

Nanoparticle induced pulmonary toxicity

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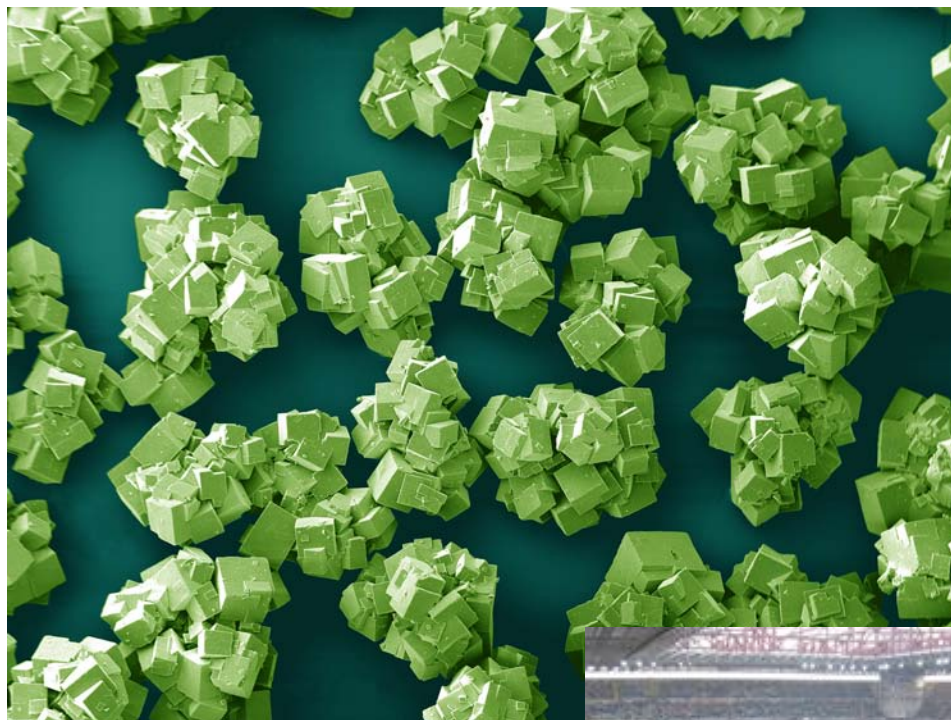
Laboratory for Alternative Methods

Experimental Toxicology and Ecology, BASF SE,
Ludwigshafen, Germany



Nanoparticles

high surface to volume ratio



**"Nanocubes"
store Hydrogen**

BASF BASOCUBE®

4.500 m²/g

(surface of 2 g of Basocube
equals area of a football field)



