Istituto Zooprofilattico Sperimentale delle Venezie

Single particleICP-MS as a screening tool to detect TiO_2NPs in edible mussels

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Workshop A.I.S.E.T.O.V.

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Overview

- ***In vivo*** **experimentation: TiO_2NPs, mussels**
- **Results: analysis of mussels (ICP-MS, spICP-MS)**
- **Conclusions**

TiO_2NPs

Several applications

From 2006 OECD «sustainable use of nanotechnology»
List of 11 NMs that deserve attention (TiO_2NPS)

In vivo experimentation:
Mytilus Galloprovincialis and TiO_2NPs

TiO_2NPs in surface waters*

Bioaccumulation
Food Chain

*Andreas P. Gondikas et al. 2014 Environ. Sci. Technol., pp 5415–5422. Release of TiO_2 NPs from Sunscreens into Surface Waters: A One-Year Survey at the Old Danube Recreational Lake.

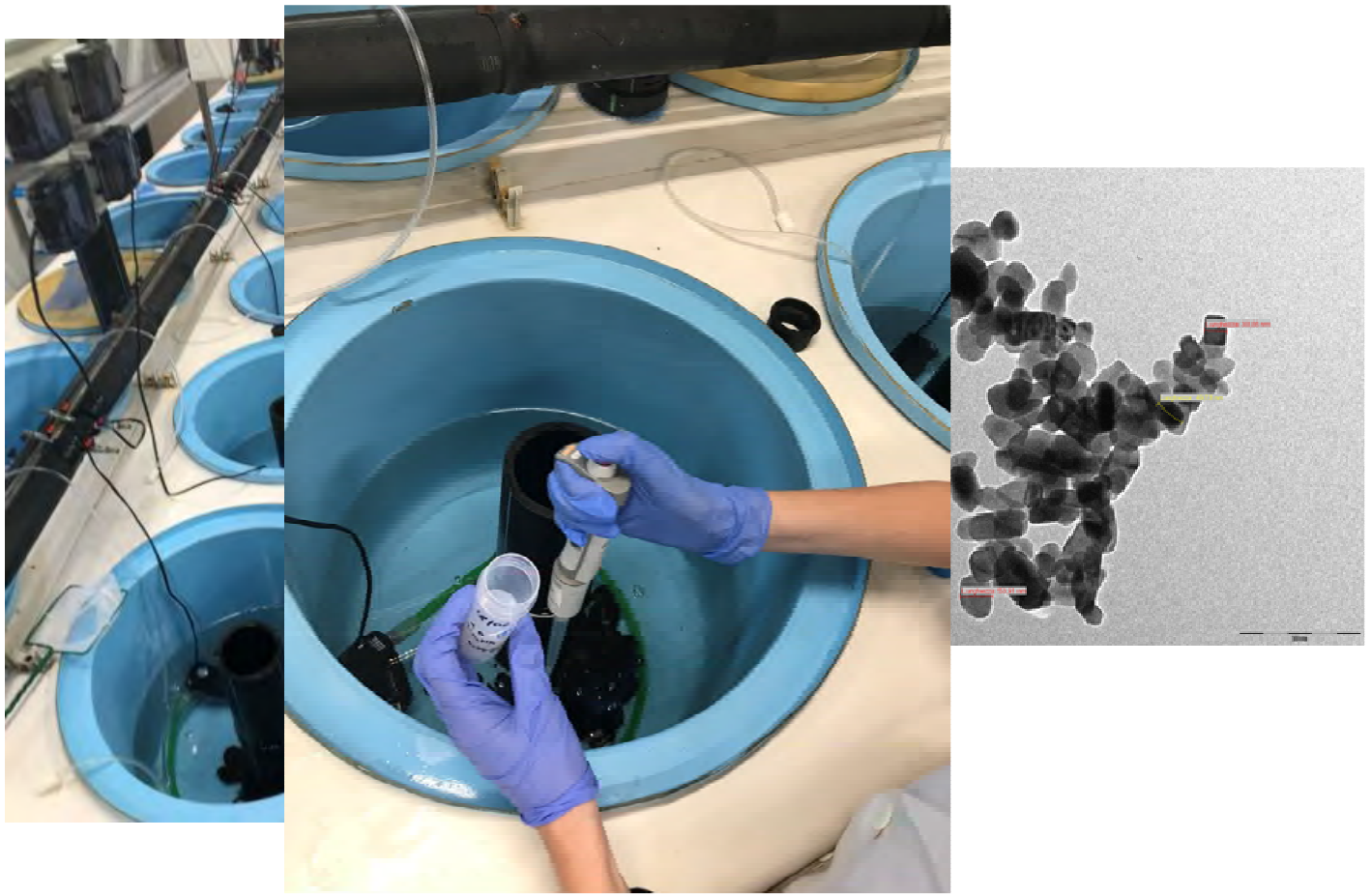
*R. Kaegi et al. 2008. Synthetic TiO2 nanoparticle emission from exterior facades into the aquatic environment Environmental Pollution 156, 233–239.

