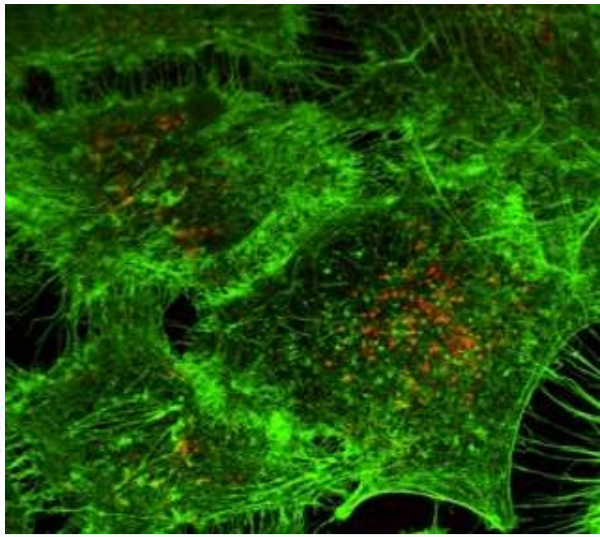
Hier steckt Nano drin | für intelligente Lösungen im Alltag.



Nanopartikel in Wechselwirkung mit Zellen: Von der Anwendung bis zur Sicherheit“

Dr. Annette Kraegeloh

Nano Zell Interaktionen

www.inm-gmbh.de

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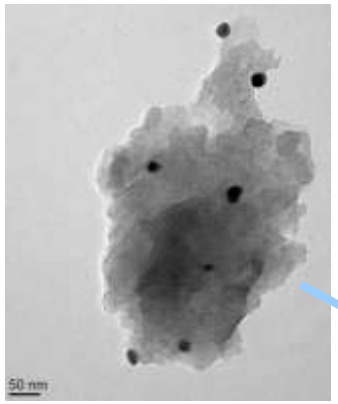
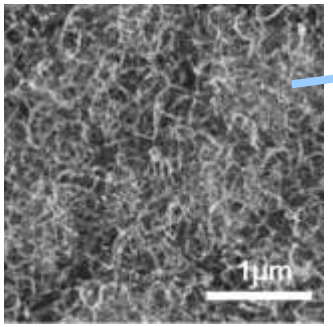
Was sind Nanomaterialien?

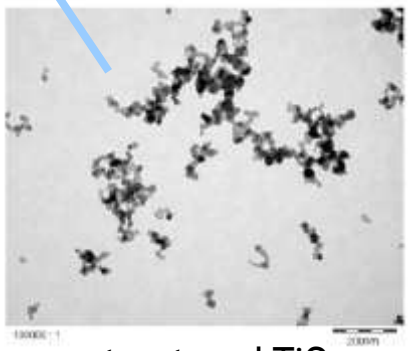


Ag nanoparticles [INM]

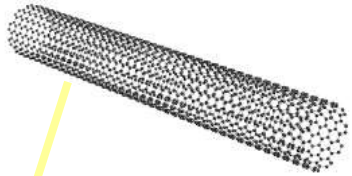


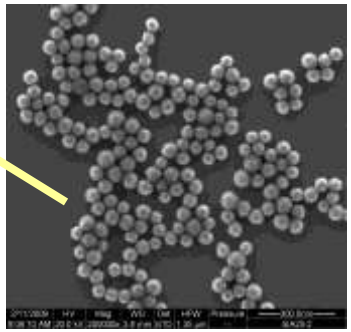
oxidic nanostructures [INM]

- Nanomaterials
  - Nanostructured Materials
    - Nanocomposites
    - Nanostructured Surfaces
    - Assembled Nanomaterials
  - Nano-objects
    - Nanoplates
    - Nanofibres
    - Nanoparticles


nanostructured TiO_2

Carbon Nanotube, scheme

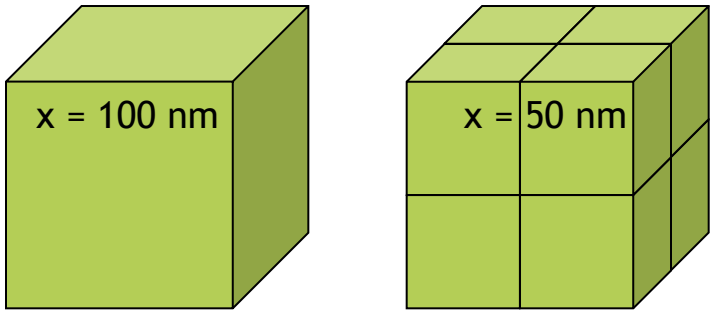



SiO_2 Nanoparticles [INM]

