

NANOSAFE – Exposure

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Towards a better assessment of
occupational exposure to airborne
NP by integrating work activity
analysis and exposure
measurement
- ExproPNano project -

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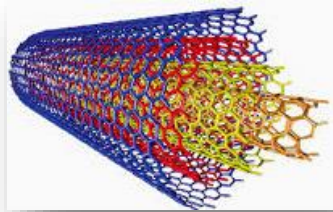
And the ExproPNano study group : Maximilien DEBIA (DSEST), Stéphane DUCAMP (SPF), Irina GUSEVA
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Introduction

□ Nanoscale particles < 100nm



- Manufactured and Incidental Nanoscale Particles (ultra fine particles)
- Several determinants of toxicity

□ News challenges for occupational health

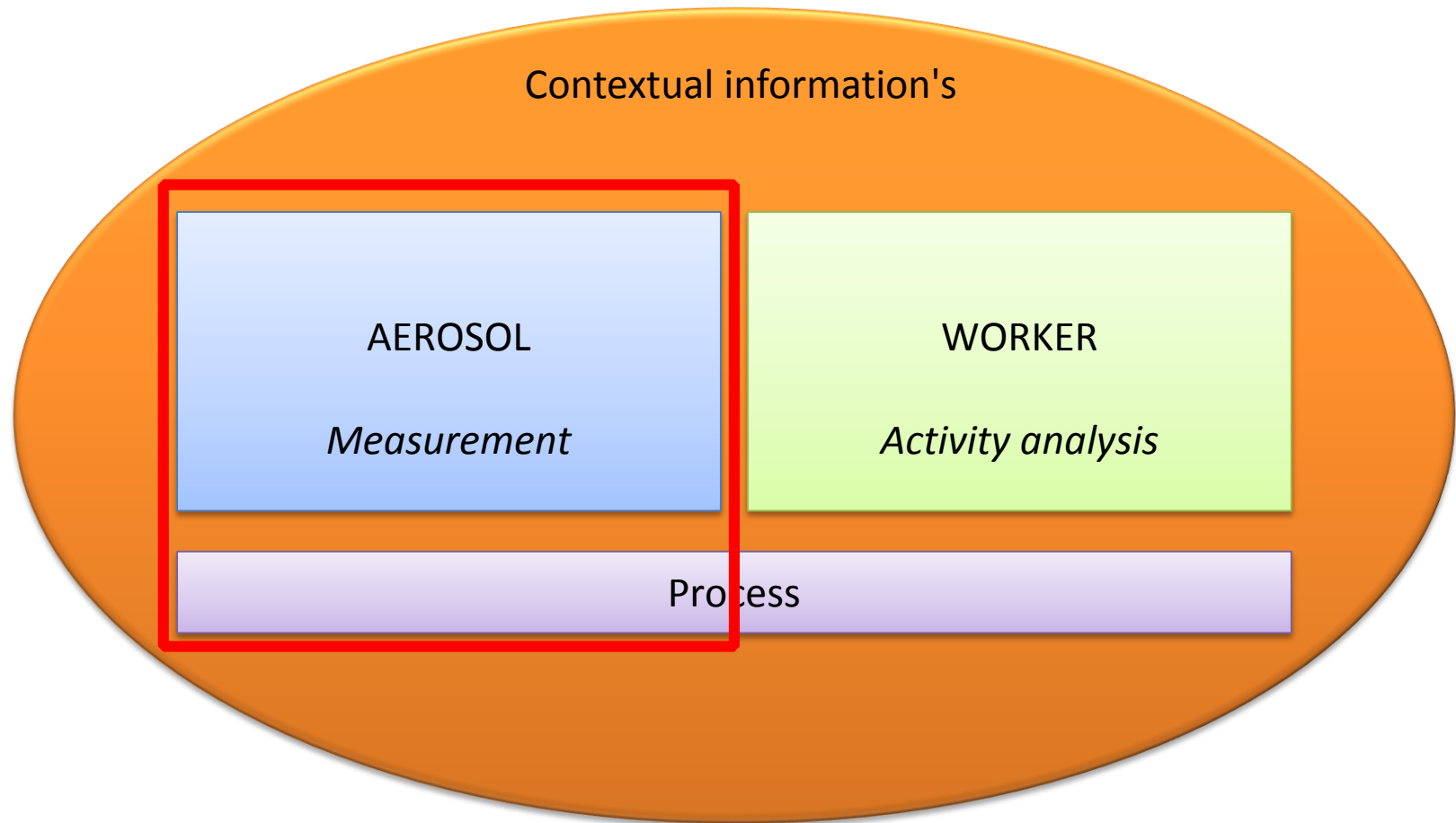
- Uncertainties dealing with health effects and their determinants
- Change of paradigm : from mass to number and surface area
- Need of new tools for preventionist, occupational hygienist, epidemiologist
- Opportunity to develop pluridisciplinarity in the field of occupational health

