

Nanoparticles and occupational health: exposure, hazards and research coordination

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Nanotechnologies



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5 steps for control of risks

- 1 - Gather information
- 2 - Assess risk
- 3 - Apply control strategies and hierarchies (STOP)
- 4 - Do health surveillance
Establish health status and watch out for "the unusual"
- 5 - Do product stewardship
Know what your customers are doing - reduce their risk

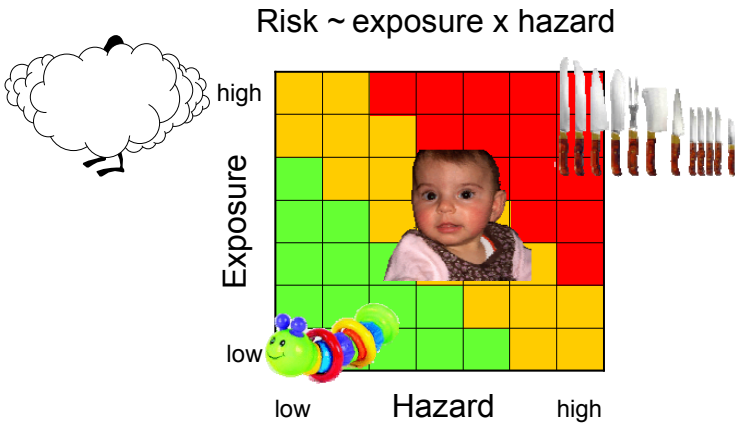
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Assess risks = Assess exposures and hazards

Risk ~ exposure x hazard



efficiency to cause damage x Gravity of outcome

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From Exposure to Dose

- How much is taken up?

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Uptake routes for nanoparticles

High uptake potential for powders and aerosols in lungs

Route Form	Lungs	Skin	GI-track	Estimation of occupational uptake-potential
Powder	High	Medium	Medium	
Aerosol	High	Medium	Medium	
Liquid	Medium	Medium	Low	
Brittle solid	Medium	Medium	Low	
Solid	Low	Low	Low	

Cave: "no uptake" does not mean "no contact"

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The IST mobile measurement unit



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Observation of industrial activities

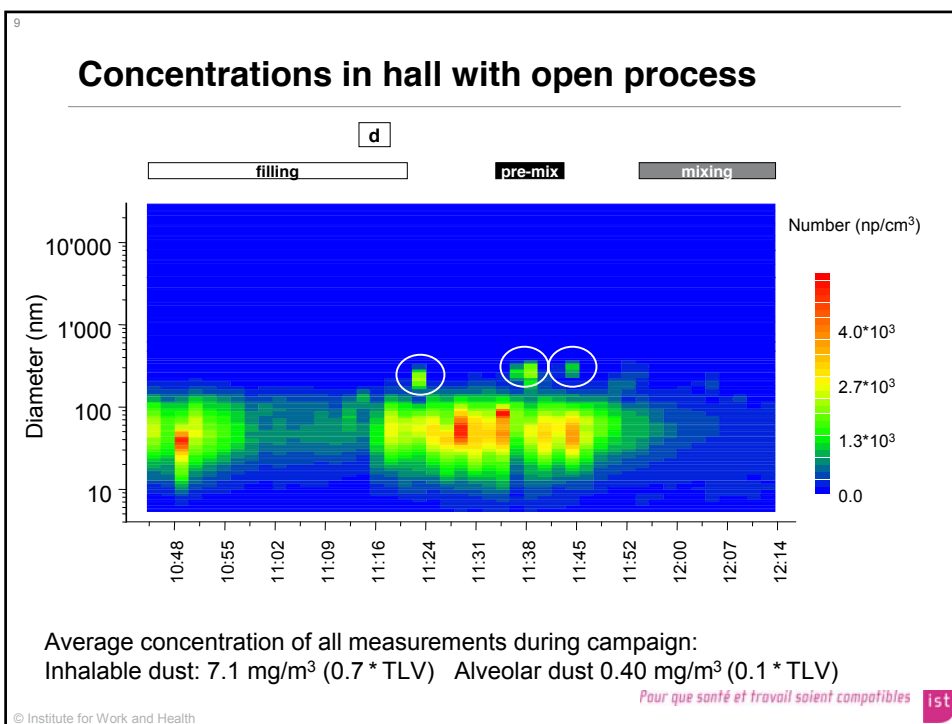


**Demi-masque
à poussière P3
Obligatoire**



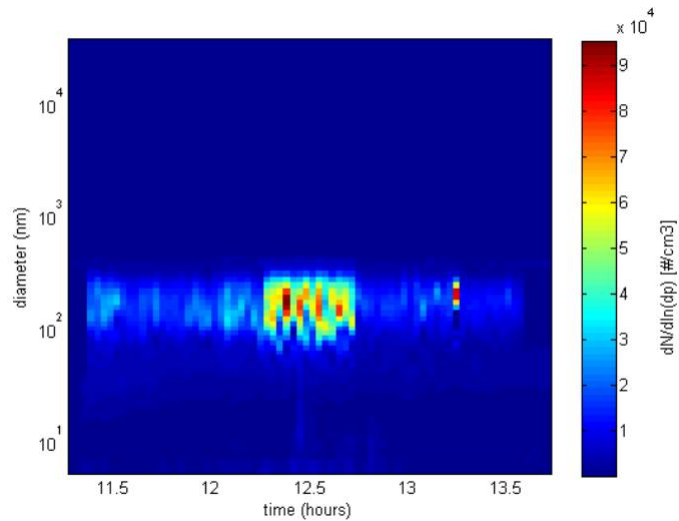
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"non-suspicious" process in research lab