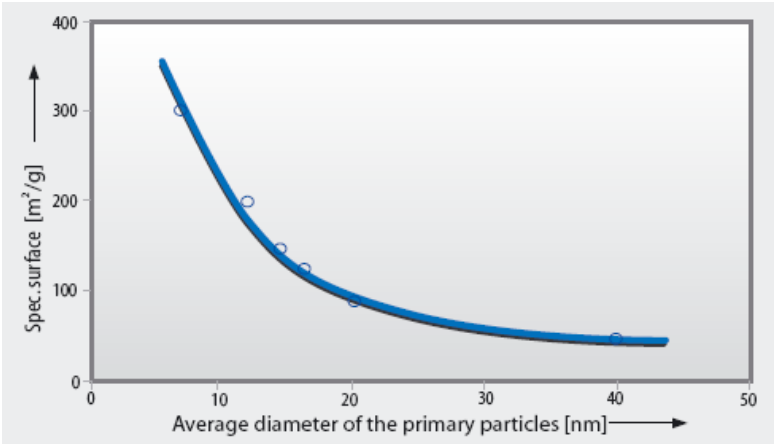
[DIN CEN ISO/TS 27687; nano.DE-Report 2009; Nanorep. Royal Soc., 2004; NanoCare Report, 2009]

Besondere Eigenschaften von Nanoobjekten

High Surface to Volume Ratio



O = 3,6 10^5 nm^2
V = 1 10^6 nm^3

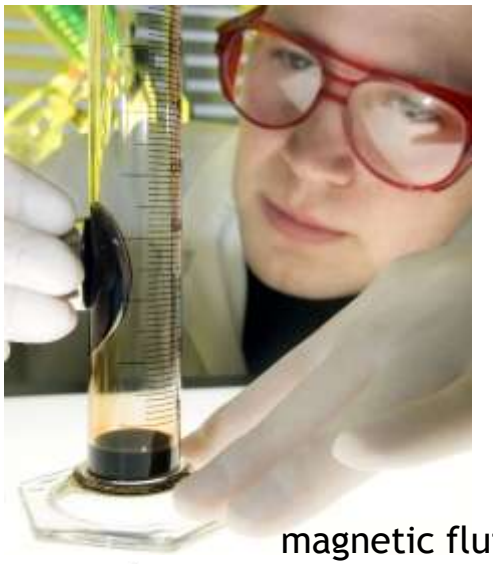


[Techn. Bull. Fine Part.]

Luminescence

CdSe Quantum Dots [Niemeyer, 2005]

Superparamagnetism



magnetic fluid [INM]

Anwendungen in der Pharmazie und den Lebenswissenschaften

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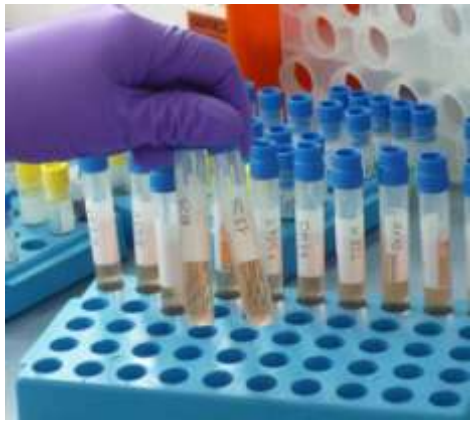
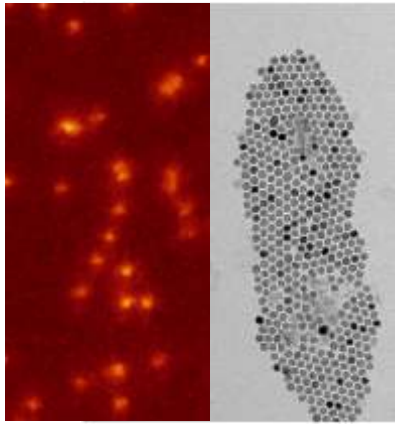
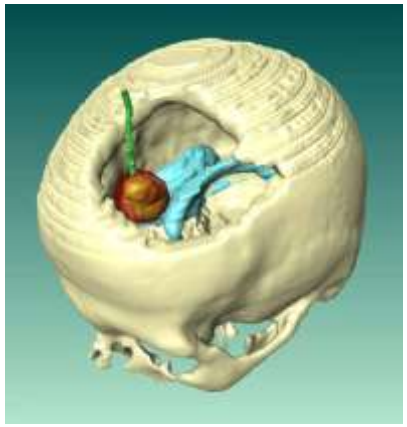
Diagnostik/Separation



Bildgebung/Markierung

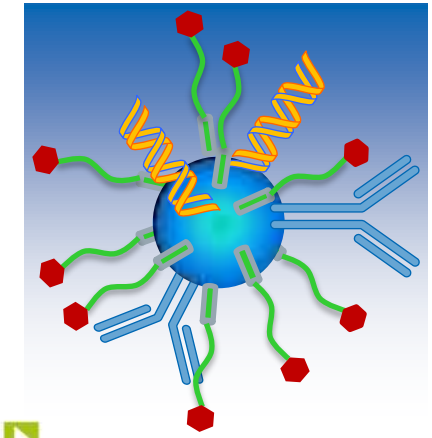


Tumortherapie



[Maier-Hauff et al., 2006]

