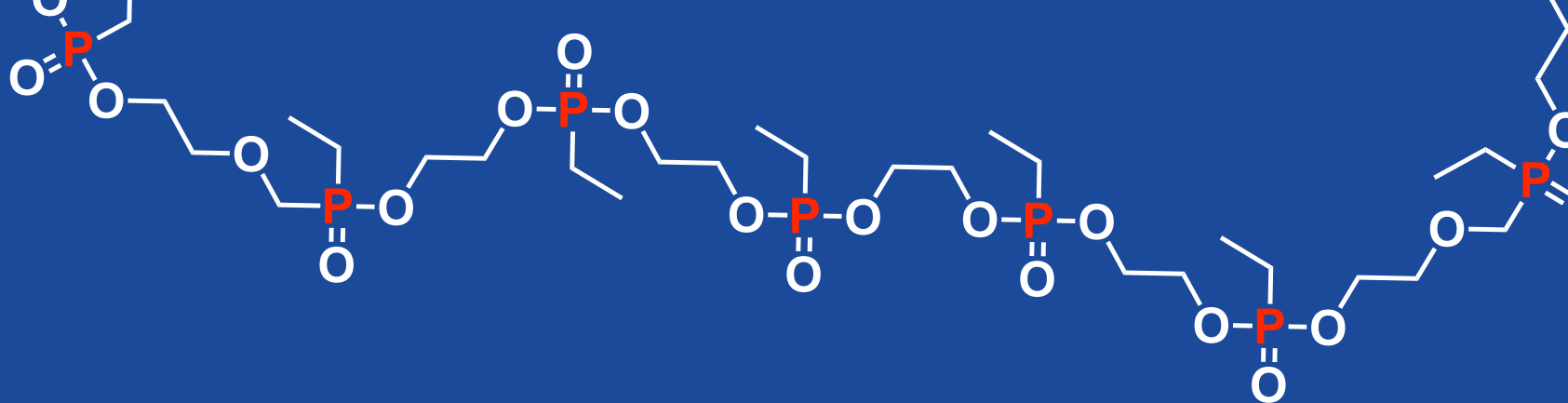
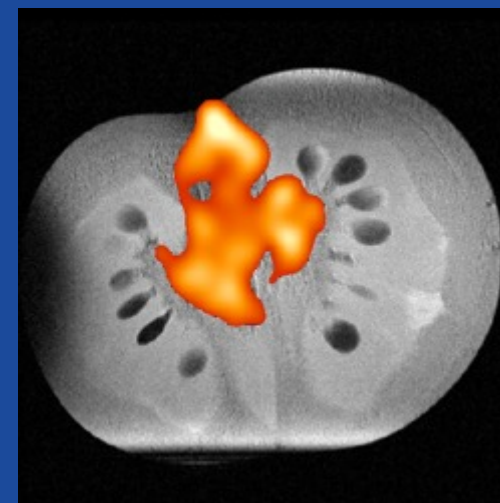




Biodegradable Polyphosphoester Micelles Act as Background-free ^{31}P MRI Agents and Drug Nanocarriers

Olga Koshkina

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MRI is a powerful imaging modality

More than 95 Millions MRI scans /year*



Whole body

Molecular information

No radioactivity

*source: GE Healthcare; MRI scanner created with Canva AI

MRI contrast agents contain harmful heavy metals

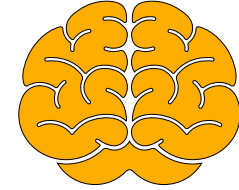


clinical contrast agents

toxic Gd-ions

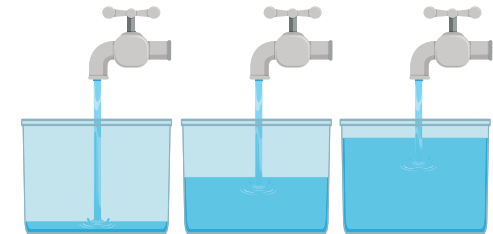
40000 kg /
year used!

