

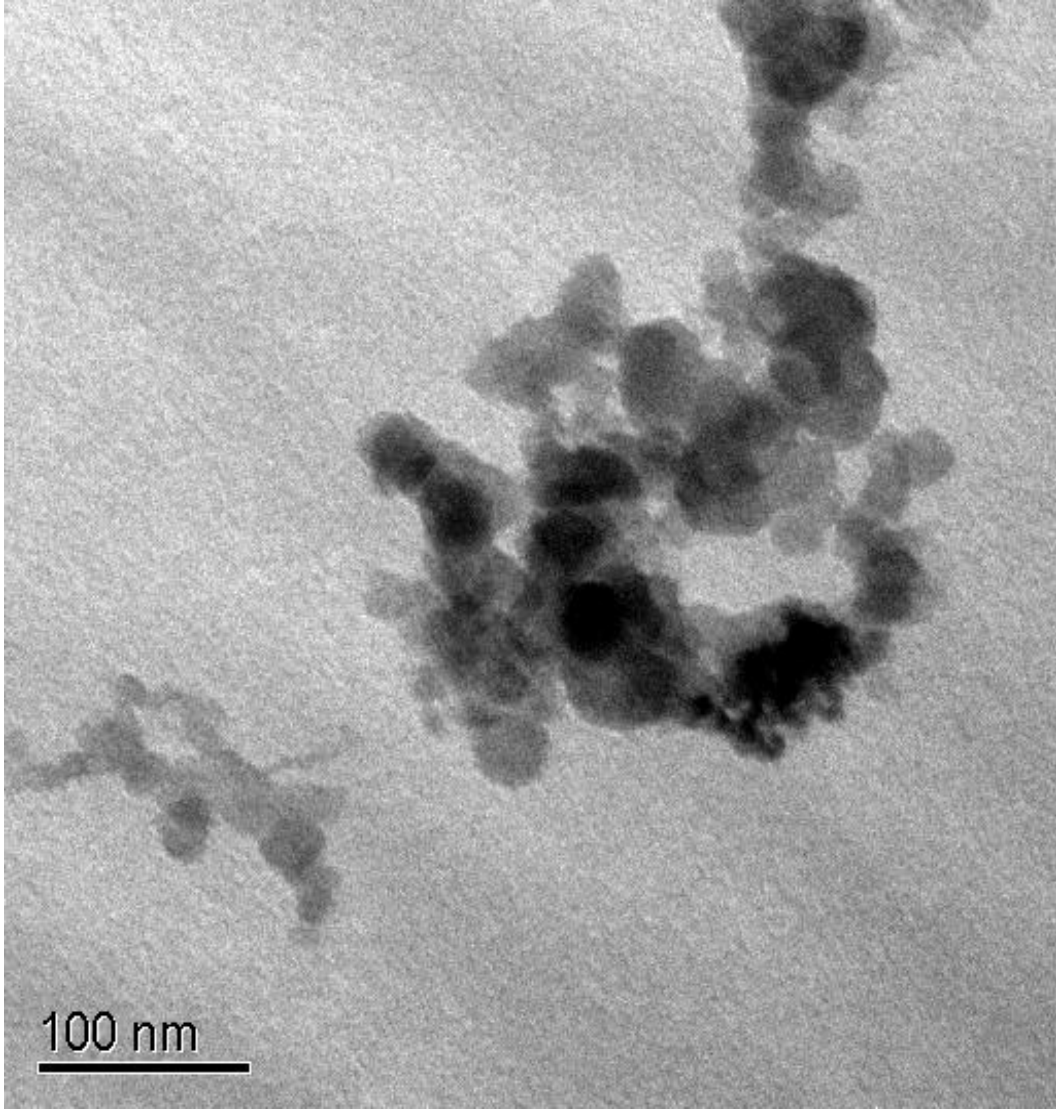
Učinki nanodelcev na biološke sisteme

damjana.drobne@bf.uni-lj.si

Skupina za nanobiologijo in nanotoksikologijo

Oddelek za biologijo, BF

Nanodelci TiO₂



Kje smo?

Toksikologija, Okoljska toksikologija,
Naše delo

Nanotoksikologija

Nanodelci

Nanotoksikologija

Kam gremo?



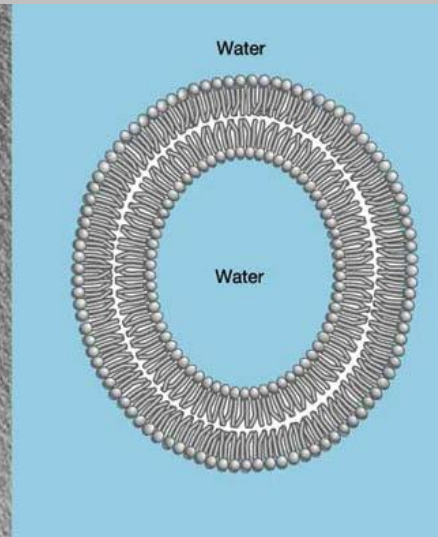
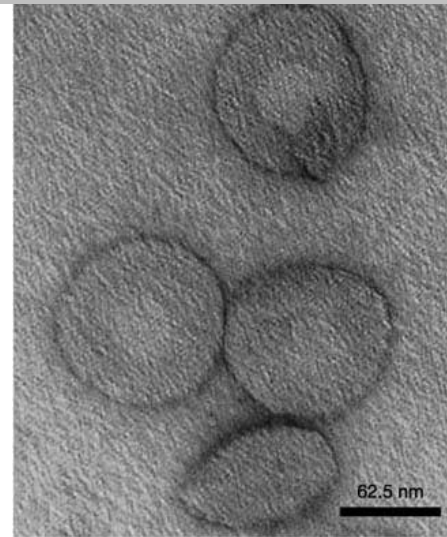
Paracelsus (1493-1541)

Phillippus Aureolus was born in Switzerland, a year after Columbus sailed in 1493. He took the pseudonym of Theophrastus Bombastus von Hohenheim and still later invented the name Paracelsus. Famous for his words "**the dose makes the poison**", Paracelsus was born in Switzerland and studied at the University of Vienna and was one of the first to apply chemicals and minerals into medicines. "All substances are poisons; there is none which is not a poison. The right dose differentiates a poison from a remedy."