*XiaomeiShia et al. 2015 Nanoimpact. Fate of TiO_2 nanoparticles entering sewage treatment plants and bioaccumulation in fish in the receiving streams.

In vivo experimentation: *Mytilus Galloprovincialis*

Mussels: water filtration, bioindicator

Aim of the project



NPs Bioaccumulation? Depuration?

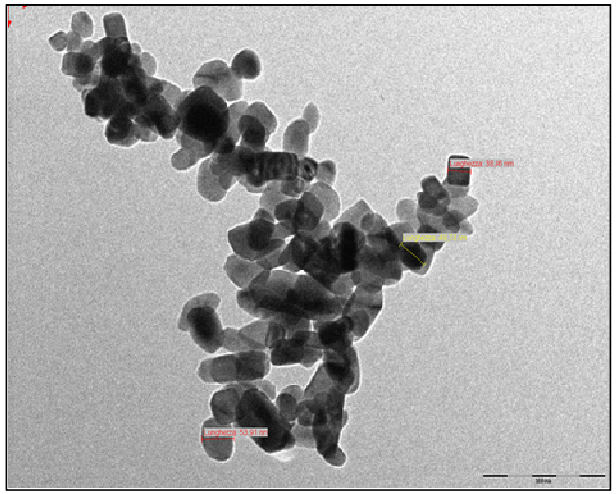
In house preparation of TiO_2NPs suspension

Powder of TiO_2NPs

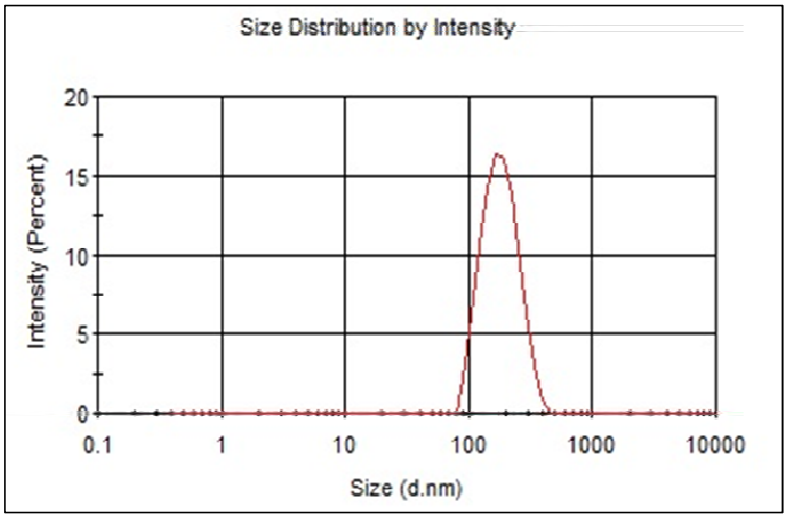
sospension

Dispersion protocol
(stability, homogeneity)