accumulate in organs



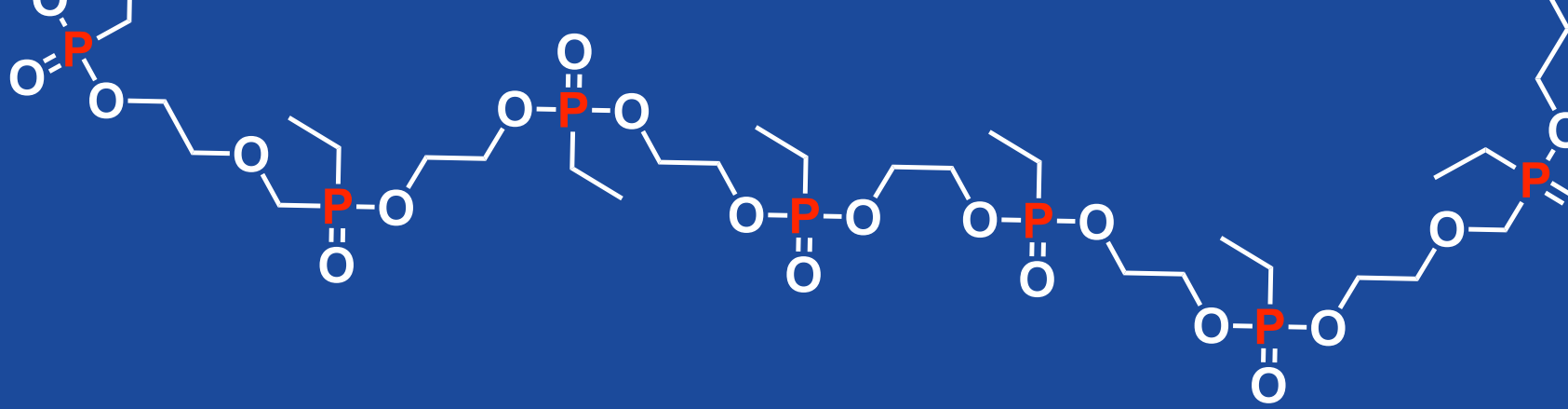
toxicity

Found in drinking water



pollution + toxicity

**No quantification of nanomedicines possible
only localization (to some extend)**

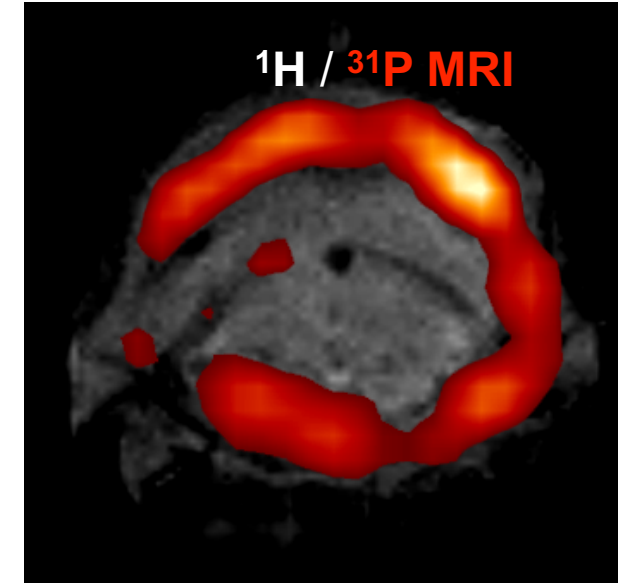
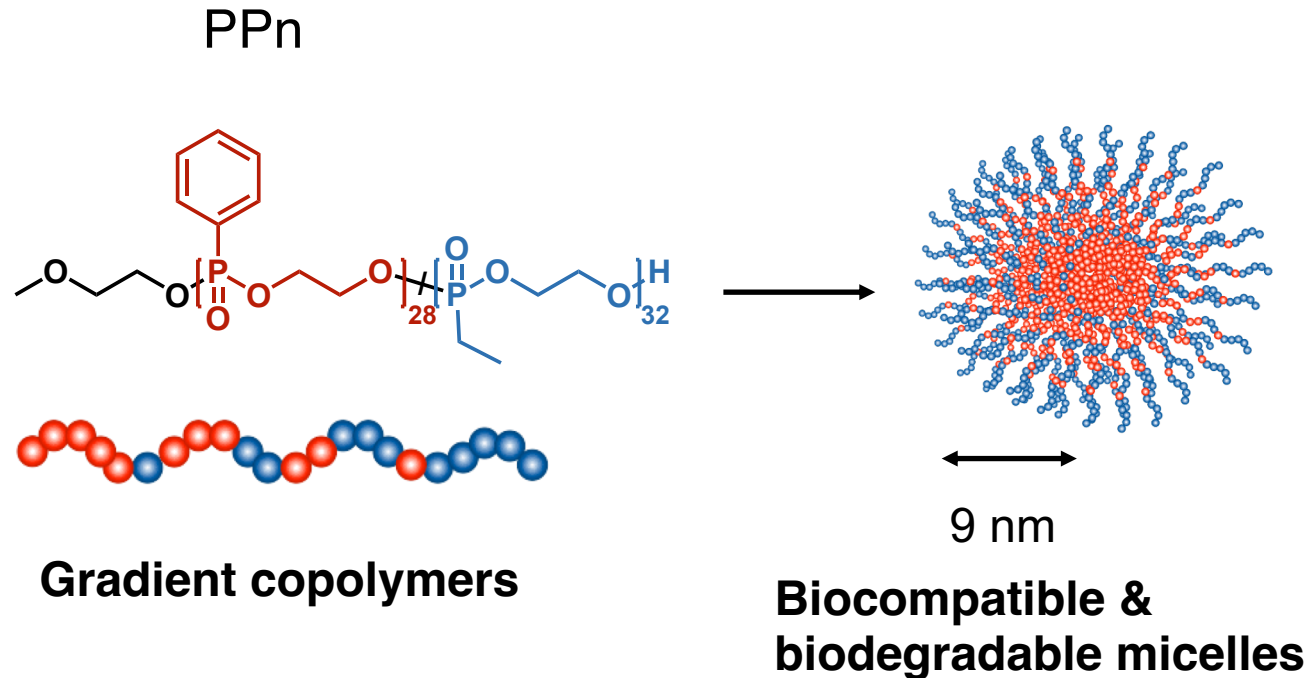


Imagine

Biocompatible, biodegradable polymers as MRI agents!