Wirkstoff-/Gentransfer



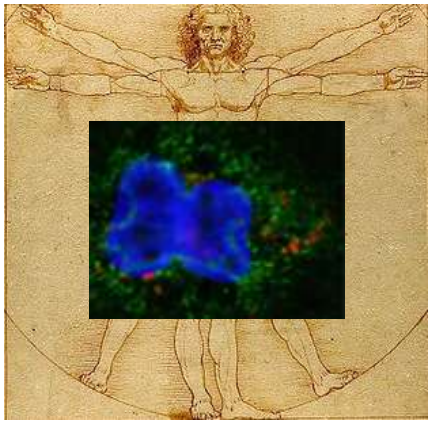
Sicherheitsmerkmale

Hygienische Materialien

Nano-Sicherheit

Produktion und Verarbeitung

Anwendung von Produkten



Biomedizin

Gefährdungspotenzial?

Exposition?

Risiko?

Freisetzung/Umwelt

[GDCh-Nachrichten, 2010; Maynard, 2006; INM; Staudt, 2008]

Eintrittswege von Nanoobjekten in den menschlichen Körper

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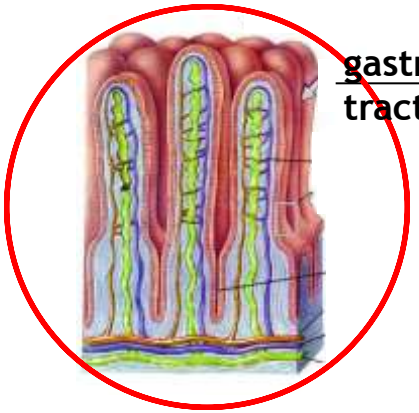
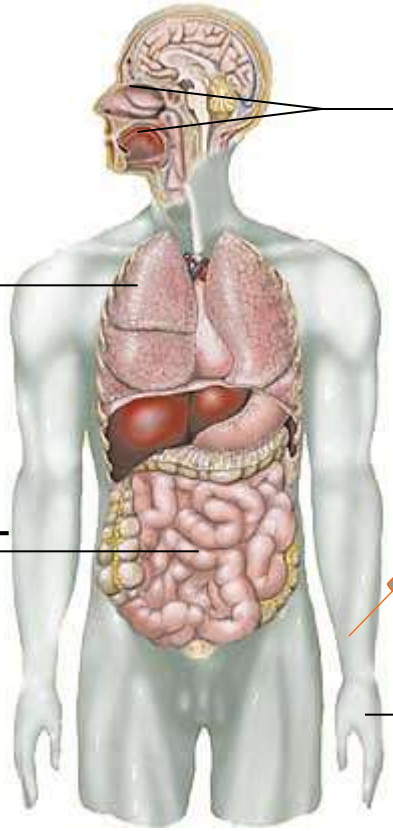
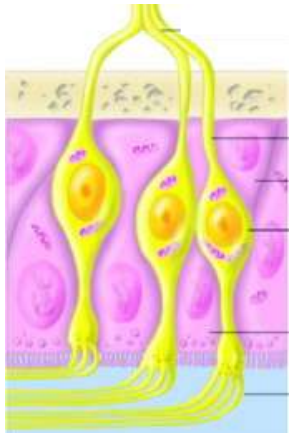
lung (~100 m^2)



gastro-intestinal-tract (~200 m^2)



mucous membranes

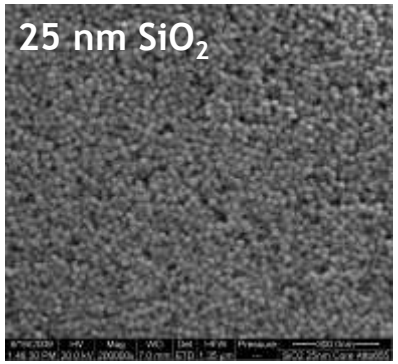


Injection (blood circulation or brain)

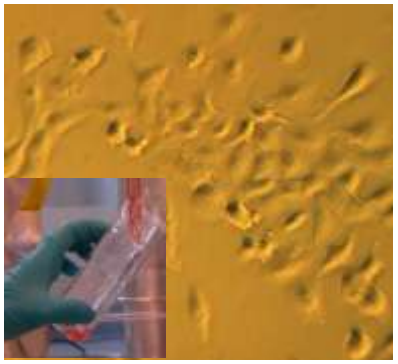
skin (~2 m^2)