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Hazards - main issues

Toxicological hazards

- Oxidative stress
- Fibre paradigm
- Interactions with protein folding and fibrillation

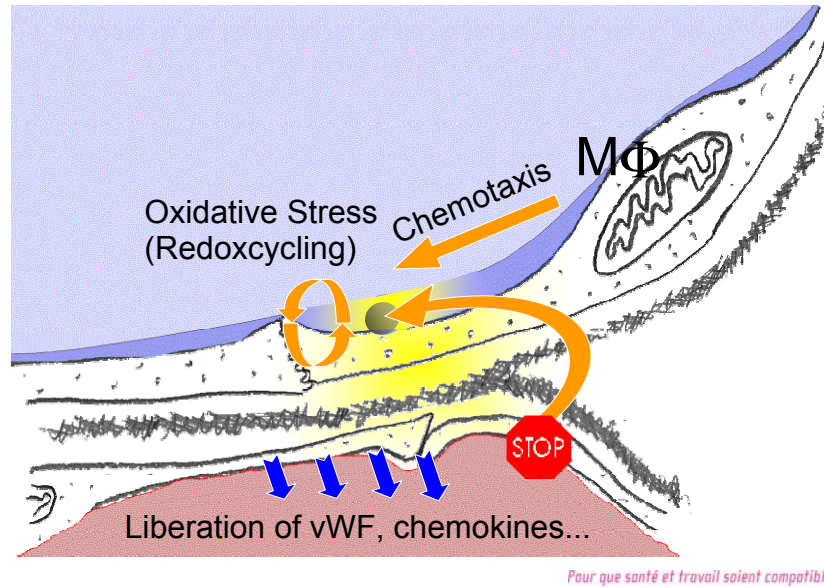
Physical and chemical hazards

- Explosion
- Altered (faster) kinetics

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ROS-paradigm



CNT-study: fibre-structure paradigm confirmed

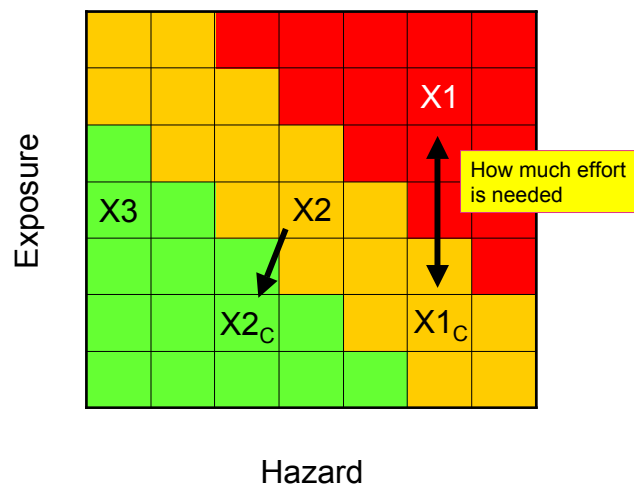
Slide with graphics from Poland et al. Nature Nanotechnology 2008
(removed for copyright reasons)

Nanoparticles enhance protein fibrillation rate

Slide with graphics from
 Linse, Sara et al. (2007) Proc. Natl. Acad. Sci. USA 104, 8691-8696
 (removed for copyright reasons)

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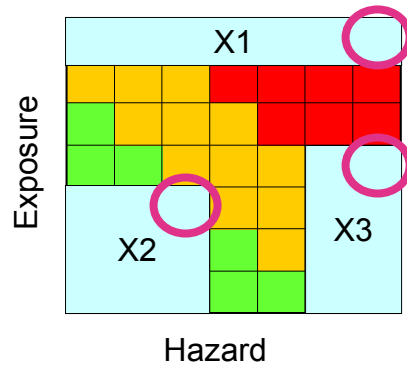
Combine exposure and hazard



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How to deal with uncertainties?

Estimate bands of likely hazards and exposures



Safety measures always then consider the worst-case

How to assess occupational health effects?

Prospective health studies for exposed workers should start **now!**

But:

How many workers are exposed?

To which type of particles, at what level, how long and how often?

In which companies and industries?

And:

How shall we assess the health effects?

Which effects - endpoints and pathways?

Using which methodologies?