Nanoparticles at BASF



**Ultramid®
BS 416N**
Fiber
treatment

- UV protection for cloths
- Synthetic fibers
look and feel like cotton



Col.9®
Dispersion

- Paints for buildings
dirt repellent



T lite™
Dispersion

- Sunscreen for cosmetics

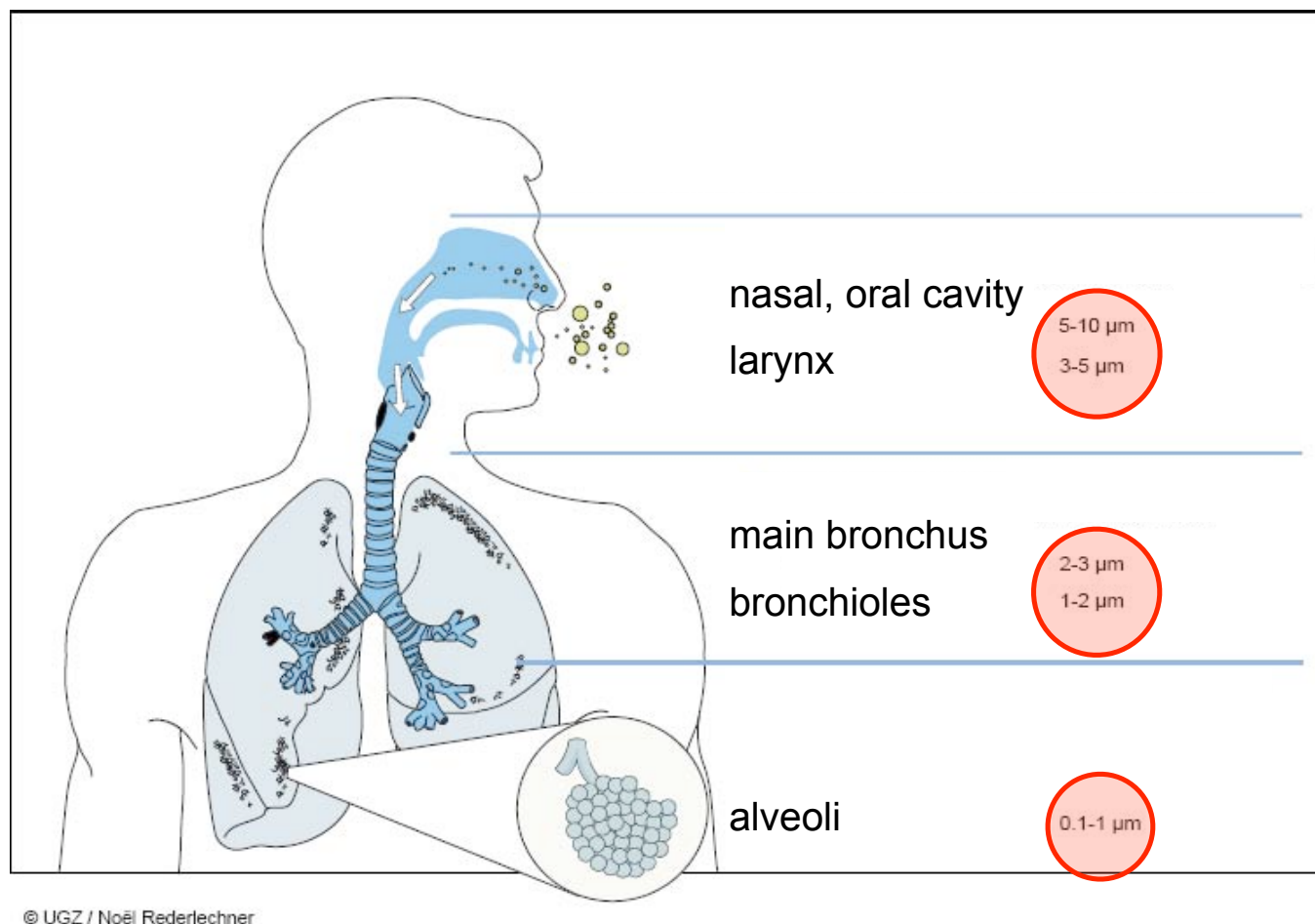


**Ultradur
Highspeed®**
Performance
Polymer

- Polymer for electronic parts
- Smaller and more complex parts



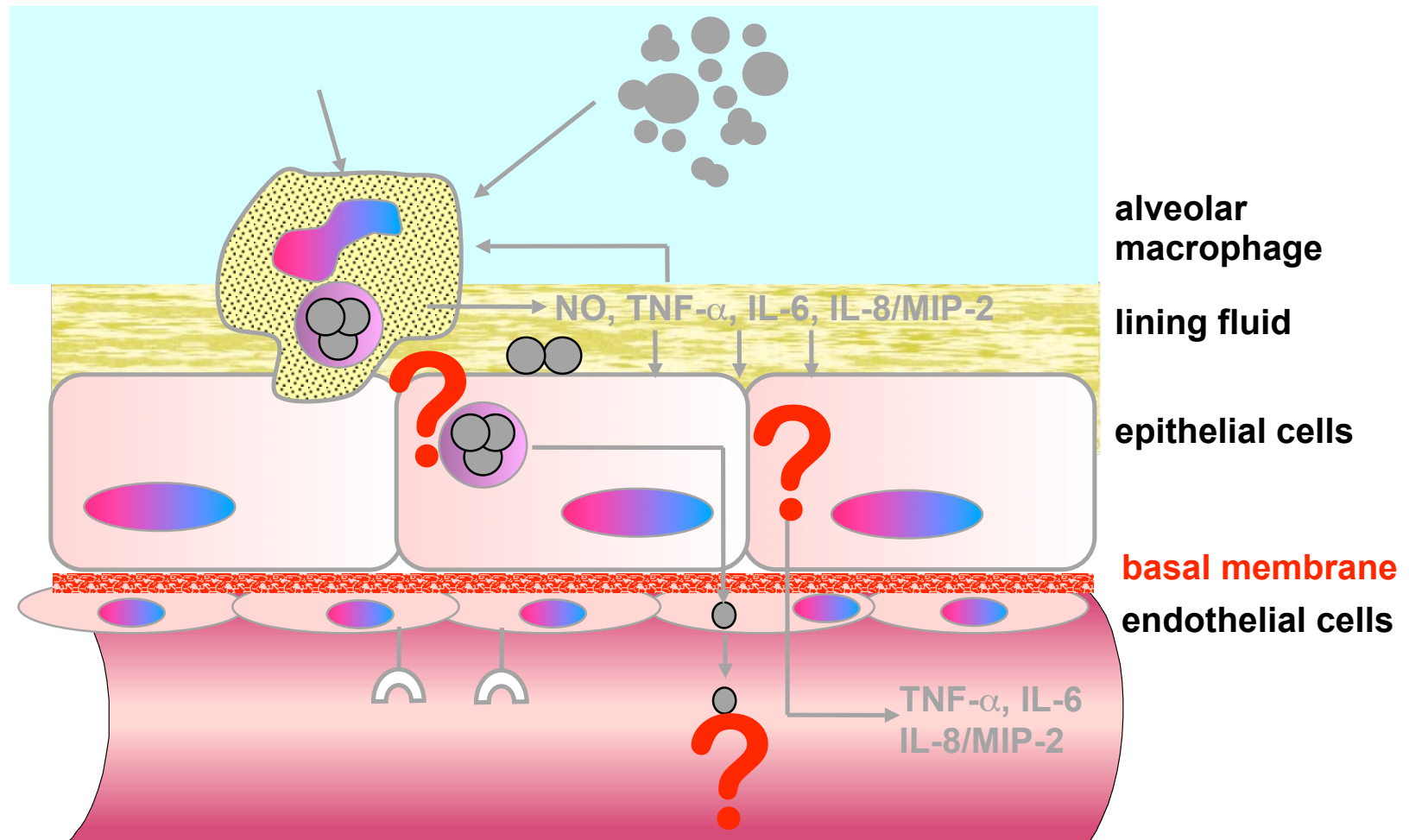
NP Uptake



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[http://www.stadt-zuerich.ch/internet/ugz/home/fachbereiche/luftqualitaet/schadstoffe/feinstaub_pm10/pm10_atemtrakt.html]

Inhalation toxicity



Atmosphere Generation *in vivo* inhalation studies

- Head/Nose only
- Brush-Generator
- Analysis of concentrations
- Particle size measurement
 - e.g., impactor



CellNanoTox at BASF

NP and precision cut lung slices



■ Background

- BASF performs inhalation studies with NPs
 - good *in vivo* database for effects of NP
- currently, no validated *in vitro* model is available to investigate general and specific aspects of lung toxicity