[Oberdörster *et al.*, 2005]

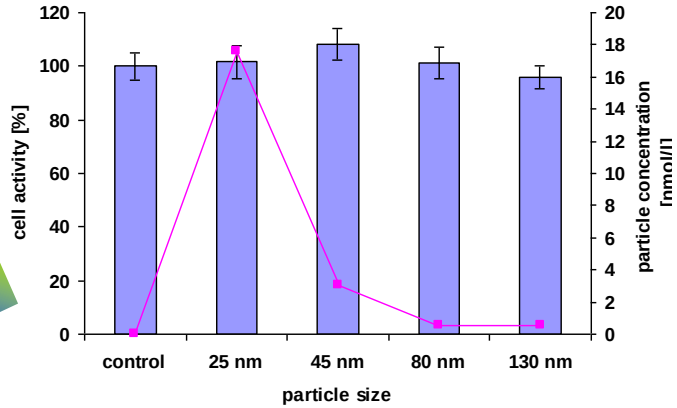
Nano Zell Interaktionen



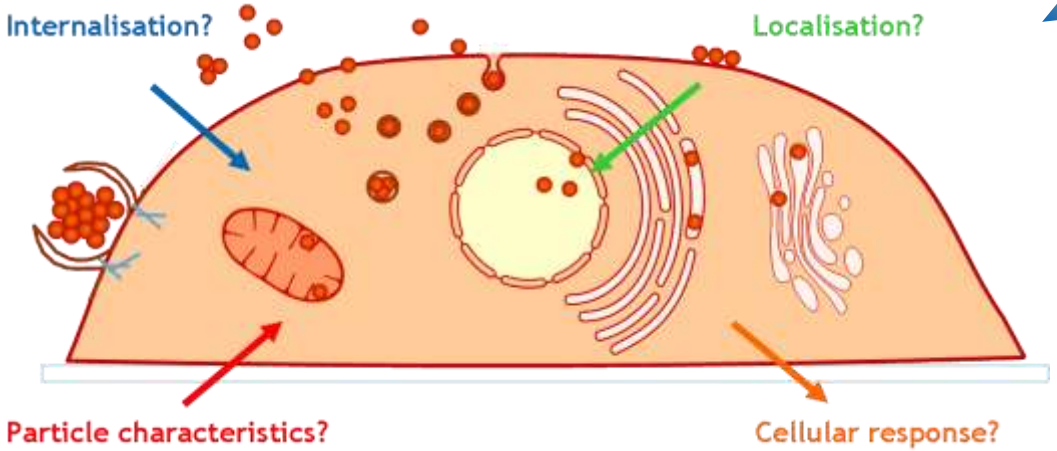
nanoparticle synthesis and characterization