Unique unprecedented technology: Polymers with an inherent MRI signal

novel type of MRI via ^{31}P

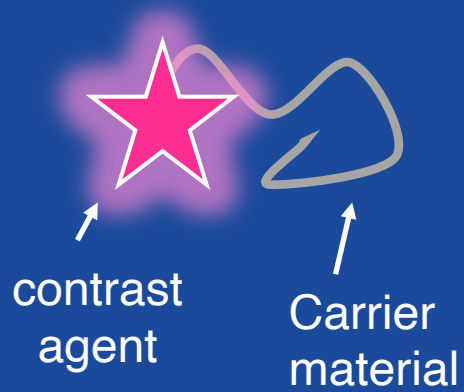


Background-free, quantitative imaging

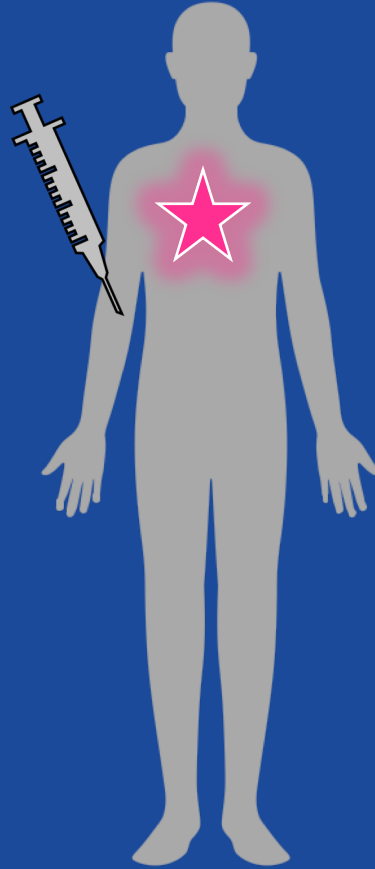
Koshkina, Rheinberger,.... Wurm, Nature Commun. **2023**, 14, 4351

Koshkina, Rheinberger, Wurm, **Patent pending**, N2031805, filed 09.05.2022

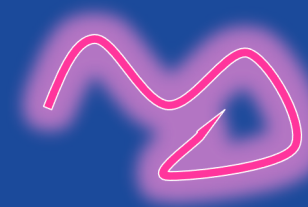
All (non-radioactive) theranostic materials now



- Carrier not detectable
- Harmful contrast agents

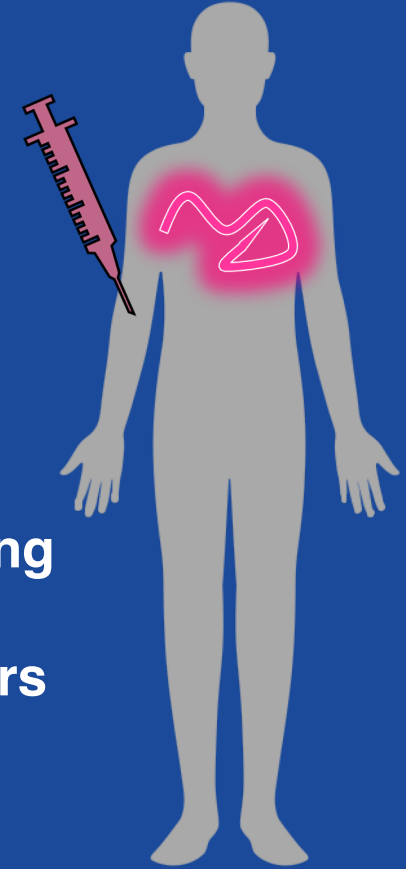


Phos4nova polymers



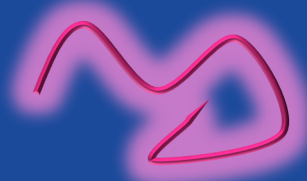
carrier is
contrast agent

- Direct carrier monitoring
- Biocompatible and biodegradable polymers



Phos4nova polymers can be assembled to next generation MRI-traceable materials

Phos4nova polymers



Nano and microcarriers



Hydrogels



Artificial cells
and organs

Thank you!

<https://phos4nova.eu>



University of Twente, Sustainable Polymer Chemistry:

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Paulusse

Heinrich Heine University Düsseldorf:
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Alexander von Humboldt
Stiftung/Foundation

UNIVERSITY
OF TWENTE.