In vivo and *in vitro* biological system



A terrestrial isopod, a model invertebrate organism

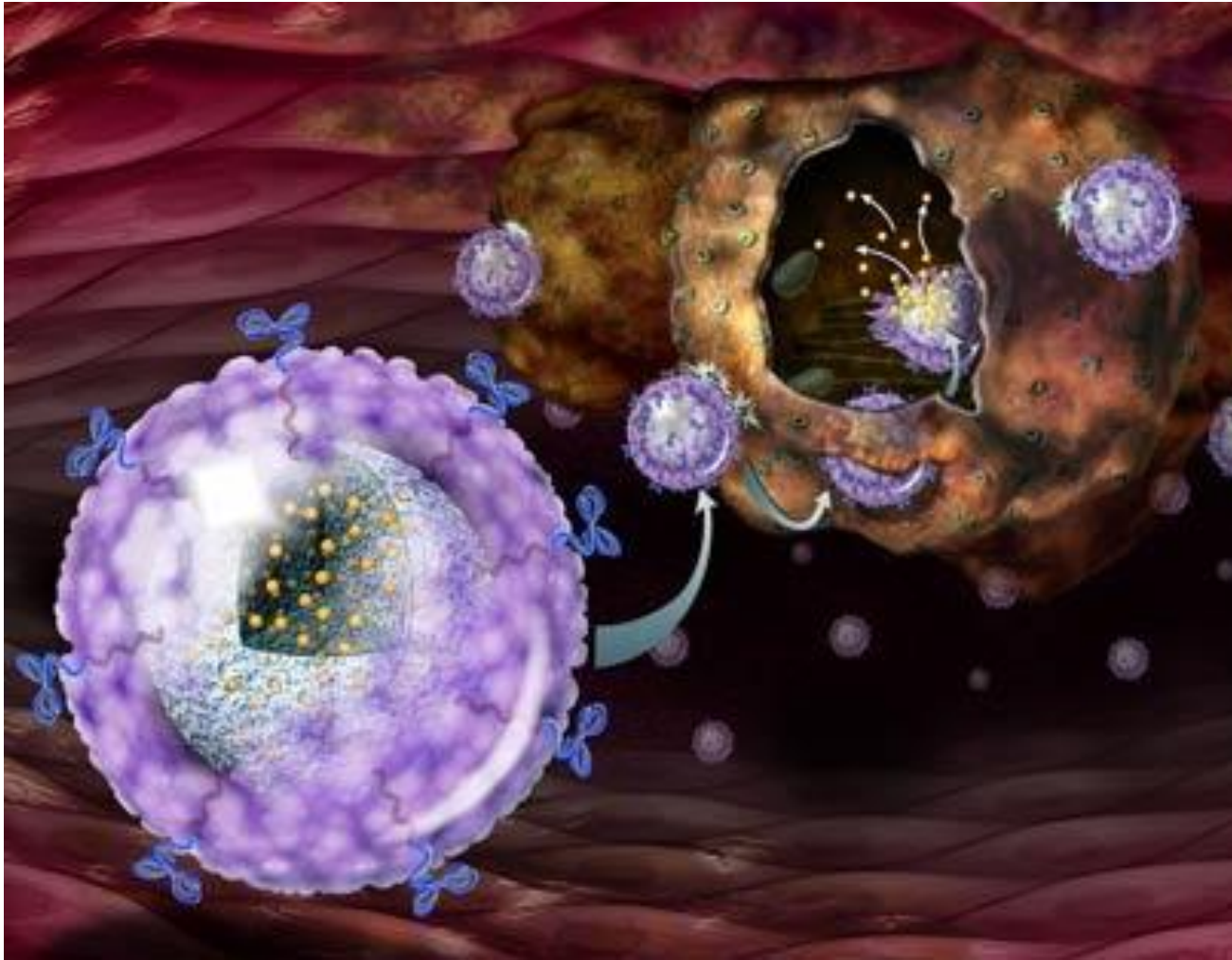


Lipid vesicles

Izkušnje



Trenutni izziv





+