Objectives

- ❑ Develop and test an operational method to assess occupational exposure to nanoscale particles
 - Incidental and manufactured nanoscale particles
 - Operational for stakeholders concerned by understand and mitigate exposure to nanoscale particles
 - Strengthen pluridisciplinarity by articulating practices from industrial hygiene, epidemiology, toxicology, prevention, ergonomics and metrology

- ❑ Literature review on methodologies to assess exposure to nanoscale particles
 - 19 recommendations : MNP, lack of consensus, several metrics and instruments recommended, expertise needed (*Witschger et al., 2012*)
 - Publications reporting measurements results contain
 - Heterogeneous metrics, limited data on occupational exposure
 - Few contextual information's, work activity analysis
 - ➔ Scarce data difficult to use for epidemiologist and industrial hygienist (MatPUF observation)
 - Absence of tools and methods to describe and analyze work activity
 - Understand real exposure situation imply taking into account work activity and airborne characterization

Chosen definition of exposure



Proposed methodology



Number, surface and mass concentration
size distribution

Tier 5 :
Safety measures
implementation and evaluation

Tools selection
Study group to build the method
Training of the intervention team

Originality of the method

□ Metrology

- Easy-to-use, affordable, portable and reliable instruments describing relevant aerosol characteristics
- Develop protocol and methodology to analyze samples of airborne Nanoscale Particles for institutional preventionist
- Develop some nano specific tools to assess exposure to NP
- Better understanding of the NP aerosol behavior (use of Video Exposure Monitoring)

□ Ergonomics

- Describe formal safety practices built by companies
- Link exposure variation and level of exposure with specific work activities or processes (use of Video Exposure Monitoring)
- Understand workers characteristics, postures, perceptions and attitudes that can affect exposure (mitigate or increase)
- Identify real work, occasion and dysfunction that contribute to exposure to build operational and effective safety practices

- ❑ Development of prevention in companies and of politics of control and management
 - **From measurements to exposure assessment** → Integration of worker activity analysis in the exposure characterization
 - Contribution to standardization
 - Feed exposure database as Ev@lutil, COLCHIC, NECID
 - Exposure modelling and epidemiological studies improvement
 - Operational experience feedback on the impact of current recommendations and resources allocated on risk assessment and mitigation
- ➔ Develop safety and safety culture in occupational environment

❑ Strength of the methodology

- Characterize appropriate aerosol parameters
- Understand whole determinants of exposure
- Reinforce effectiveness of prevention institute action

❑ Weakness

- Development of protocols still necessary for physicochemical characterization of some NP
- Time consuming ?
- Need to implement methodology in companies to test tools in order to select most appropriate / effective strategy to fulfill the objectives

Aeronautic (additive manufacturing, machining, surface treatment and maintenance), rubber sectors (mixture of fillers), research laboratories (involving manufactured NP), mine, harbour

Thank you for your attention !