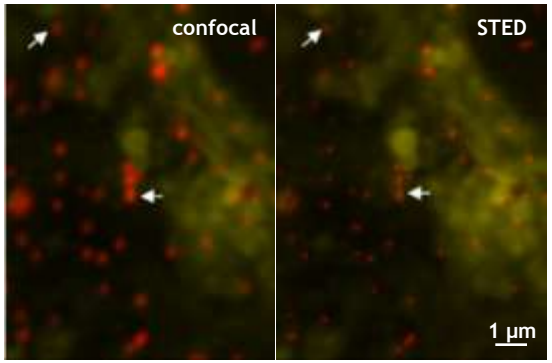


cultivation of cells and exposition to nanoparticles



determination of the cellular response





microscopical analysis, localization of particles

Nanopartikel Systeme

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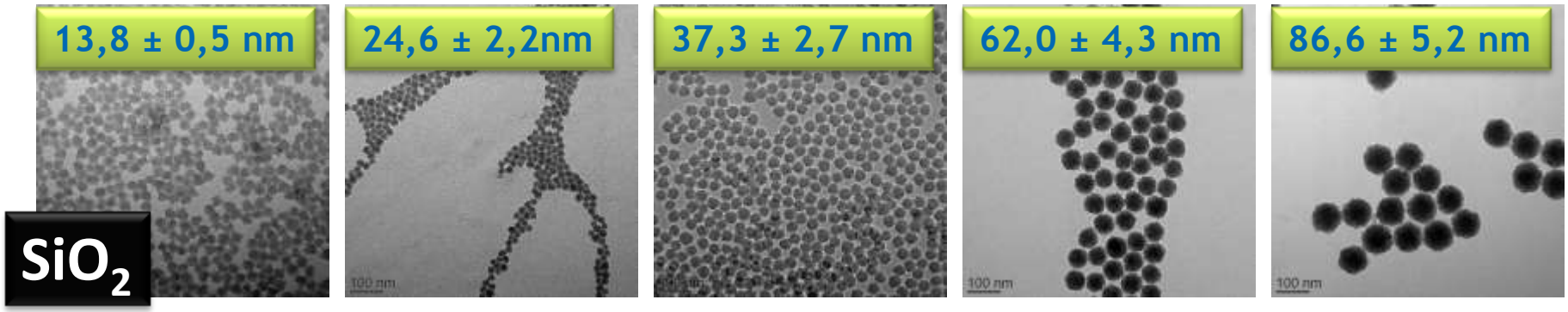
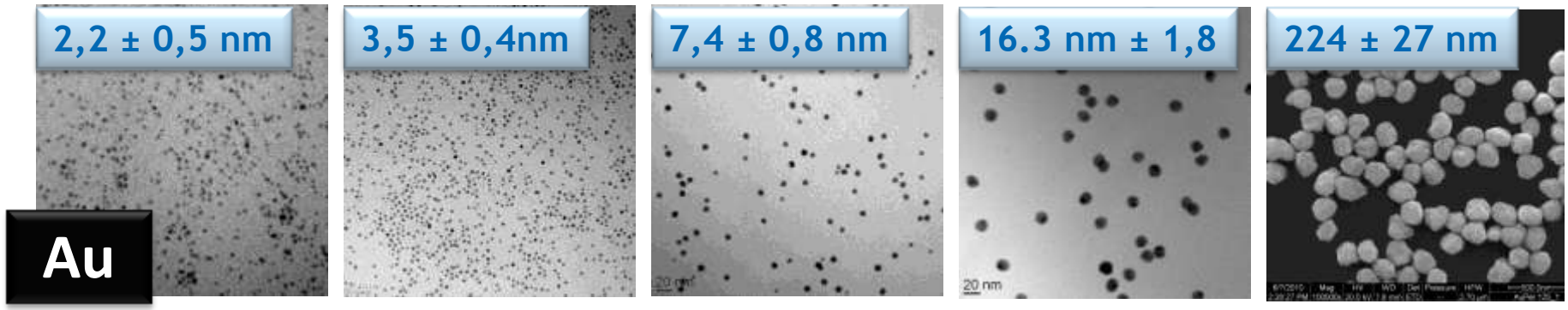


SiO_2

Size



Au

[Cavelius, submitted]

Verbesserung der lateralen Auflösung durch STED-Mikroskopie

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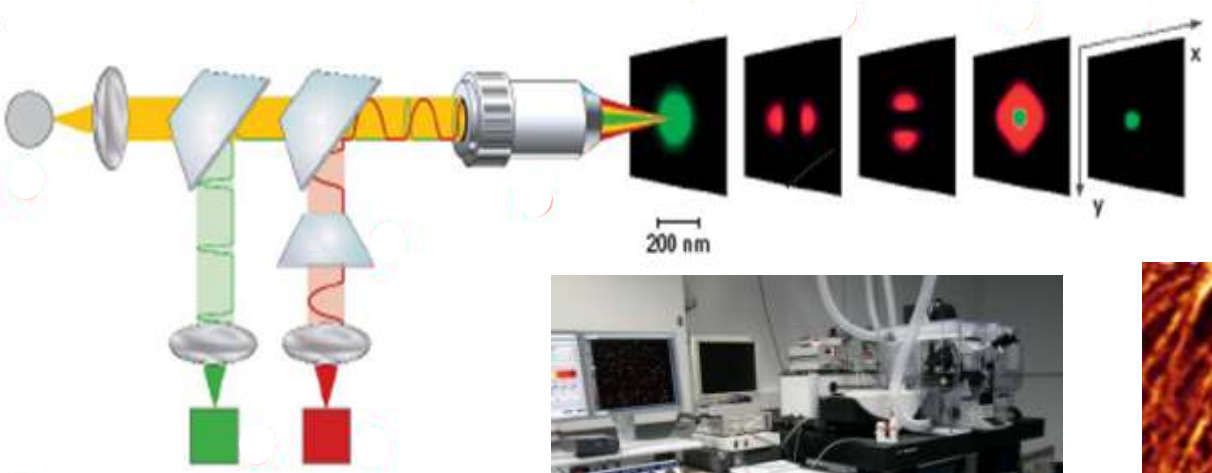
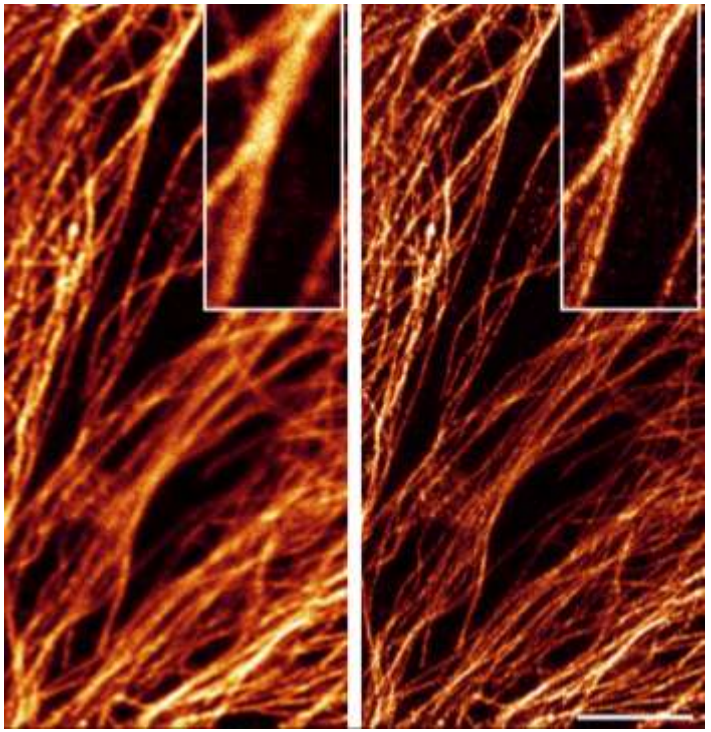
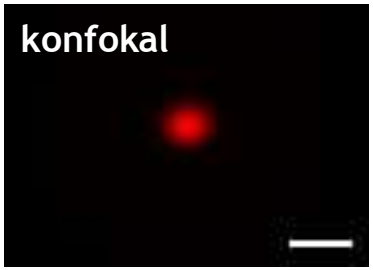