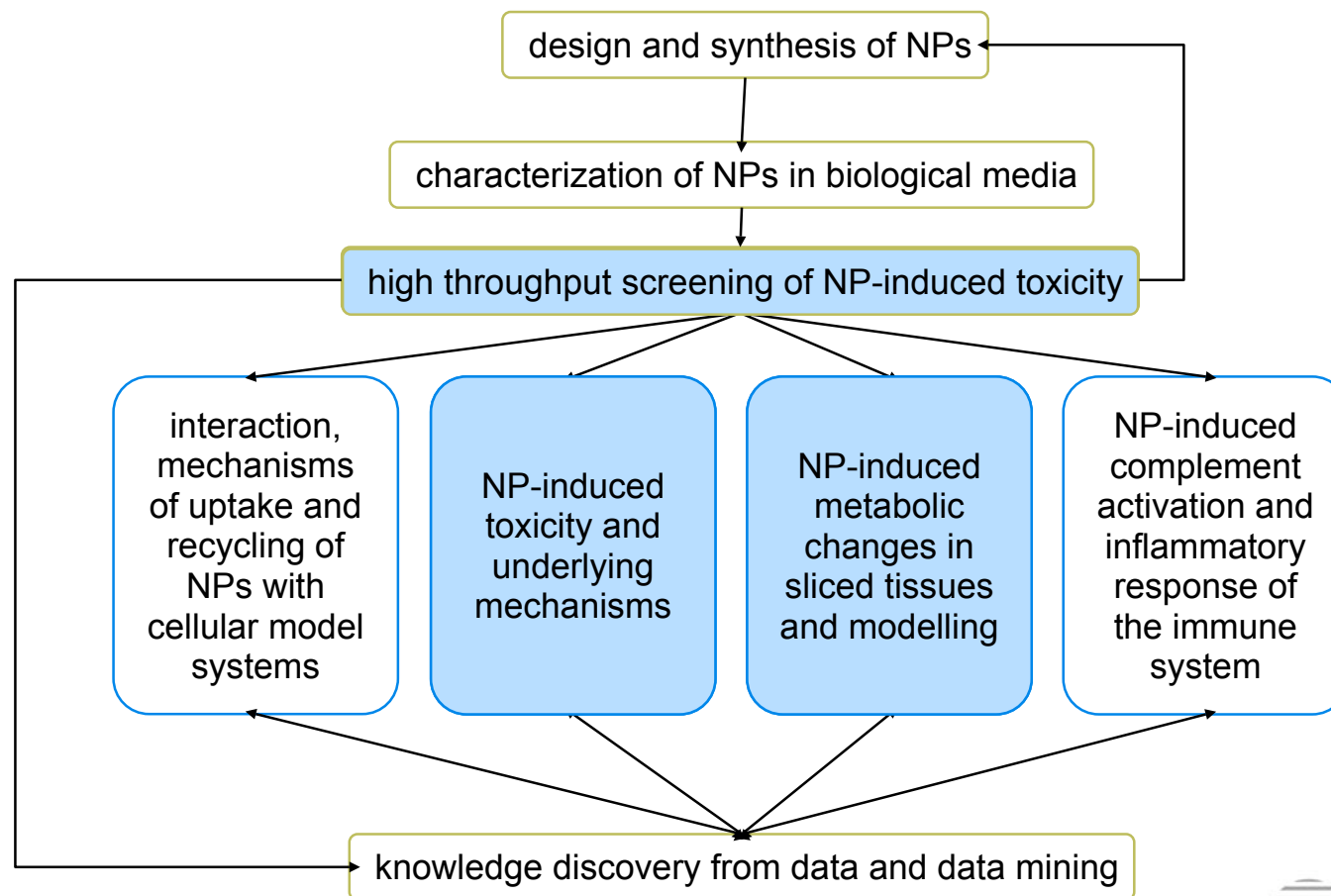
■ Objective

develop, establish, and validate precision cut lung slices as an *in vitro* model or alternative method for lung toxicity of NP