NanoImpactNet

The European Network on the Health and Environmental Impact of Nanomaterials

Coordinator: Michael Riediker
Institute for Work and Health, Lausanne, Switzerland

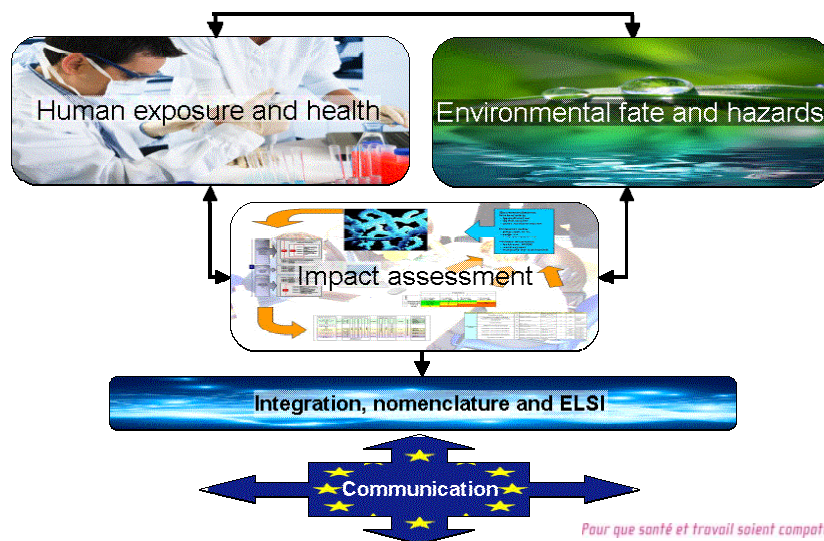
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Focus of NanoImpactNet:

European Network on the Health and Environmental Impact of Nanomaterials*

* European funding, but open for all to participate at their own cost



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NanoImpactNet is a network for researchers

Bring together researchers to...

- Identify knowledge gaps
- Define joint strategies and protocols
- Facilitate collaboration between projects
- Network and Communicate



Collaborate to achieve excellence in science
(good for industry, workers, consumers and the environment)

Next event

March 23-27, 2009 Conference in Lausanne, Switzerland



Conference announcement
Lausanne, 23 to 27 March 2009



1st NanoImpactNet Conference - for a healthy environment in a future with Nanotechnology

<p>Topics</p> <p>Toxicological testing strategies</p> <p>Practices in nanotoxicology and nanoecotoxicology</p> <p>Protocols for assessment of biological hazards</p> <p>Strategies to assess occupational health effects</p> <p>Exposure assessment</p> <p>Environmental dispersion</p> <p>Standardization of materials and protocols</p> <p>Most relevant material metrics for different needs</p> <p>Dispersion guidelines</p> <p>Impact assessment strategies</p> <p>Life cycle assessment of nanomaterial-containing products</p> <p>Strategies to make industrial data available</p>	<p style="text-align: center;">Conference at a glance</p> <p style="text-align: center;">UNIL Lausanne, Switzerland</p> <p style="text-align: center;">Monday, 23 March 2009</p> <p style="text-align: center;">Training school: Handling protocols and toxicological testing strategies</p> <p style="text-align: center;">Tuesday, 24 March 2009</p> <p style="text-align: center;">Workshop: Protocols for assessing biological hazards</p> <p style="text-align: center;">Wednesday, 25 March 2009</p> <p style="text-align: center;">Integrating Conference day 1</p> <p style="text-align: center;">Thursday, 26 March 2009</p> <p style="text-align: center;">Integrating Conference day 2</p> <p style="text-align: center;">Friday, 27 March 2009</p> <p style="text-align: center;">Dual Workshop (for industry and researchers): Strategies to assess occupational health effects and how to make industrial data available</p>	<p>Scientific committee</p> <p>Rob Althert</p> <p>Marlene Berges</p> <p>Daniel Bloch</p> <p>Hans Bouwmeester</p> <p>Pietermijn Cassee</p> <p>Kenneth Davison</p> <p>Cees De Heer</p> <p>Marta Dusinska</p> <p>Teresa Fernandes</p> <p>Peter Gahr</p> <p>Geoffrey Hunt</p> <p>Lucienne Julierat</p> <p>Harald Krug</p> <p>Thomas Kuhlbusch</p> <p>Steffen Loft</p> <p>Bernd Nowack</p> <p>Barbara Rother-Rutishauser</p> <p>Kai Savolainen</p> <p>Juan-Ringo Sintes</p> <p>Vicki Stone</p> <p>Lang Tran</p> <p>Peter Vitek</p>
<p>Schedule</p> <p>10 October 2008 Call for abstracts</p> <p>09 January 2009 Abstract submission deadline</p> <p>30 January 2009 Confirmation of abstract acceptance</p> <p style="text-align: right;">Conference Program available</p>		





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Merci pour votre attention

Pour toute information complémentaire:
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www.i-s-t.ch + www.nanoimpactnet.eu

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