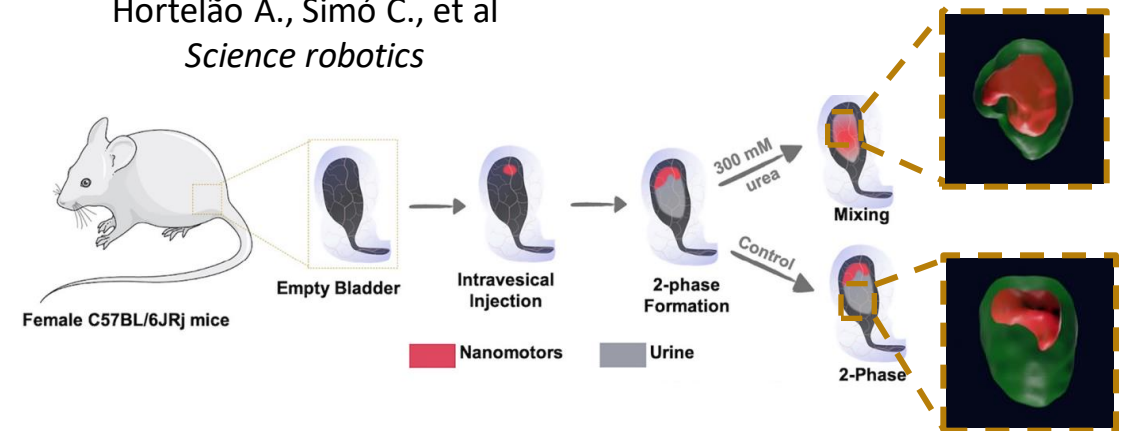
2019

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2021

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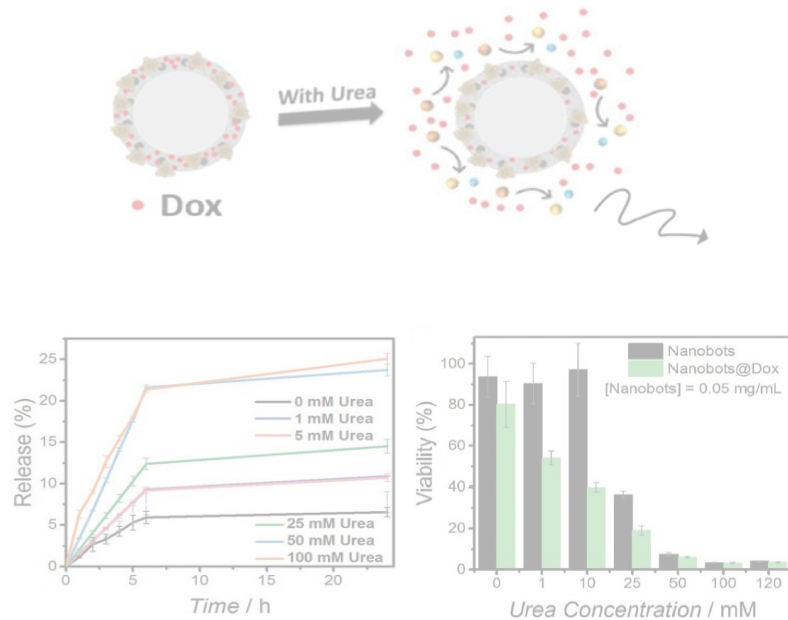


3D-reconstructed rendering of PET images

Nanobots for bladder cancer treatment

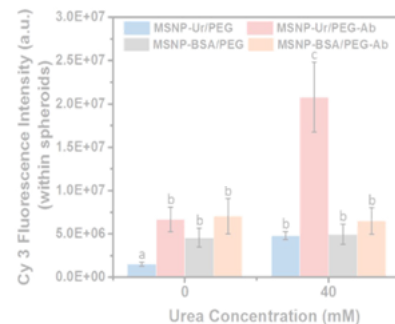
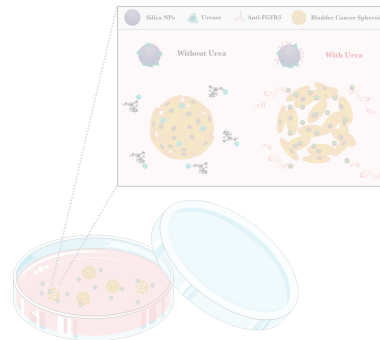
2017

