DIFFERENT INTERACTIONS ON NANOSCALE RECOGNITION, ACTIVE TRANSPORT ACCUMULATION AND FATE ENABLING AND REGULATING THE FUTURE GLOBAL CONVERSATION AND COR
NANOPARTICLES ACT DIFFERENTLY FROM CHEMICALS

green 40nm PS particles red lysosomes

A549 cell and LysoTracker Red 30 min after 10 min pulse of 100 µg/mL 40 nm green ps particles
They Travel on Highways, using the transport Process of Cell

Same system-4 hours later-many particles have reached lysosomes
NEW SCIENCE

Chemicals Partition but Nanoparticles processed-energy of cell used
Nanoscale engages with intrinsic (endogenous) active cellular processes; Such interactions invariably involve recognition especially of the in situ interface.
‘Hard Corona’
Common Nanoparticles surface covered by proteins from surrounding

Particles in plasma

Dimers, trimers, etc

Particles after washing

Map out protein composition
Quantitatively mass spec.


Biological Identity derived from \textit{in situ} Interface

In PBS Non-Specific nanoparticle surface Interactions general

In presence of High Protein, Specific interactions

D.C. David OC, Marco
Recognition; the amount and pathway of cellular uptake determined corona (in situ interface)

Isolated complexes
- no ambient serum
- Including ambient serum

Number of nanoparticles in cell

Human serum corona (silica)

LDL is on surface
- When LDL Receptor is silenced
  - Particle uptake greatly reduced

Lesniak et al ACS Nano 2012
Salvati et al Nature Nano 2012
Bio-accumulation
Long Term, Repeated Dose
‘Low Acute Toxicity’

- Biological processing at Nanoscale, recognition and accumulation
- Non-degradable or slowly degradable materials for long periods in new places in organisms and environment

IN ORGANISMS AND ENVIRONMENT
THE FUTURE-IS HERE

TIME TO MOVE ON, AND DEAL WITH ENORMOUS RANGE OF NEW MATERIALS?

Name These, Classify these
REGULATION FOR FUTURE
A PRACTICAL WAY FORWARD?

VALUE CHAIN REGULATION-WITHOUT PREJUDICE?
GLOBAL CONVERSATIONS

• EXPOSED TO WHAT (EXACTLY) DURING LIFE CYCLE (COR1)
  • Characterization modifications from environment, formulation,

• FUTURE MATERIALS, NAME THEM, CLASSIFY PREDICTION
  • Predictors of biodistribution, fate (COR2,3)
  • Parameters of biodistribution, *useful* classification and organization of data, safety by design (COR5)

• ENABLING AND REGULATING THE FUTURE (COR6)
  • Risk Management, Risk Control to *enable* (safely)
  • Priviliged pathways of lowered risk