konfokal STED

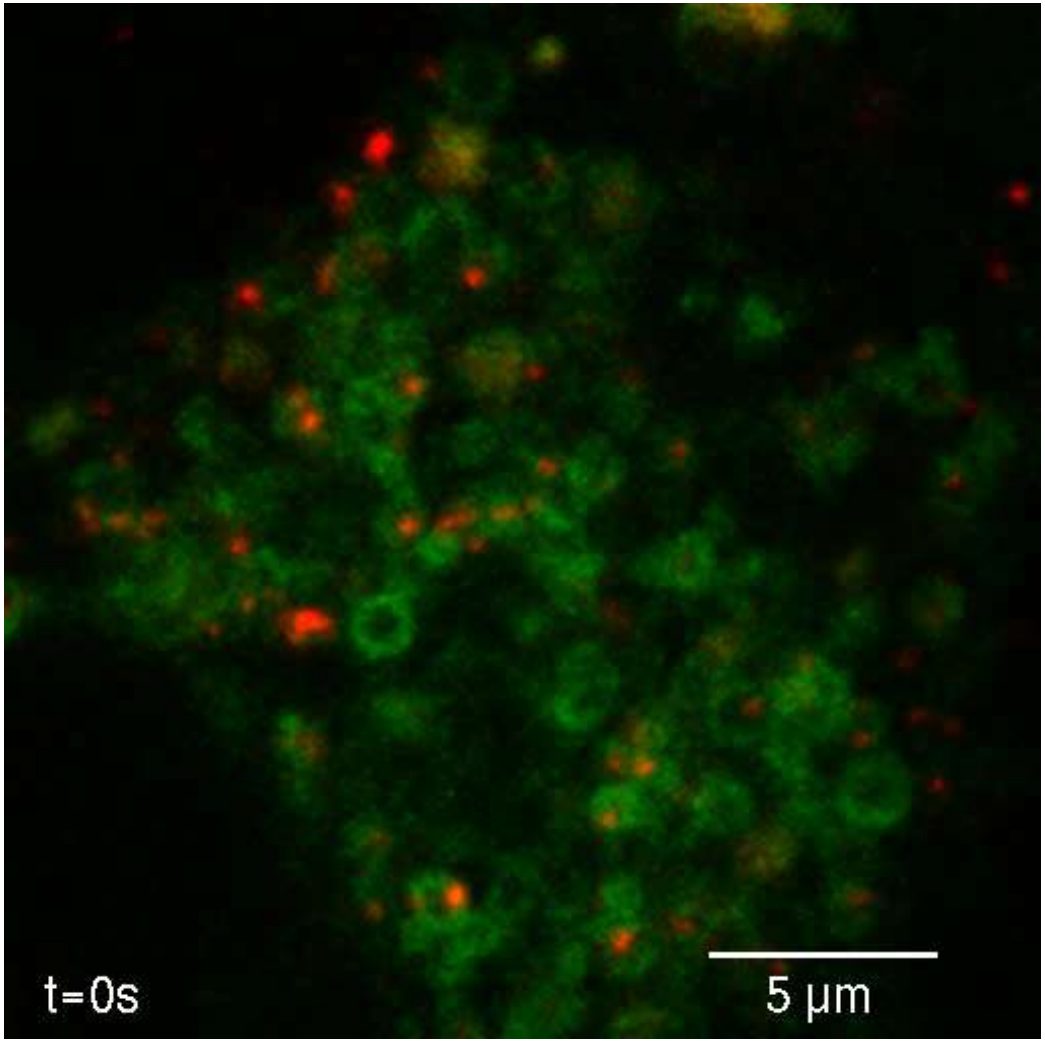


Mikrotubuli (A549 Zellen)