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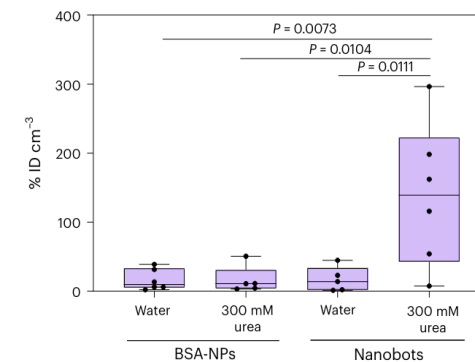
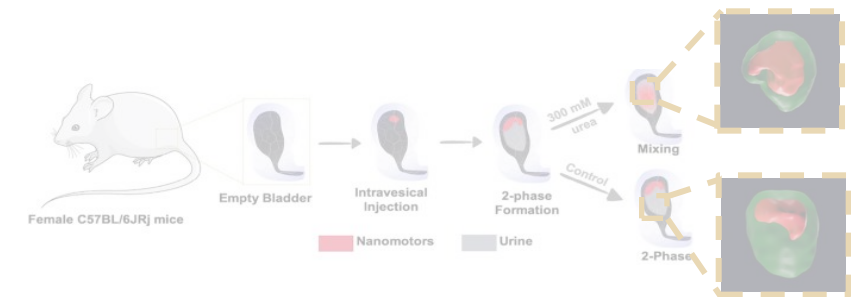
2019