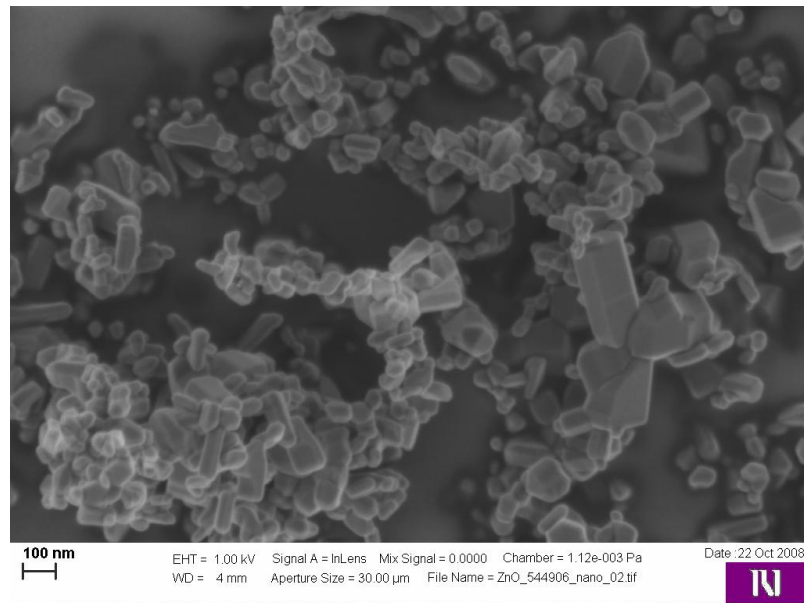
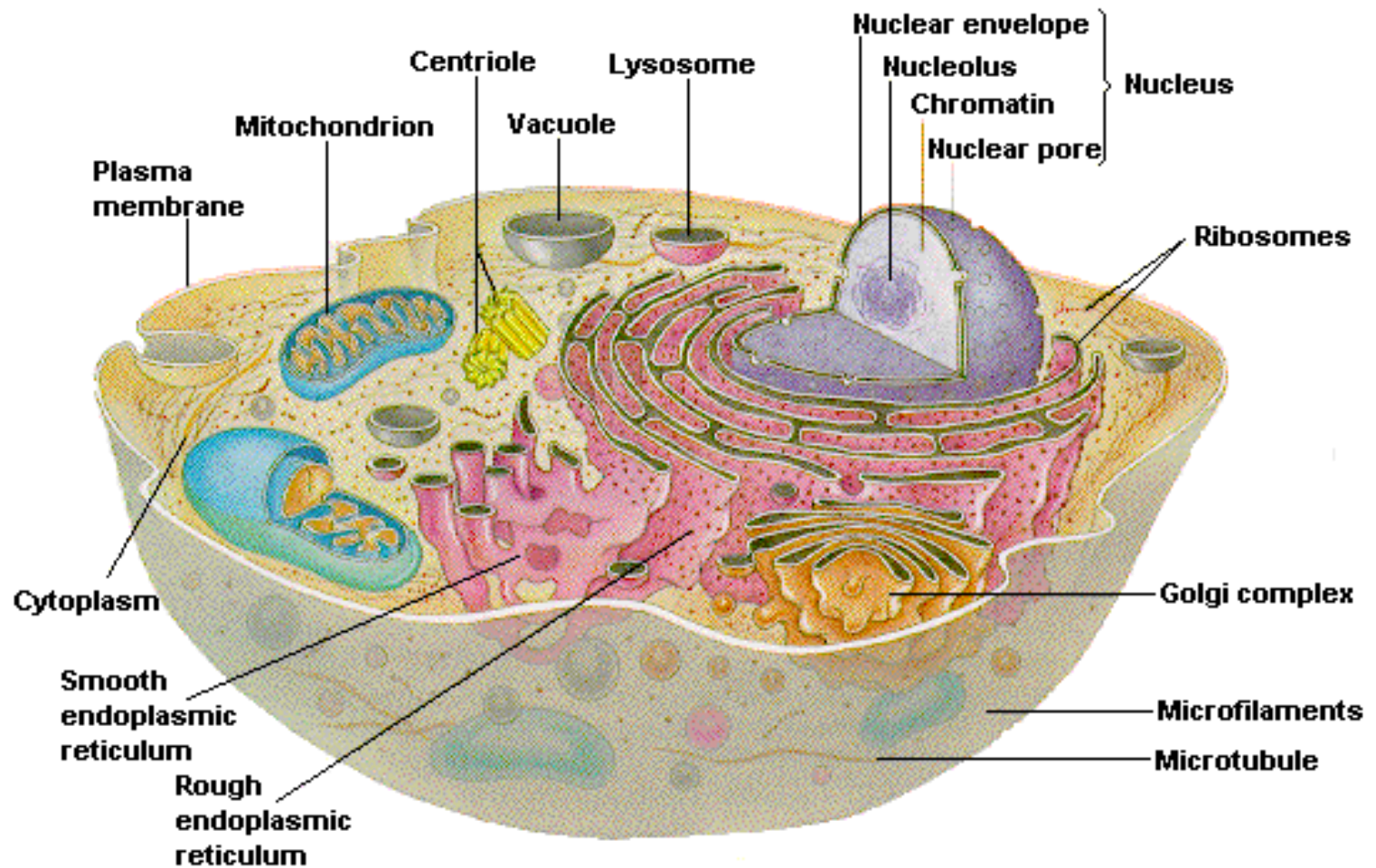


Photo: M. Bele, Institute of chemistry, Ljubljana

.. .biološki potencialnanodelev



Se delci akumulirajo?



?

