



INSTITUTE FOR AGRICULTURE AND TRADE POLICY

# **Nano-pesticides and options for protecting farmworkers**

Steve Suppan

International Seminar (via video)

Ministry of Labor: São Paulo, Brazil

November 27, 2019

**RAQUEL VON HOHENDORFF  
WILSON ENGELMANN**

**NANOTECNOLOGIAS  
APLICADAS AOS  
AGROQUÍMICOS  
NO BRASIL**

**A Gestão dos Riscos a Partir do  
Diálogo Entre as Fontes do Direito**

# What we've learned about impacts, risks and toxicity since von Hohendorff/ Engelmann (2014)

- “Little is understood yet about nano-toxicity. The levels of nano-exposure are not known; the levels of exposure that could be harmful to human health are not known nor whether there is a safe limit of exposure. Furthermore, there are few studies about long term exposure to research the potential toxicity of these products.” (p. 72)
- Unfortunately, this summary continues to be valid, **save for:**
- Bio-persistent nano-particles (NPs) can be measured and visualized as they move in the human body for up to 365 days
- The most hazardous NPs can be identified by means of screening nano-informatic data bases of *in vivo* and *in vitro* experiments
- However, there is no agreement on nano-relevant risk assessment metrics for regulation and particularly for protection of workers

# Overview: nano-pesticides and the occupational health of farmworkers

- Why nano-pesticides?
- Types of nano-pesticides, according to the report of the Brazilian Agribusiness Research Corporation (EMBRAPA)
- Brief U.S. nano-pesticides history: EPA permitting commercial use without published risk analysis
- Kocide<sup>®</sup>: EPA registered in 2015: label on use and EPA's revised Worker Protection Standard
- Controls to protect lab technicians from NP exposure: feasible to apply to farmworkers?
- "Safe by Design" (SbD) NPs: a future of nano without rules?