[Fitzpatrick et al., 2009; Müller et al., 2012]

Lebend-Zell-Mikroskopie und Kolokalisationsstudien



[Schumann et al., 2012]

30 nm Silika Partikel im Zellkern von Caco-2 Zellen

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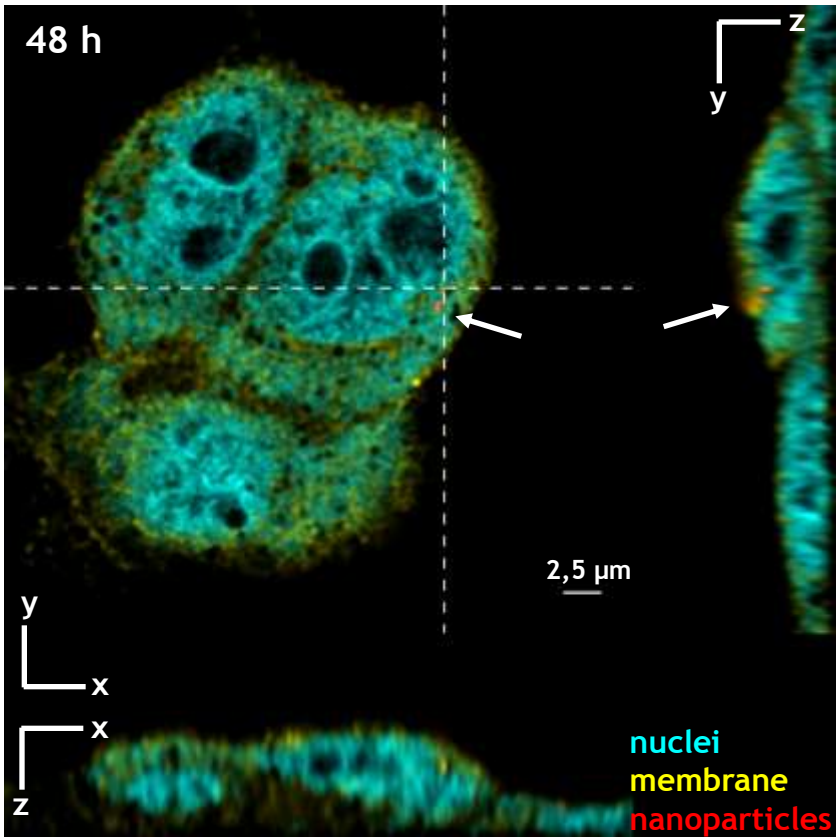

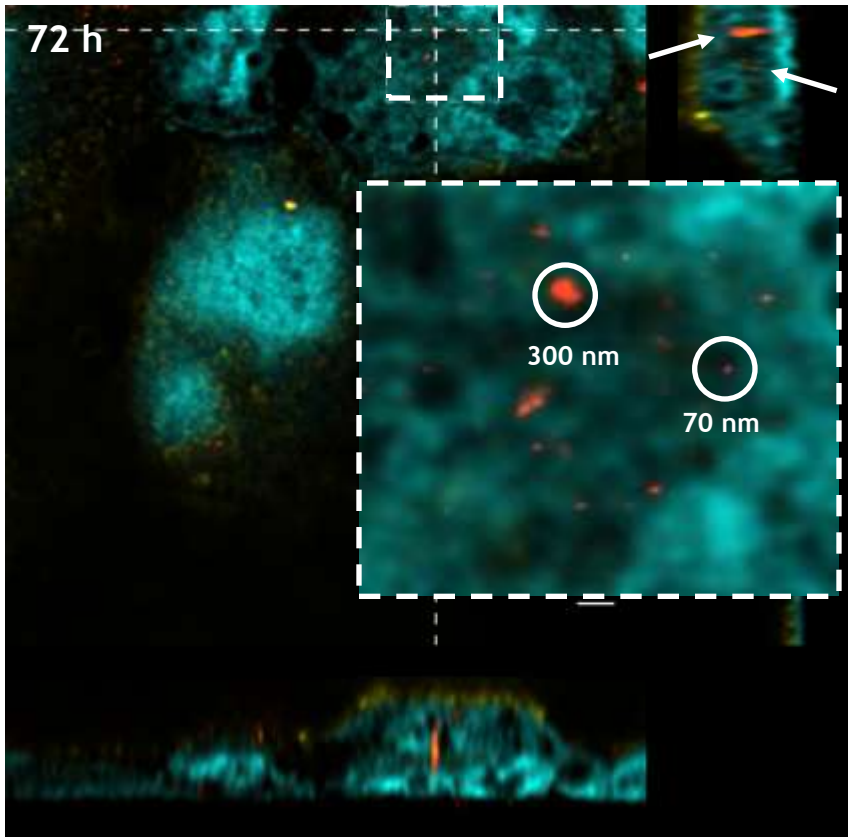

[Schübbe et al., 2012]