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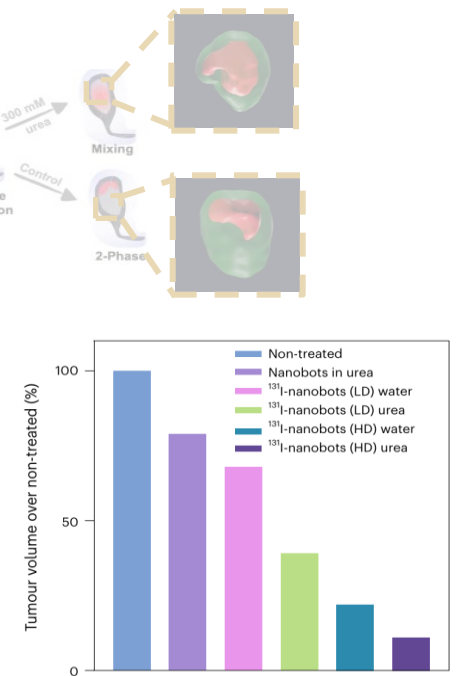
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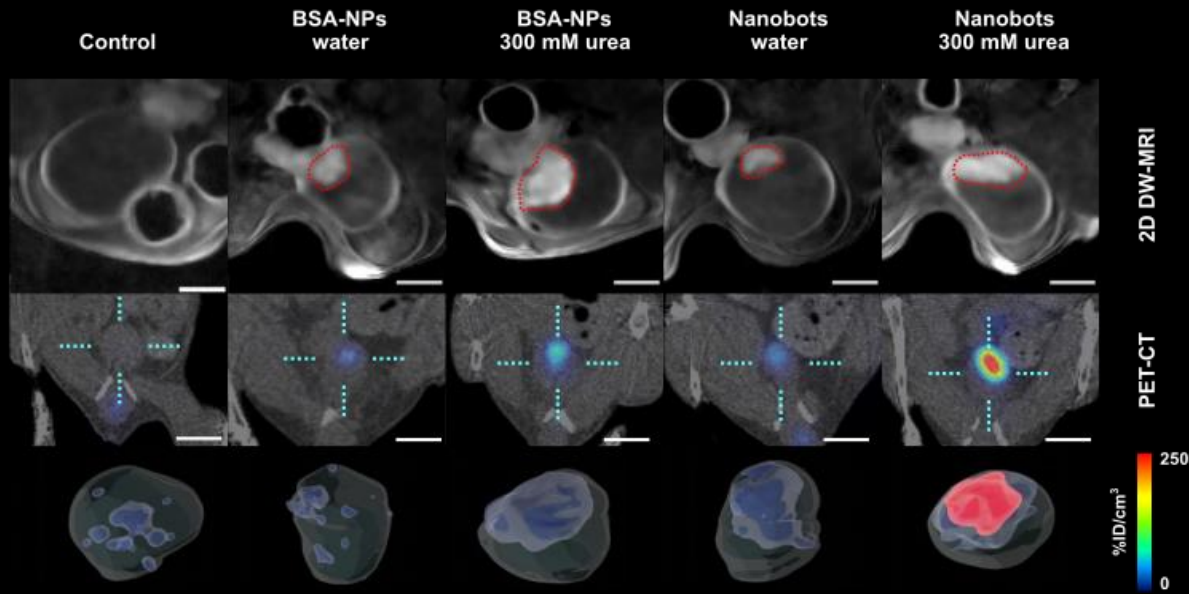
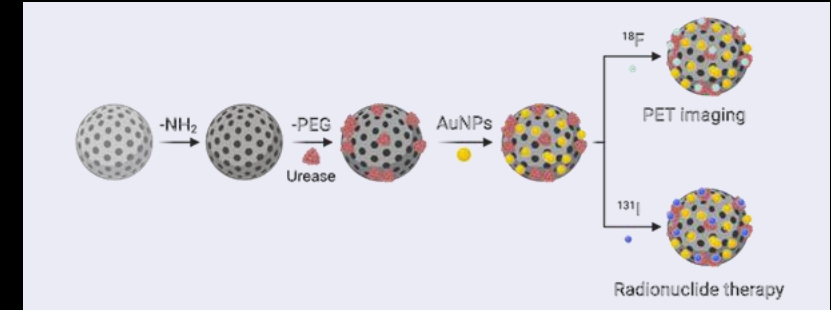
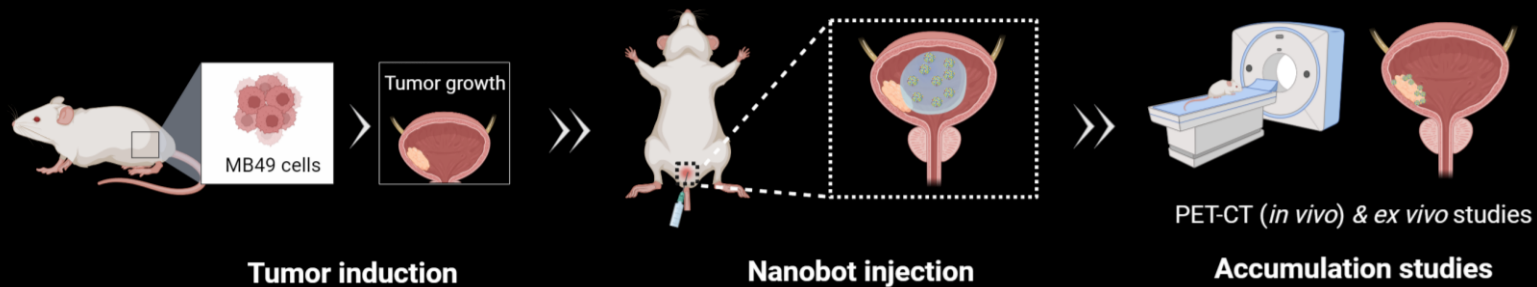


2024

Simó C., Serra-Casablancas M., et al
Nature Nanotechnology



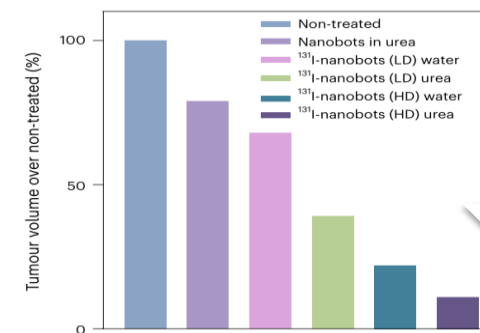
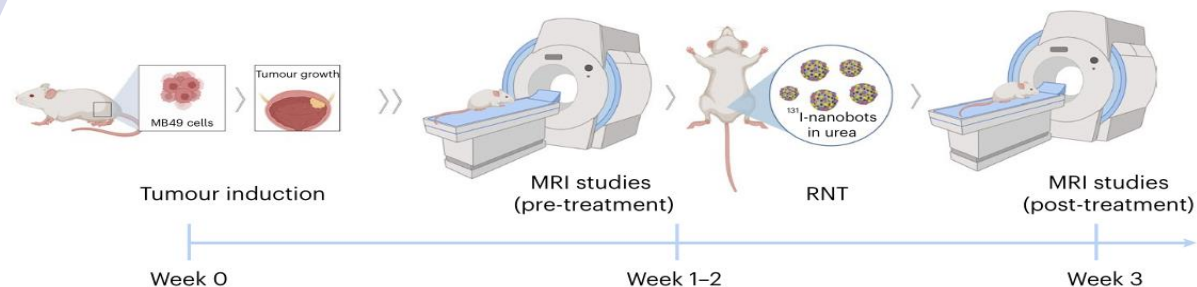
Nanobots show enhanced tumor accumulation