# Nano in the Agri-tech revolution

<https://www.nature.com/articles/s41565-019-0461-7>

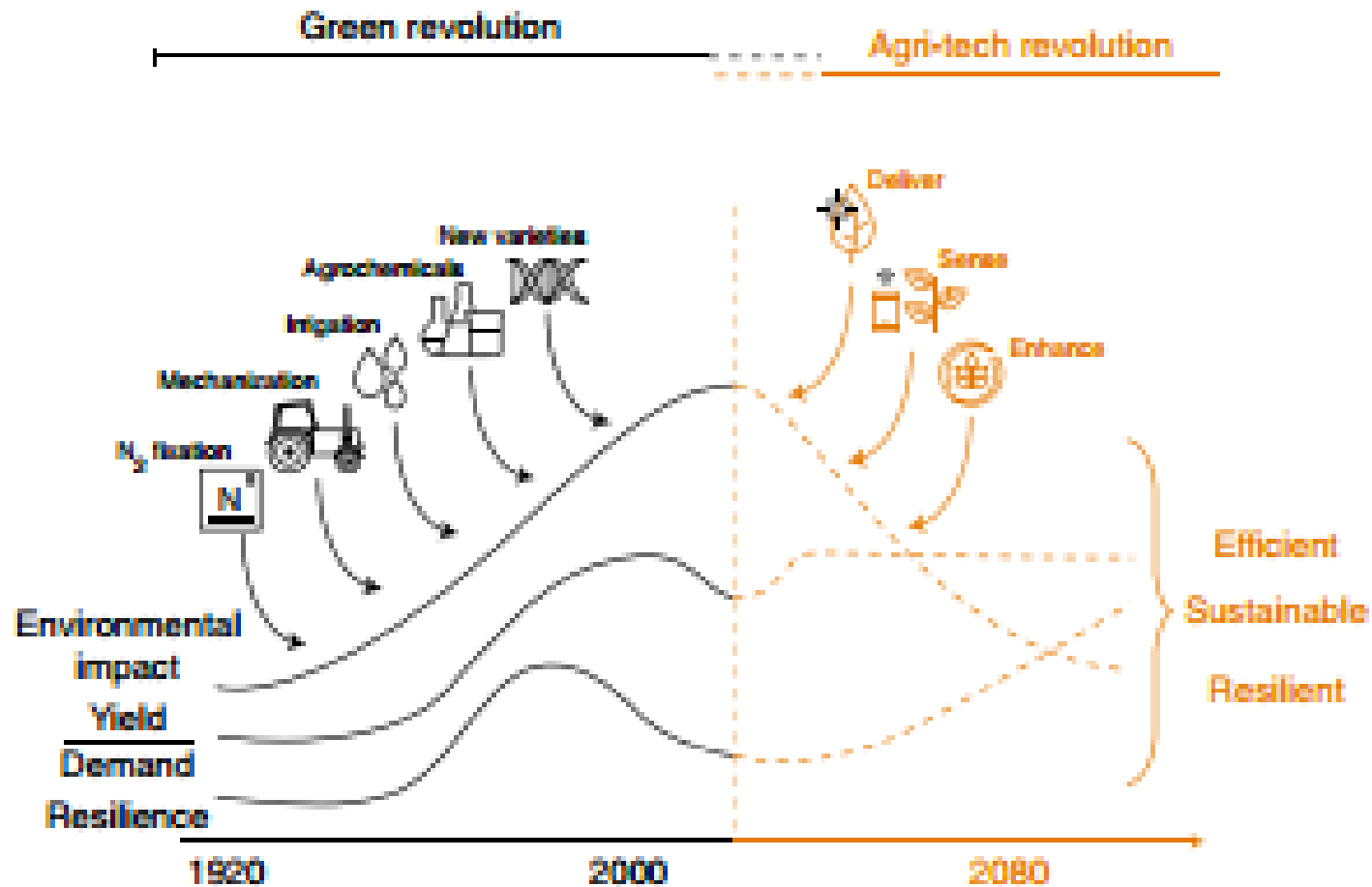
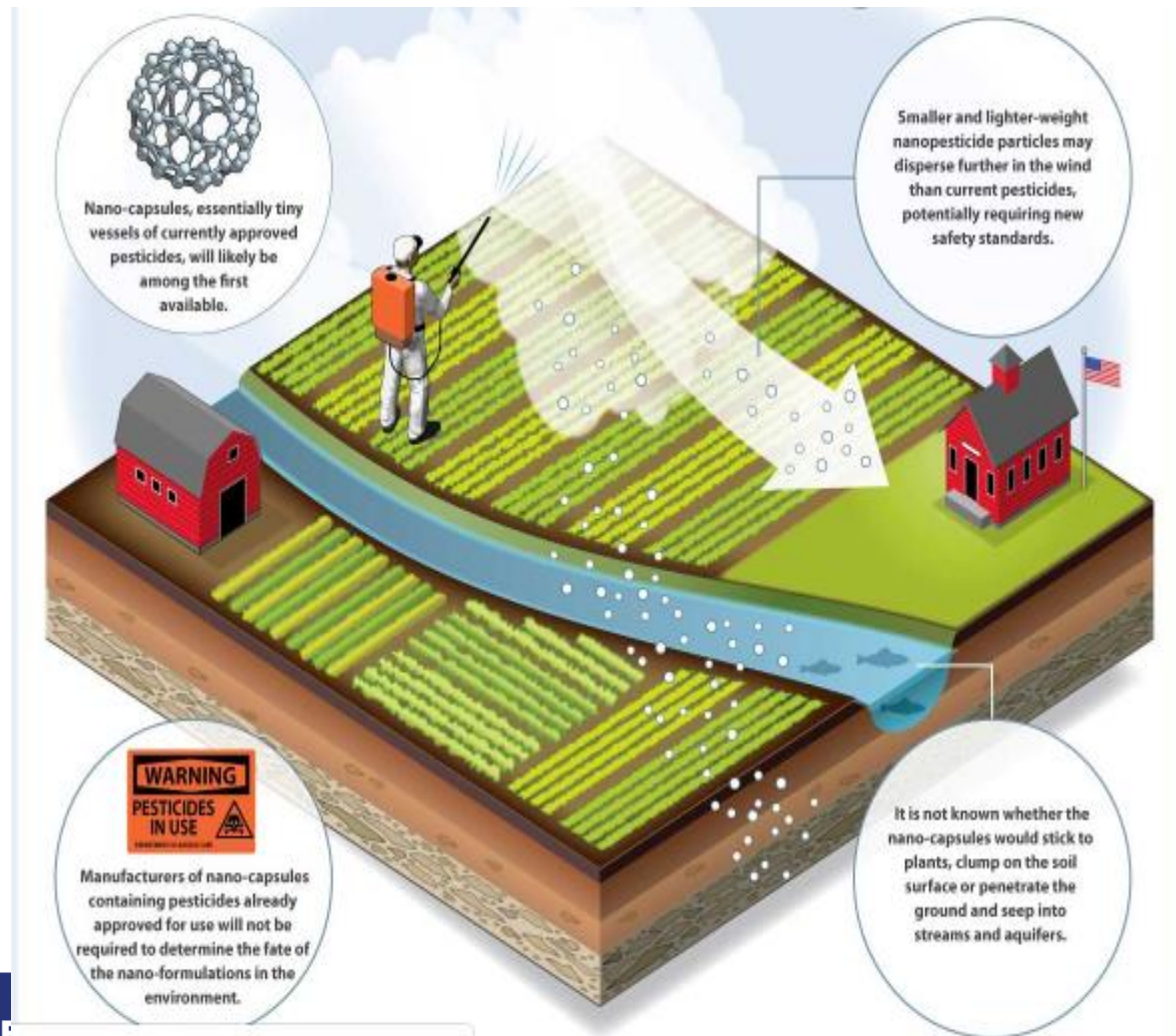