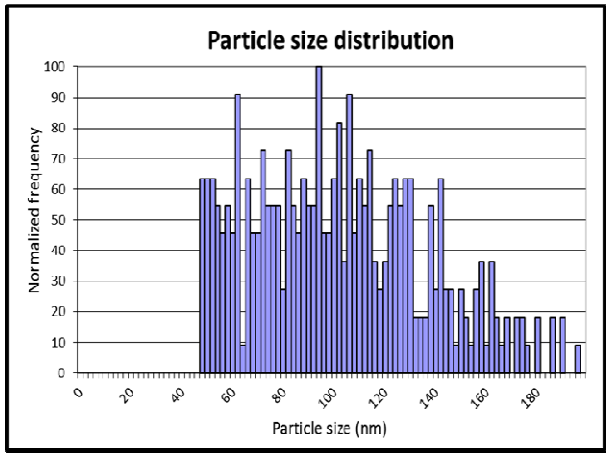
TiO_2NPs suspension characterization



TEM



DLS

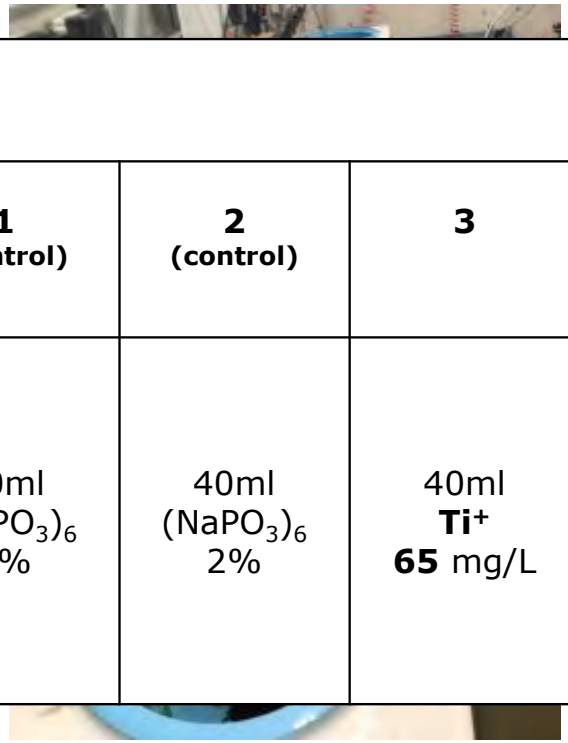


spICP/MS

In vivo experimentation

700 specimen *Mytilus galloprovincialis*

Open sea (Venice)



Groups						
1 **(control)**	**2** **(control)**	**3**	**4**	**5**	**6**	**7**
40ml $(NaPO_3)_6$ 2%	40ml $(NaPO_3)_6$ 2%	40ml **Ti^+** **65** mg/L	40 ml **TiO_2NPs 10** mg/L	40 ml **TiO_2NPs** **10**mg/L	40ml **TiO_2NPs** **100** mg/L	40 ml **TiO_2NPs** **100** mg/L

7 tanks
100 mussels/tank

(mussels were daily fed, water was daily changed)

TiO_2NPs ICP-MS Analysis

LOQ: 50 µg/kg

TiO_2NPs and Ti treated group contain Titanium

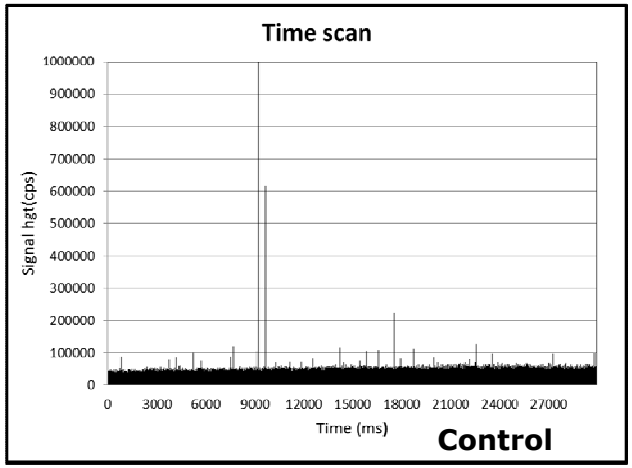
Disadvantages: difference between Ti^+ and TiO_2NPs ?