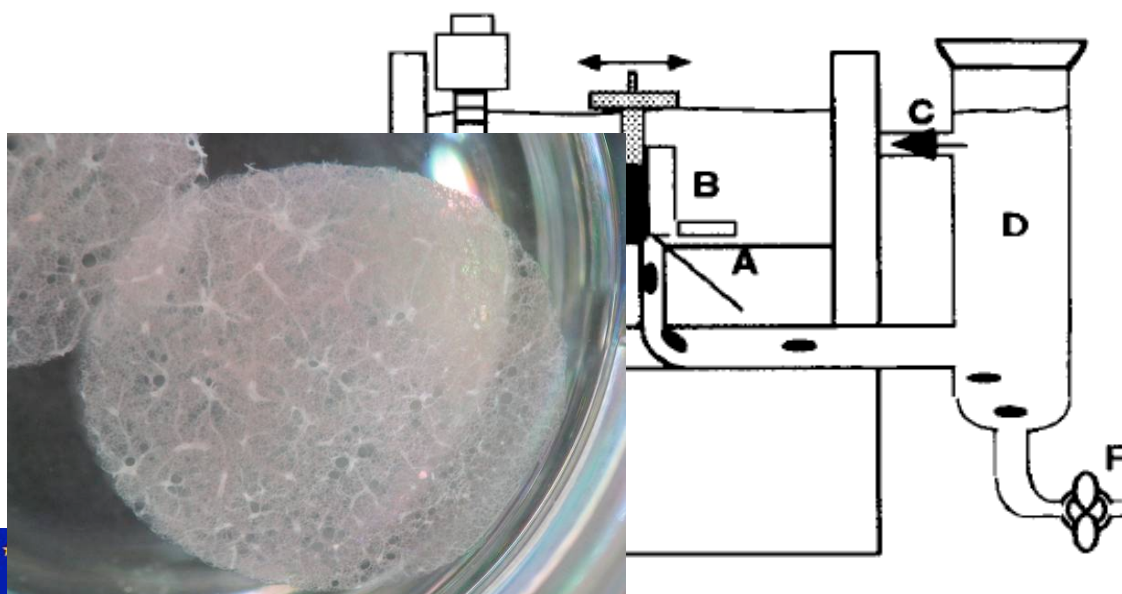
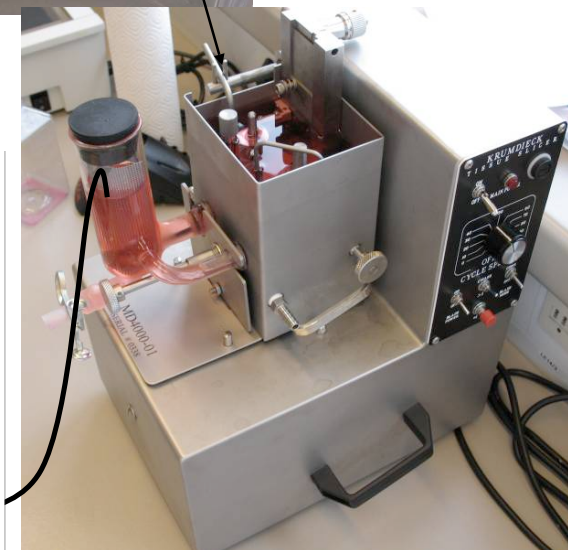
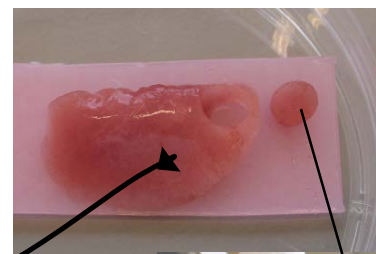
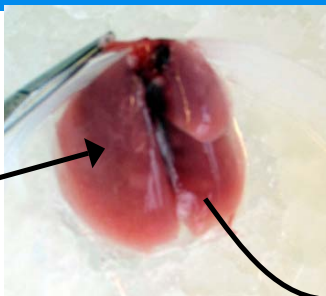
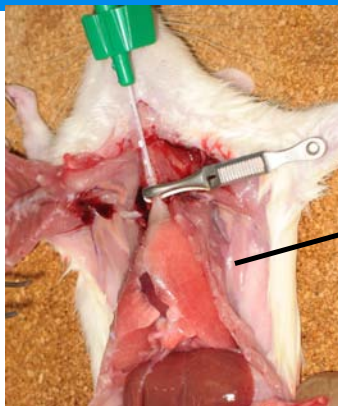


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research activities



Precision Cut Lung Slices (PCLS) preparation

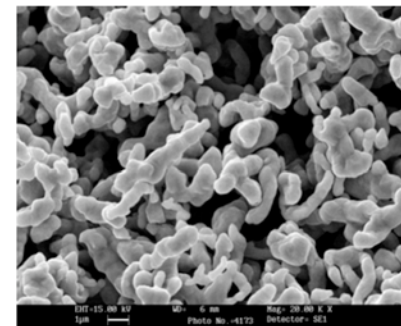
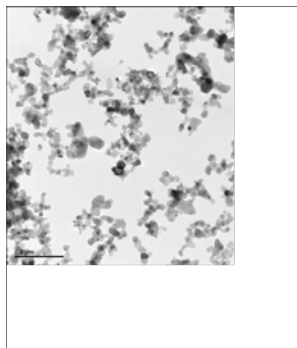


[Parrish et al. 1995]

Precision Cut Lung Slices (PCLS)