Fig. 1 | The green revolution and the new agri-tech revolution.

# V. Gerwin: "Everything you need to know about nano-pesticides": *Modern Farmer*, 1/21/15



**“Currently, there is little understanding of the risk associated with this emerging technology” Rai Kookana (2015)**

<https://ecos.csiro.au/nanopesticides-a-promising-new-pesticide-solution/>



ECOS

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[Home](#) / 2015 / Issue 210 / Nanopesticides: a promising new pesticide solution?

# Nanopesticides: a promising new pesticide solution?

By Virginia Tressider

August 4th, 2015

# Kookana et al : Guiding Principles for Regulatory Evaluation of Environmental Risks (2014)

<https://pubs.acs.org/doi/pdf/10.1021/jf500232f>

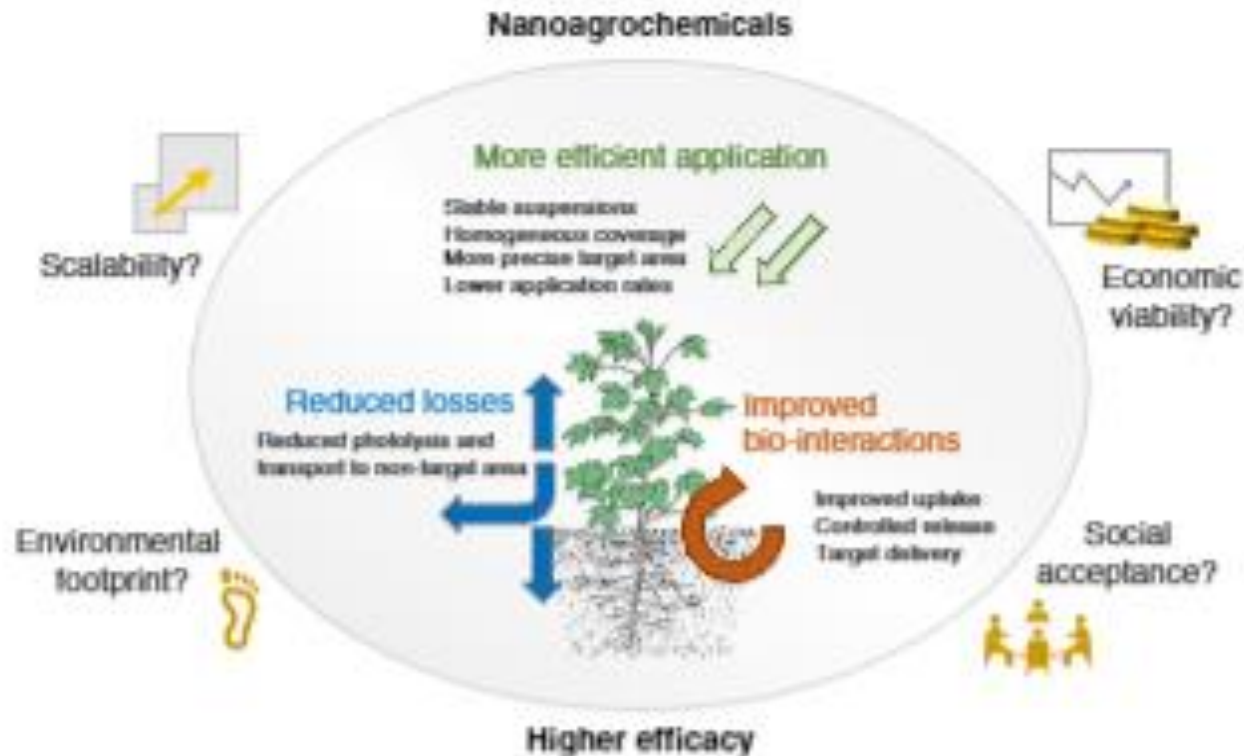
Table 1. Potential Applications of Nanotechnology in the Pesticides Sector

function	how this can be achieved	current examples
enhanced apparent solubility	nano- and microemulsions	emulsion-based registered pesticides, Banner MAXX of Syngenta <sup>64</sup>
faster decomposition in soil and/or plant	nanocatalyst-conjugated ai in microcapsules	SDS-modified TiO <sub>2</sub> /Ag conjugated with ai such as dimethomorph; <sup>65</sup> imidacloprid and avermectin <sup>66</sup>
controlled release	nanocapsules, nanospheres	polymeric stabilized bifenthrin; <sup>67</sup> nanocomposite 2,4-D; <sup>68</sup> porous hollow Si-encaged validamycin <sup>69</sup>
targeted delivery	nanocapsules	nanoencapsulated glyphosate or sulfonylurea herbicide <sup>2</sup>
protection against premature degradation	nanocapsules with catalyst ai conjugate	TiO <sub>2</sub> -M262 polymer metaflumizone; <sup>70</sup> porous hollow Si-encaged validamycin <sup>69</sup>
enhanced uptake/efficacy	nano- and microemulsions, nanospheres	nanopermethrin; <sup>71</sup> nanosphere insecticides <sup>72</sup>
enhanced toxicity to target organism (lower dose)	nanodispersions; nanosuspensions	nanodispersed triclosan <sup>73</sup>
nanoparticle as ai	nanometals and nanoclays	registered Nano-Ag biocide; <sup>74</sup> Nano-Si <sup>75,76</sup>



# Absent from the analysis of nano-pesticides: impacts on worker health (2018)

<https://www.researchgate.net/publication/324992564> A critical evaluation of nanopesticides and nanofertilizers against their conventional analogues



**Fig. 1 | Key drivers for applying nanotechnology to improve the efficacy of agrochemicals.** Associated socio-economic and environmental considerations that still need to be addressed are shown around the centre.

# Nano-pesticides: types, properties, challenges

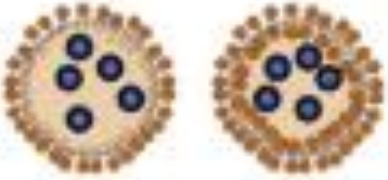
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6380358/>