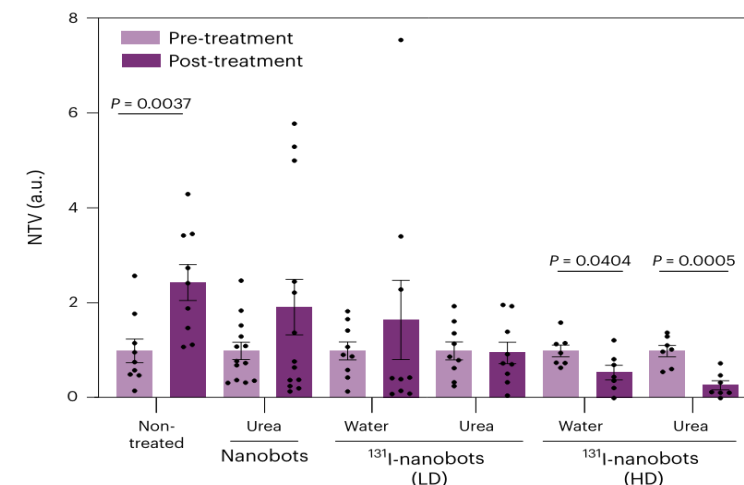
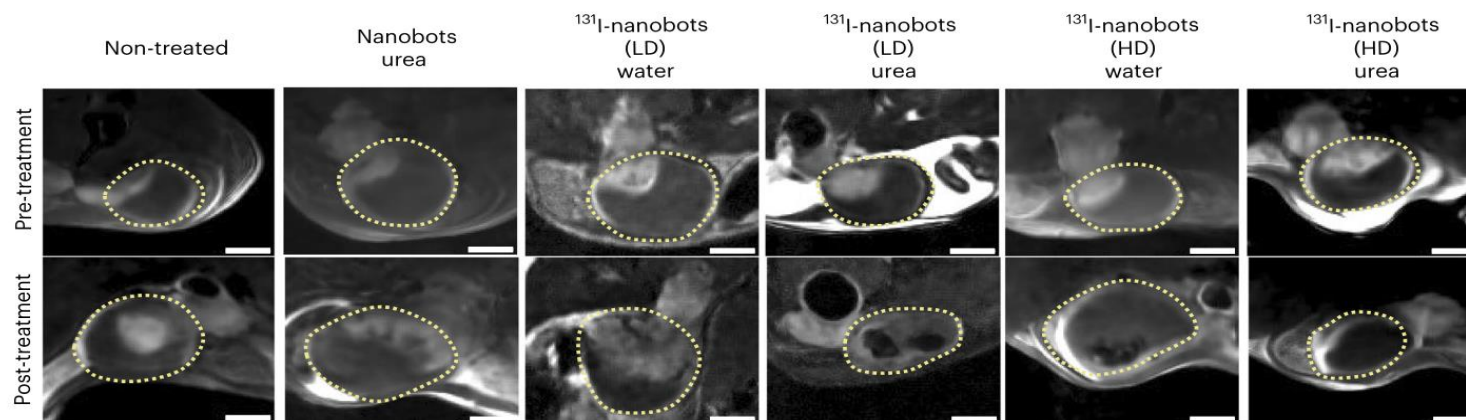
8-FOLD
INCREASE



Radionuclide therapy with ^{131}I -nanobots reduces bladder tumors size



90%
tumor
reduction



The team



Cristina Simó
Co-first author

CICbiomaGUNE MEMBER OF
BASQUE RESEARCH
& TECHNOLOGY ALLIANCE



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Urease-powered nanobots for radionuclide bladder cancer therapy

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OCHOA**



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