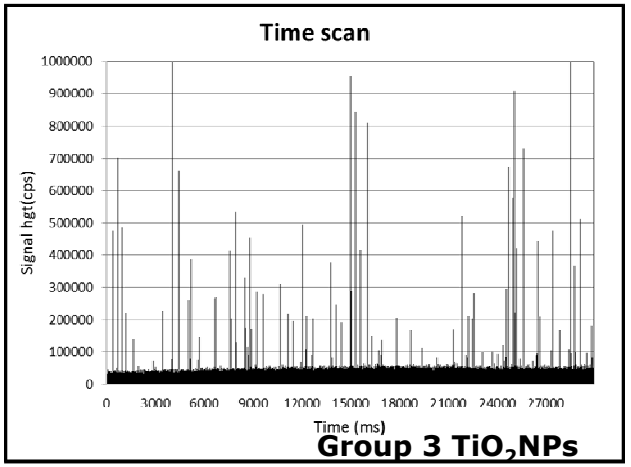
spICP-MS Analysis

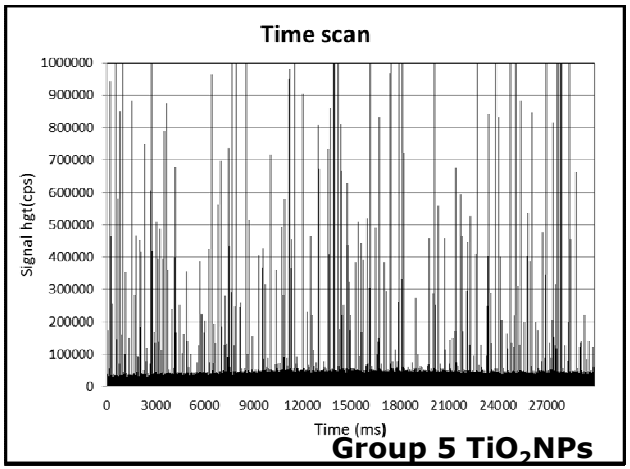
LOQ: 50 µg/kg
LOD size: 40 nm

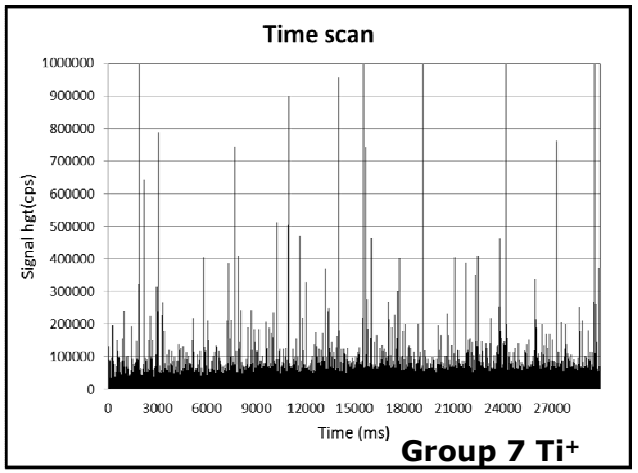
Groups 3-6 cointains TiO_2NPS
..also mussels of group 7 contains NPs (*in vivo* formation?)..

spICP-MS Analysis









TEM-EDX Analysis

Qualitative confirmation: presence of Ti containing NPs in group 7

Conclusion

- **Mussel can bioaccumulate TiO_2NPs**
- **NPs *in vivo* formation**
- **SpICP-MS as a screening tool for NPs detection in routine analysis**

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