<p><b>Nanopesticides</b></p> <ul style="list-style-type: none"><li>✓ Nano-emulsions, -dispersions, -spheres, -capsules, and -gels of traditional pesticides;</li><li>✓ Solid lipid NPs, coated liposomes, or inorganic NPs associated with active ingredients;</li><li>✓ Engineered NPs, i.e. Ag- and TiO<sub>2</sub>-NPs.</li></ul>	<ul style="list-style-type: none"><li>✓ Greater pesticide solubility, mobility and durability;</li><li>✓ Reduced amount of ingredients via targeted/controlled release;</li><li>✓ Reduced resistance and damage to nontarget organisms.</li></ul>	<ul style="list-style-type: none"><li>✓ Biosafety of nanopesticides;</li><li>✓ Toxicological profile; interactions with co-formulants; environmental fate;</li><li>✓ Long term effects on the environment and chronically exposed workers</li></ul>
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Polymeric nanospheres,  
nanocapsules, nanogels and  
nanofibers



Solid lipid NPs, liposomes or  
inorganic NP formulations



Pristine, inorganic, engineered  
NPs (metal, metal oxide NPs and  
nanoclay)



# Summaries of 170 studies; 4 on nano-pesticides; none on health impacts



**Most efficient NP form to control insecticide release to reduce harm to citrus plants without unintended effects?**



*IX Workshop de Nanotecnologia Aplicada ao Agronegócio*



## **ESTUDOS PRELIMINARES APLICADOS AO NANOENCAPSULAMENTO DE INSETICIDAS NEONICOTINÓIDES: TIAMETOXAM**

**(Márcia R. Assalin<sup>1</sup>, Débora C. S. Dutra<sup>1</sup>, Maria A. Rosa<sup>1</sup>, Rafaela C.R.M. Duarte<sup>1</sup>, Patrícia Donaire<sup>2</sup>, Nelson Duran<sup>2</sup>)**

*(<sup>1</sup> EMBRAPA Meio Ambiente, Rodovia Campinas Mogi-Mirim, Tanquinho Velho, CP. 69, CEP 13820-000, Jaguariúna, SP, Brazil. <sup>2</sup> Laboratório de Química Biológica, Instituto de Química, Universidade Estadual de Campinas, CP 6154, CEP 13083-970, Campinas, SP, Brazil)  
Márcia.assalin@embrapa.br*

**Classificação:** Tecnologias de micro e nanoencapsulação de princípios ativos



# Biogenic silica capsules to optimize rate of pesticide release for 3 levels of salinity, pH and temperature



*IX Workshop de Nanotecnologia Aplicada ao Agronegócio*



## **SÍLICA BIOGÊNICA COMO VEÍCULO NA LIBERAÇÃO CONTROLADA DE BIOCIDAS**

**Bruno D. Mattos<sup>a</sup>, Tainise V. Lourençon<sup>b</sup>, Washington L. E. Magalhães<sup>c</sup>**

<sup>a</sup> *PPG em Engenharia e Ciência dos Materiais (PIPE), Universidade Federal do Paraná (UFPR).*

<sup>b</sup> *PPG em Engenharia Florestal (PPGEF), Universidade Federal do Paraná (UFPR).*

<sup>c</sup> *Empresa Brasileira de Pesquisa Agropecuária - Embrapa Florestas*

**Classificação:** Tecnologias de micro e nanoencapsulação de princípios ativos.

*In vitro* study: inhibit 3 pathogenic fungi with 3 Ag NP inoculation formulas: 13-75% inhibition compared to non-inoculated control plants



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## **NANOPARTÍCULAS DE PRATA BIOGÊNICAS PARA O CONTROLE DE FUNGOS FITOPATOGÊNICOS**

**\*Mariana Guilger<sup>1</sup>, Vitória A. N. Antunes<sup>1</sup>, Leonardo Fernandes Fraceto<sup>2</sup>, Renata Lima<sup>1</sup>**