By L.Ziccardi, M. McArdle, Y. Lowney, J. Tsuji

Experimental set up



+

Four weeks feeding on Nanoparticle,
micropowder or
ZnCl dosed food

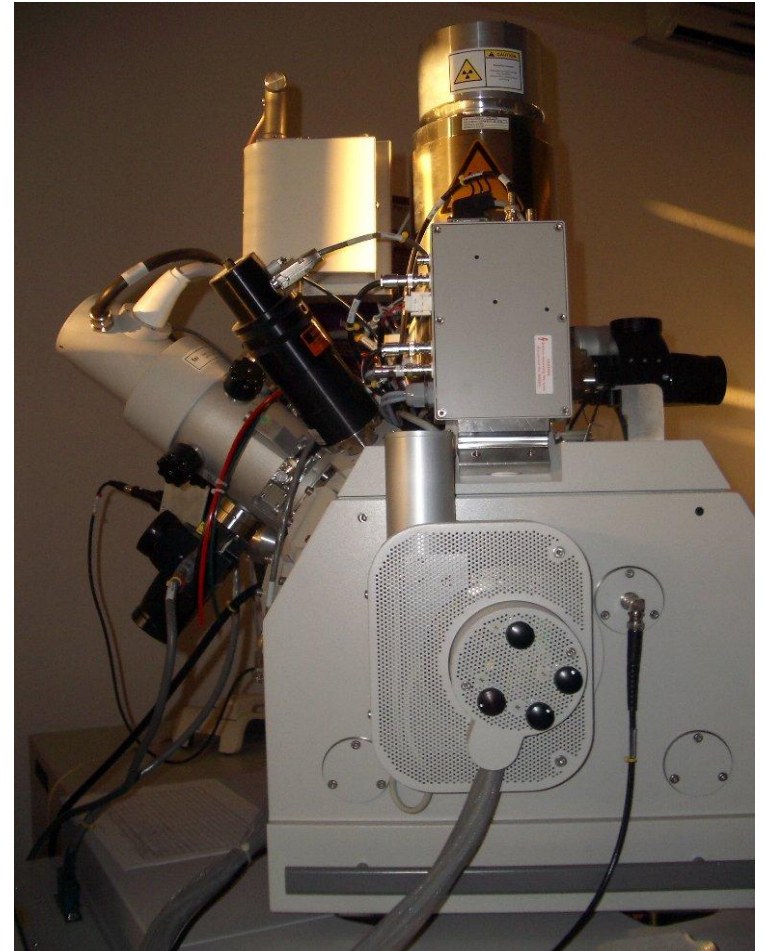


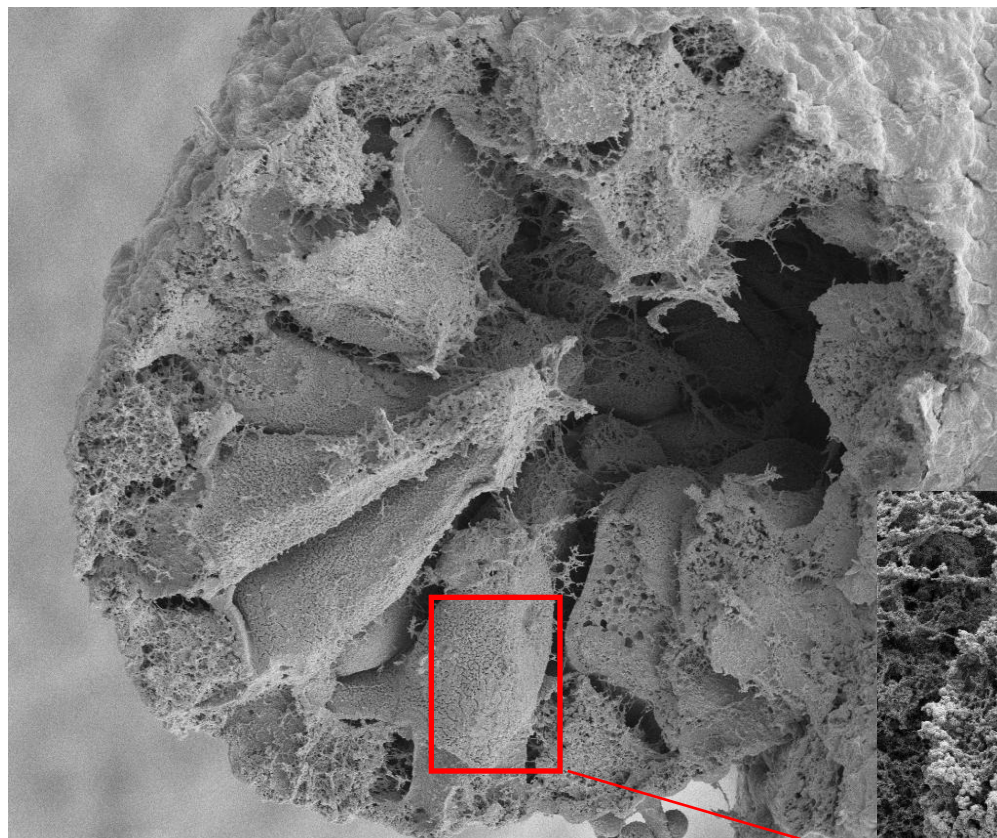
metal analyses in whole organism by AAS



concentrations of Zn in the body

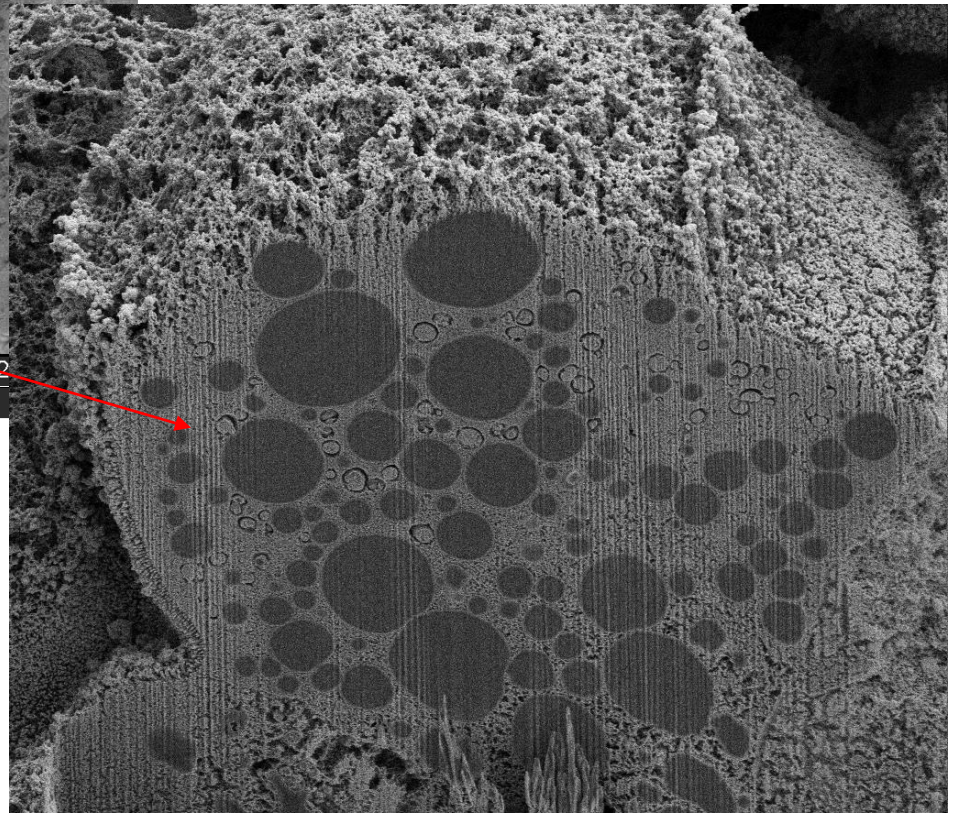
