Technical Workshop for the Latin American and Caribbean Region on Nanosafety Issues

Brazilian Initiatives on Nanotechnology and Nanotoxicology

22-24 June 2015, Bogotá, Colombia

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2014 Global RD Funding Forecast (www.battelle.org)

Size of circle reflects the relative amount of annual R&D spending by the indicated country.
Road map on Nanotechnology
Interministerial Nanotechnology Council (CIN)

- Brazilian Nanotechnology Initiative (BNI)
  - Aldo Rebelo
    - Ministry of Science Technology and Innovation (MCTI)
  - Armando Zeferino Milioni
    - Secretary of Technological and Scientific Development (SETEC)
  - Alfredo de Souza Mendes
    - General Coordinator for Micro and Nanotechnologies (CGNT)
Interministerial Nanotechnology Council (CIN)

• Integration of management;
• Evaluation of program results;
• Strategy, priority areas, investments;
• Budget Integration;
• International cooperation.
SisNANO - National System of Nanotechnology Laboratories

• Created by
  – MCTI Ministry Act nº 245, 05/04/2012 and
  – Instrução Normativa nº 2, 15/06/2012
SisNANO - Objectives

- Stimulate and support the industrial development of nanotechnology products and process.
- Building and extending the state of art of R&D in nanotechnology.
- Supporting the international collaboration to nanotechnology community.
- Training in nanotechnology.
- Spreading nanotechnology in society and market.
National Institutes of S&T - Nanotechnology

- Complex Functional Materials (UNICAMP)
- Micro/Nanoelectronics Systems - NAMITEC (UNICAMP)
- Photonics for Optical Communications (FOTONICOM) (UNICAMP)
- Nanostructured Molecular Systems
- Surface engineering (UFRGS)
- Nanobiostuctures and NanoBioMolecular Simulation (UFC)
- Pharmaceutical Innovation (UFPE)
- Photonics (UFPE)
- Nanotechnology for Integrated Markers for (UFPE)
- Nanobiotechnology of Midwest and North (UNB)
  - Carbon Nanomaterials (UFMG)
  - Nano-Biopharmaceutics (UFMG)
- Semiconductor Nanodevices (PUC/RJ)
  - Nanotechnology in Materials Science (UNESP)
  - Organic Electronics (USP)
  - Optics and Photonics (USP)
Nanotoxicology Research Networks

- Midwest aquatic nanotoxicology network
- Toxicology of nanostructured composites: Citotoxicity e genotoxicity of products.
- Nanotoxicology of nanoparticles of interest for the oil & gas industry.
- Occupational and Environmental nanotoxicology: regulation and risk evaluation.
- Toxicity of nanoparticles in biological systems: Reference materials and methods of evaluation and characterization of toxicity.
- Toxicity of materials applied to medicine and agriculture: in vivo, in vitro methods.
Nanotoxicity - Context
Nanoparticle characterisation, pathways and toxicological impact

Nanoparticles:  
- industry  
- research  
- medicine

Nanoparticles in the environment:  
- alteration of surface  
- protein corona  
- agglomeration

Nanoparticles in cells:  
- production of reactive oxygen species  
- protein misfolding  
- membrane damage  
- mitochondrial damage  
- DNA damage

Nanosafe / EU – 2015-2025

PC Identity of NP

Robust and Validated data (interlab)

Predictive capacity based on physical and chemical identity of NP

Identity of NP

Toxicity

Characterisation of NPs

Standard protocols for PC monitoring (during NM life cycle)

Standardisation/standard reference materials

Instruments and methods validation

Identify PC properties including transformation (during NM life cycle)

Identify PC properties influencing bioavailability as metrics

Identify PC properties influencing dose metric

Inter-laboratory comparison data validation

Identify PC properties influencing internal dose

Tailored approaches for PC ID for different requirements, e.g.

PC ID predictive of biological/environmental effect

Grouping based on PC ID and Hazard parameters

Modelling requiring PC info only

Hazard ID input

Exposure ID output
Challenges

- Standardized production
- Scaling up >> Certified Reference Materials
- Samples dispersion
  - PC characterization
  - Biological effects: aggregation, agglomeration, availability
- Side/undesirable effects
  - NP affecting:
    - Tests
    - Culture medium
    - Bystanders (lipopolysaccharides, proteins, allergens)
    - Risk assessment
- Regulatory status
  - While toxicity data is continuously becoming available, the relevance to regulators is often unclear or unproven.
  - Brazilian regulation
    - Under construction
Brazilian strategy

SisNANO – Nanotox Network

International Cooperation:
- Nanovalid (FP7/CE)
- NANoREG (FP7/CE)
  - Laboratories working in network “to test the tests”
  - Map of activities:
    - WP2 – Synthesis, supplying and characterization
      - EMBRAPA, CETENE, INMETRO, FURG, GNANO, UFRGS
    - WP3 – Exposure through life cycle analysis
      - EMBRAPA
    - WP4 – Biokinetics and toxicity testing in vivo
      - GNANO, FURG, NANOBIOS, UFMG, UFRGS
    - WP5 – Advancement of Regulatory Risk Assessment and Testing
      - INMETRO
    - WP7 – Liaisons, Dissemination, Exploitation and Communication
      - INMETRO, MCTI
Thank you

- Additional informations
  - [www.inmetro.gov.br](http://www.inmetro.gov.br)

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