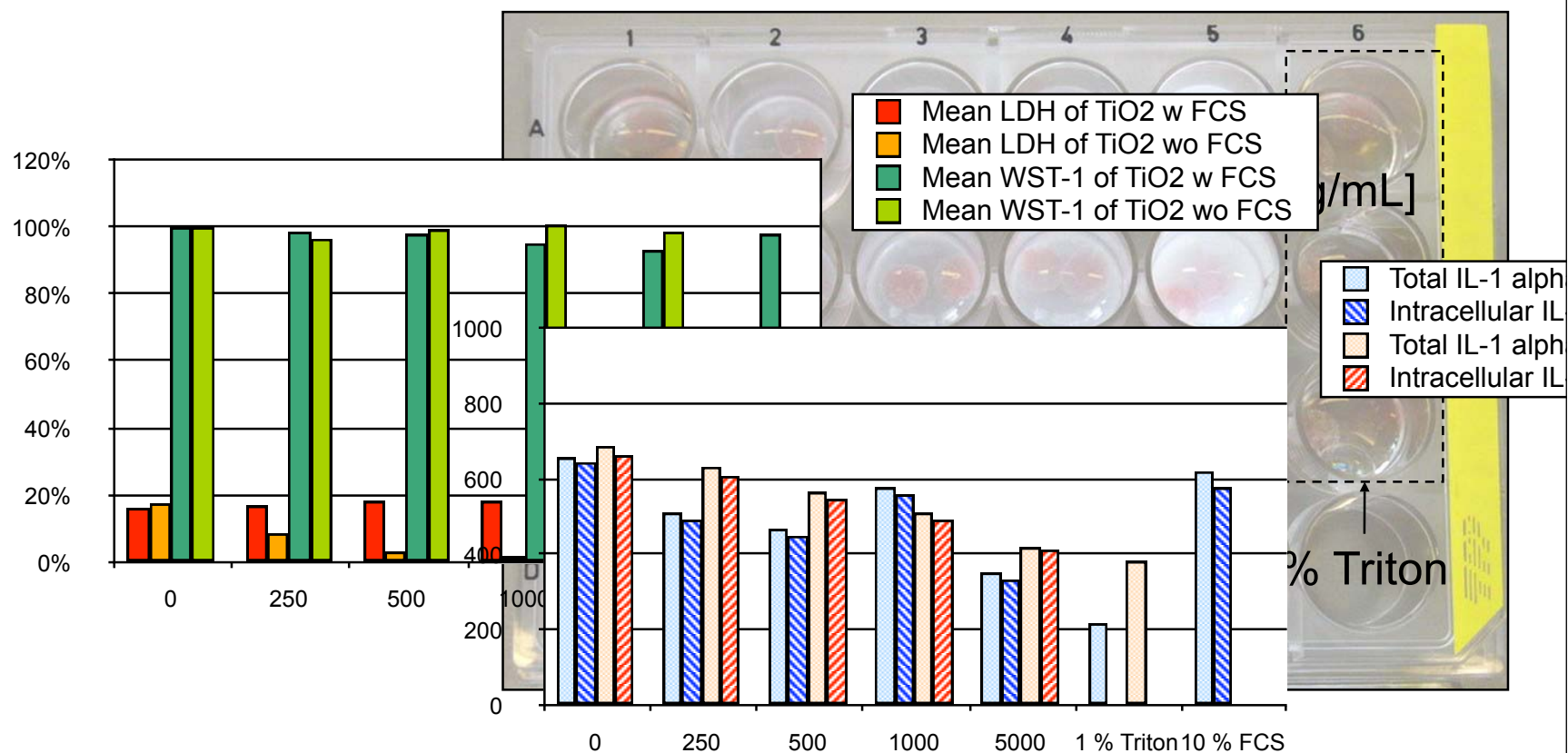
exposure to (NP) test substances

- 24 h exposure of PCLS to different concentration of NP
 - with and without protein stabilization
- assessment of
 - mitochondrial metabolic activity (WST-1 assay)
 - membrane integrity (LDH assay)
 - total protein content (BCA assay)
 - IL1 α production (ELISA)



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results TiO₂



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summary of results



Material (size)	Membrane integrity	Mitochondrial activity	Intracellular protein content	Intrinsic IL1alpha
TiO ₂ w/o FCS	no effect	no effect	no effect	↓
TiO ₂ w/ FCS (~ 36 nm)	no effect	no effect	no effect	↓
Co NP (200 – 950 nm)	no effect	↓ (1 mM)	no effect	↓
CoCl ₂	no effect	↓ (1 mM)	not determined	not determined
CoFe P601 NP w/ BSA (~ 14 nm)	↓ (1 mM)	↓ (0.8 mM)	↓ (0.8 mM)	↓
CoFe P601 NP w/o BSA	no effect	↓ (0.8 mM)	↓ (0.8 mM)	↓
CoFe 703 NP w/ BSA (~ 26 nm)	↓ (5 mM)	↓ (2.5 mM)	↓ (2.5 mM)	↓
CoFe 703 NP w/o BSA	no effect	↓ (2.5 mM)	↓ (2.5 mM)	↓

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