Background knowledge: FIB/SEM,



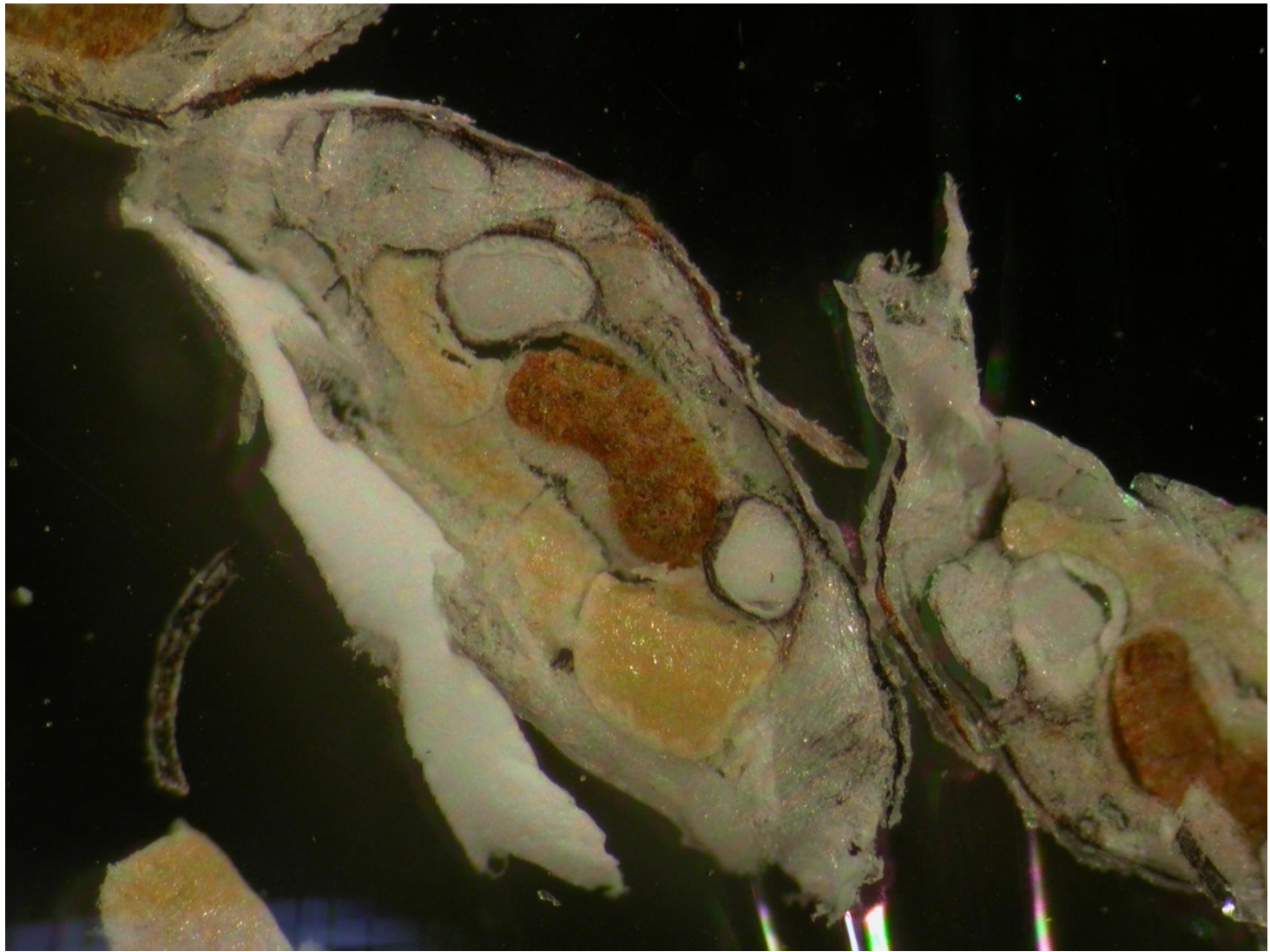


E-Beam	Det	Mag	Tilt	HFW	FWD	Spot	
5.00 kV	SED	2.00 kX	45.0°	152 μm	5.107	2	Ps 526

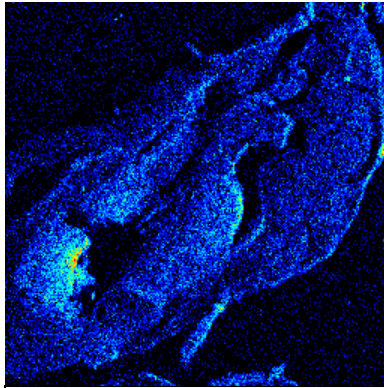
Photo: F.Tatti, FEI



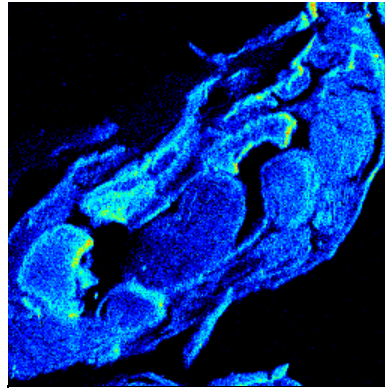
E-Beam	Det	Mag	Tilt	HFW	Spot	FWD	
3.00 kV	SED	5.00 kX	52.0°	60.8 μm	2	5.035	10 μm P.s. #617 OTOTO