Partikelauswirkungen unter verschiedenen Bedingungen

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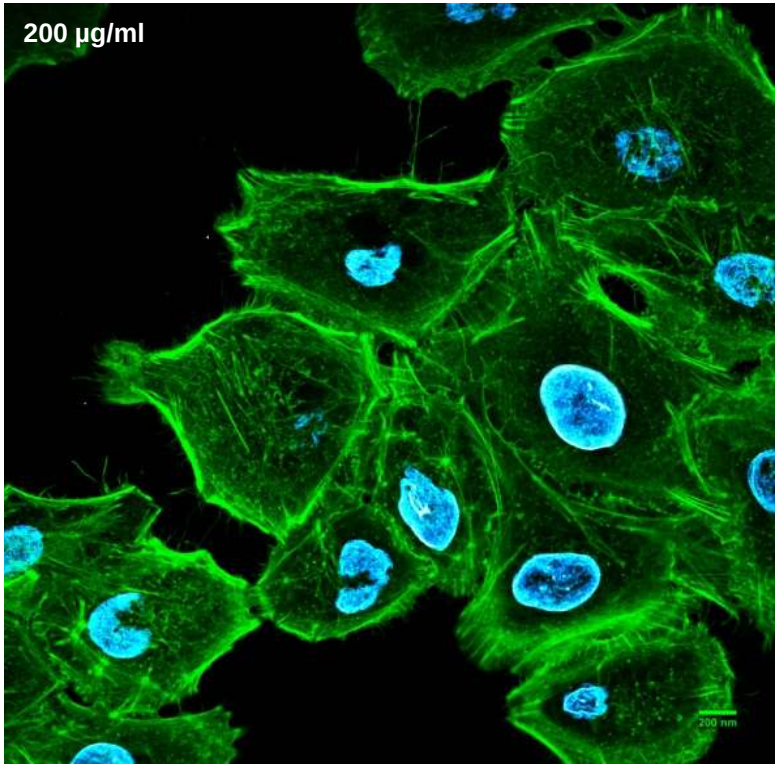
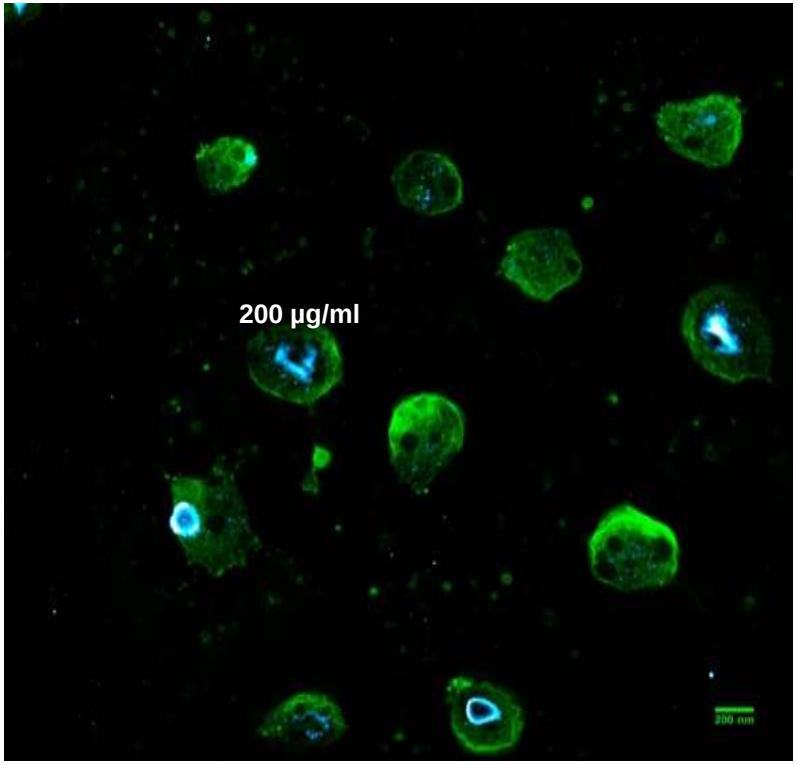
Serum



ohne Serum



5 h 25 (85) nm SiO_2

grün: Aktinzytoskelett (AF488), cyan: Zellkern (Kernlamina, AF546)

[Peuschel, et al. in preparation]

Nano Zell Interaktionen

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Ministerium für Wirtschaft
und Wissenschaft