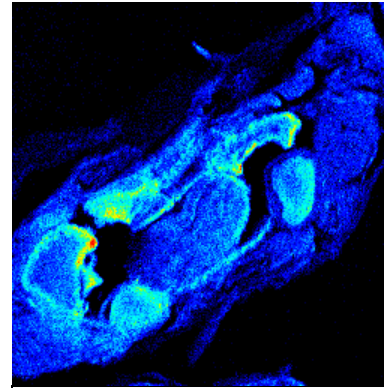
I1 (Ti 1000) 461012



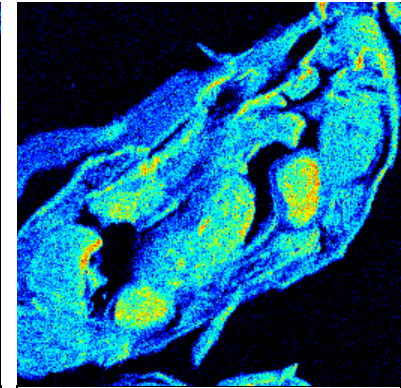
Mg



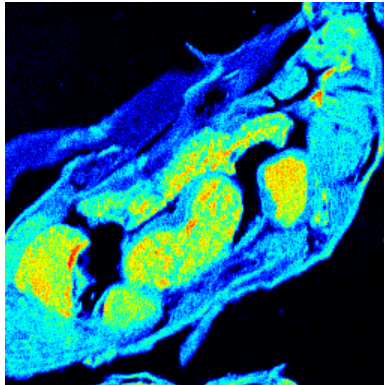
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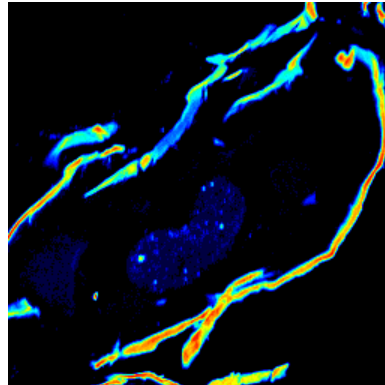
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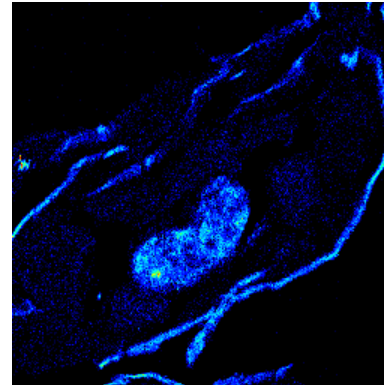
Cl



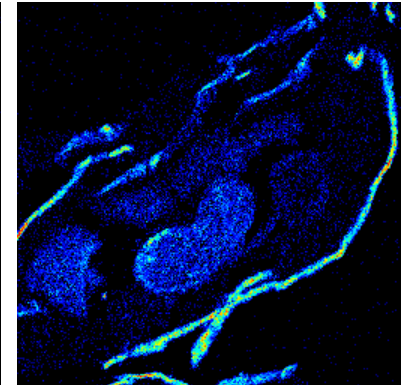
K



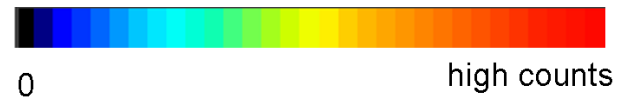
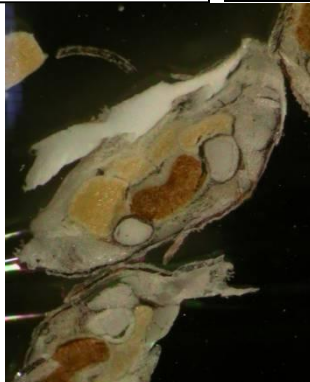
Ca



!! Ti !!

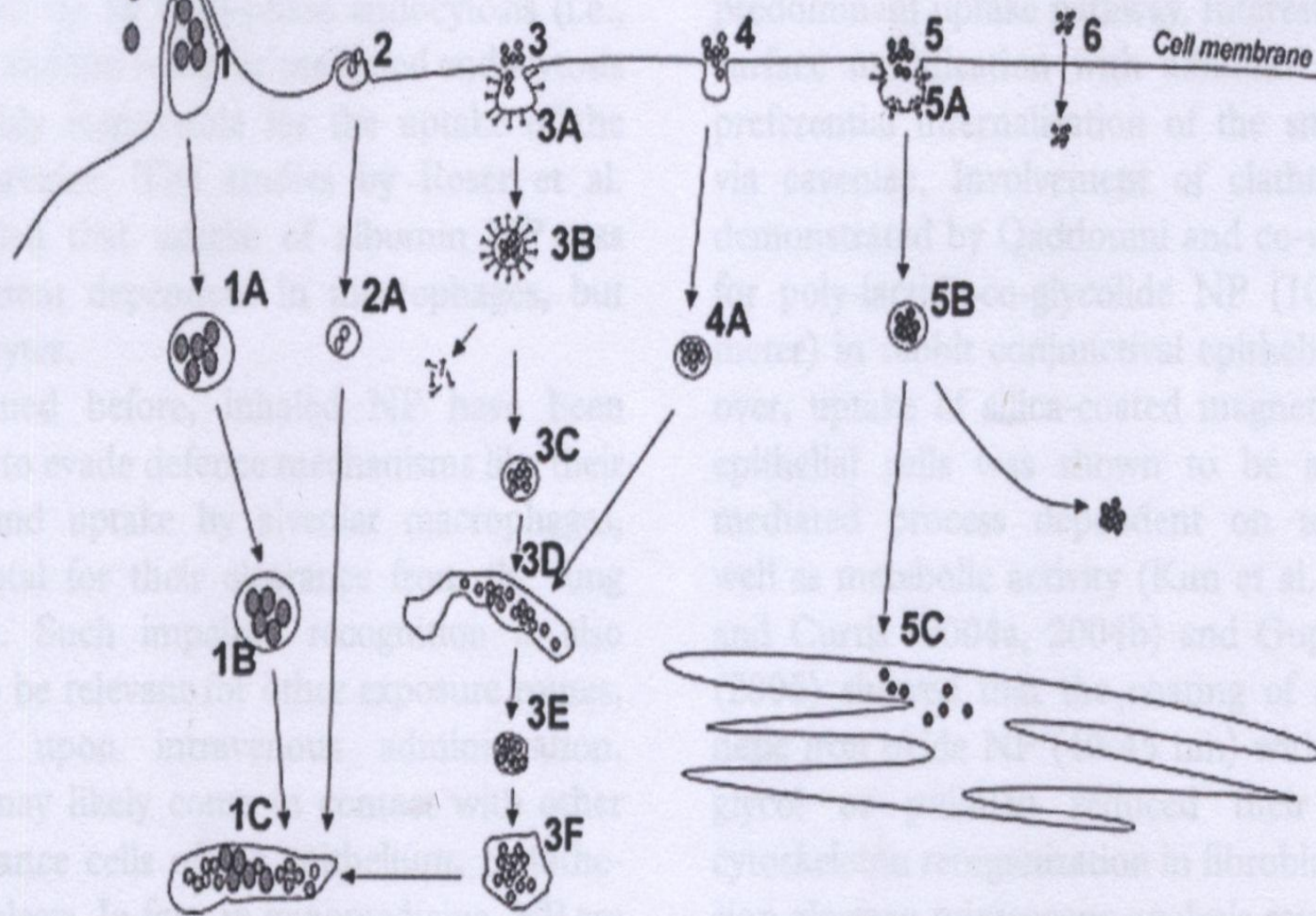


Mn

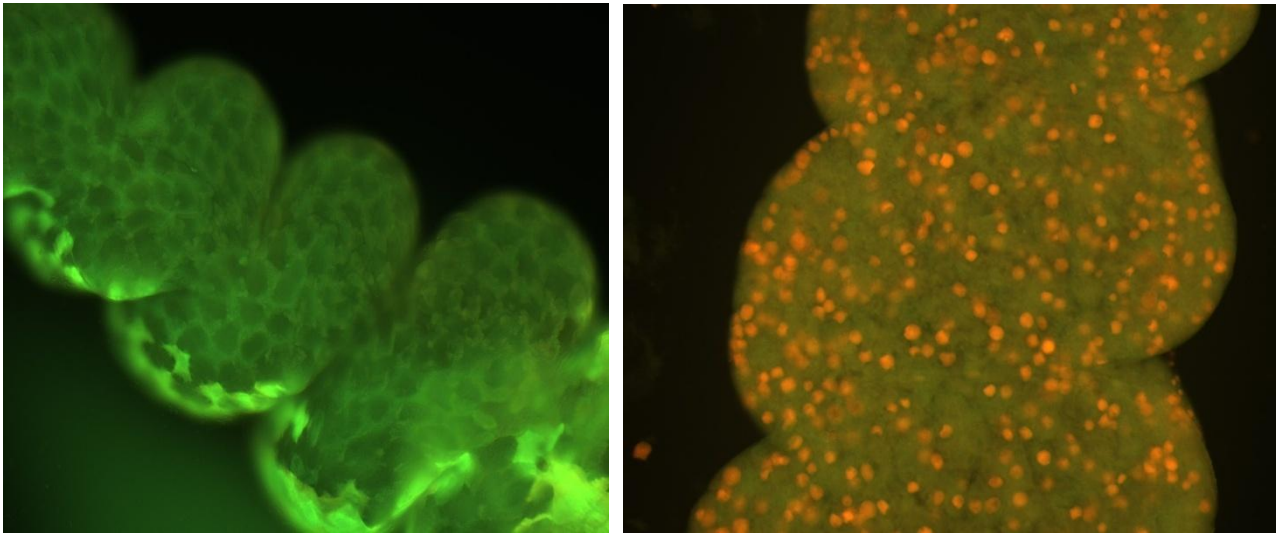


Delci se ne akumulirajo!

Imajo delci učinek?

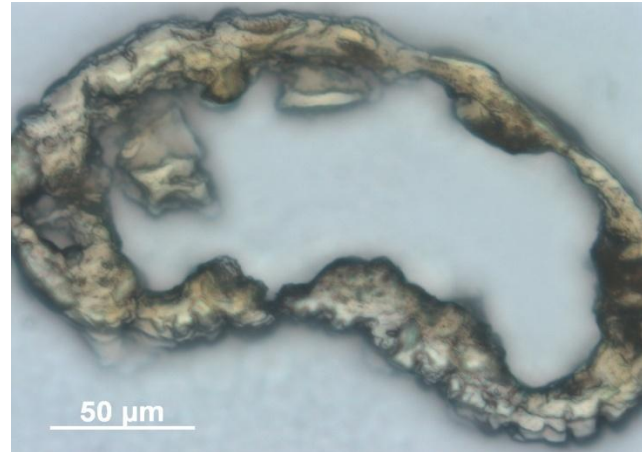
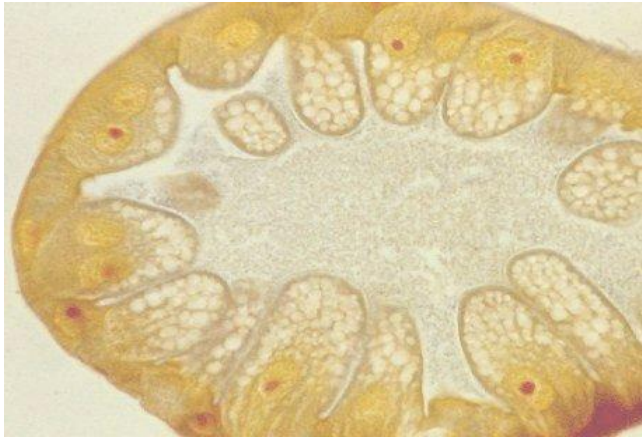


- nanodelci najprej povzročijo destabilizacijo celične membrane šele nato smo zasledili oksidativni stres

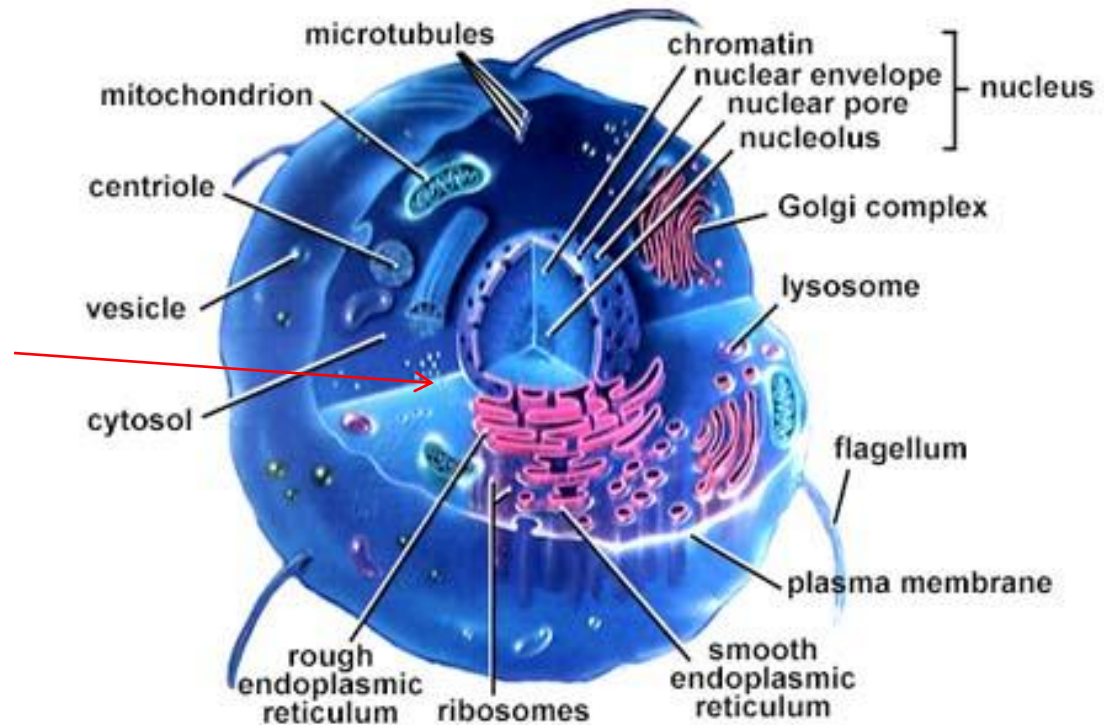
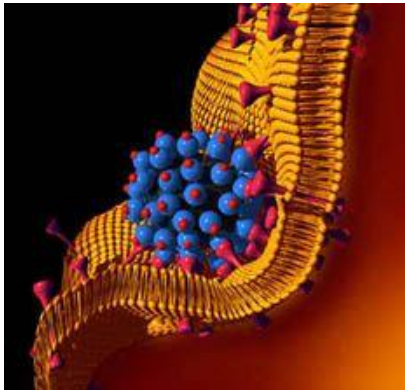


Analiza permeabilnosti celična membrane; AO/EB barvanje

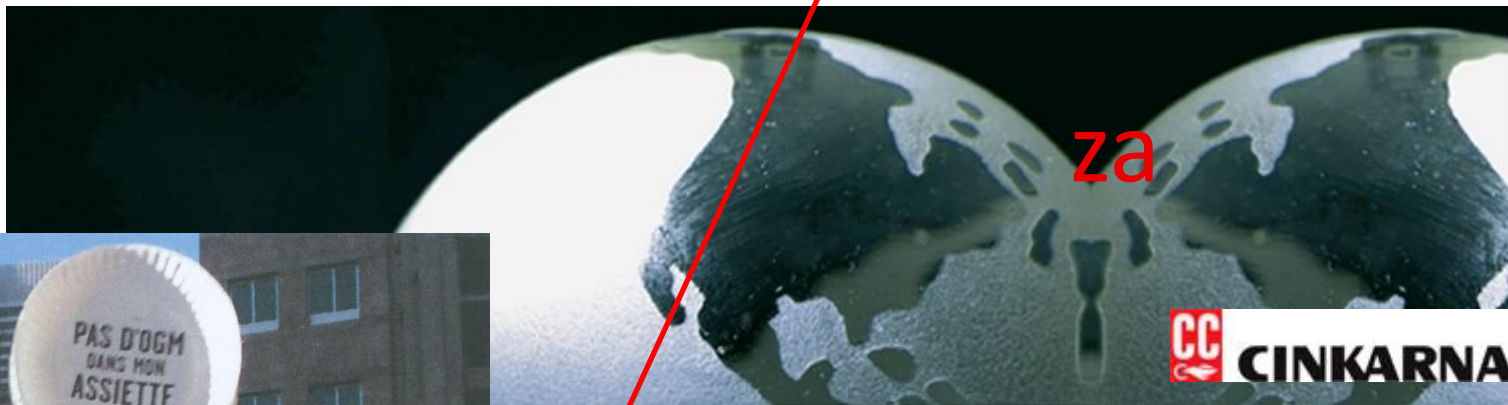
Delci delci imajo učinek na biološke sisteme
!



Poškodbe celic zaradi izpostavitve delcem!



PROBLEM: Kako ugotoviti, katera je varna doza uporabe nanodelcev?
Učinki delcev so popolnoma drugačni kot učinki drugih kemikalij!



proti

Titanov dioksid (TiO_2) v svetu proizvajamo v dveh glavnih komercialnih oblikah. Starejša in količinsko bistvena je proizvodnja pigmenta, medtem ko ultrafina ali **nano oblika** pridobiva na pomenu z razvojem modernih tehnologij.

Edinstveno bel pigment, ki mu kratkoročno in srednjeročno ni moč predvideti nadomestka, se zaradi sposobnosti zaščite materialov pred svetlobnimi in vremenskimi vplivi, izjemne moči posvetlitve in pokrivnih sposobnosti, pojavlja na vseh področjih našega življenja.

Hvala za pozornost!