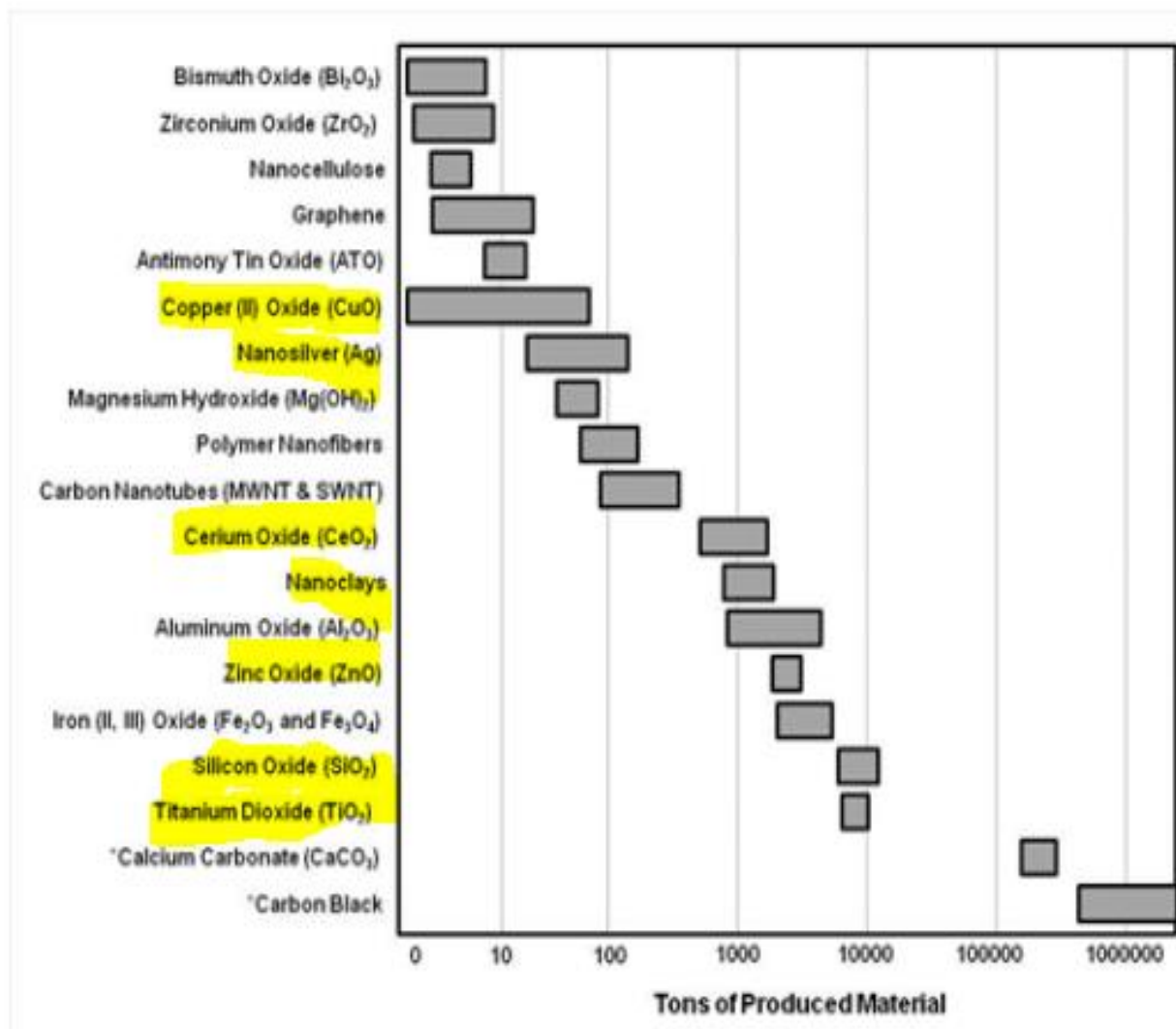
<sup>1</sup>*LABiToN – Laboratório de Avaliação de Bioatividade e Toxicologia de Nanomateriais, Universidade de Sorocaba (UNISO), Sorocaba, Brasil*

<sup>2</sup>*Departamento de Engenharia Ambiental, Universidade Estadual de São Paulo (UNESP), Sorocaba, Brasil*

*\*marianaguilger@gmail.com*

**Classificação:** Novos materiais e processos em nanotecnologia e sua aplicação no agronegócio

# Commonly Produced and Used NM



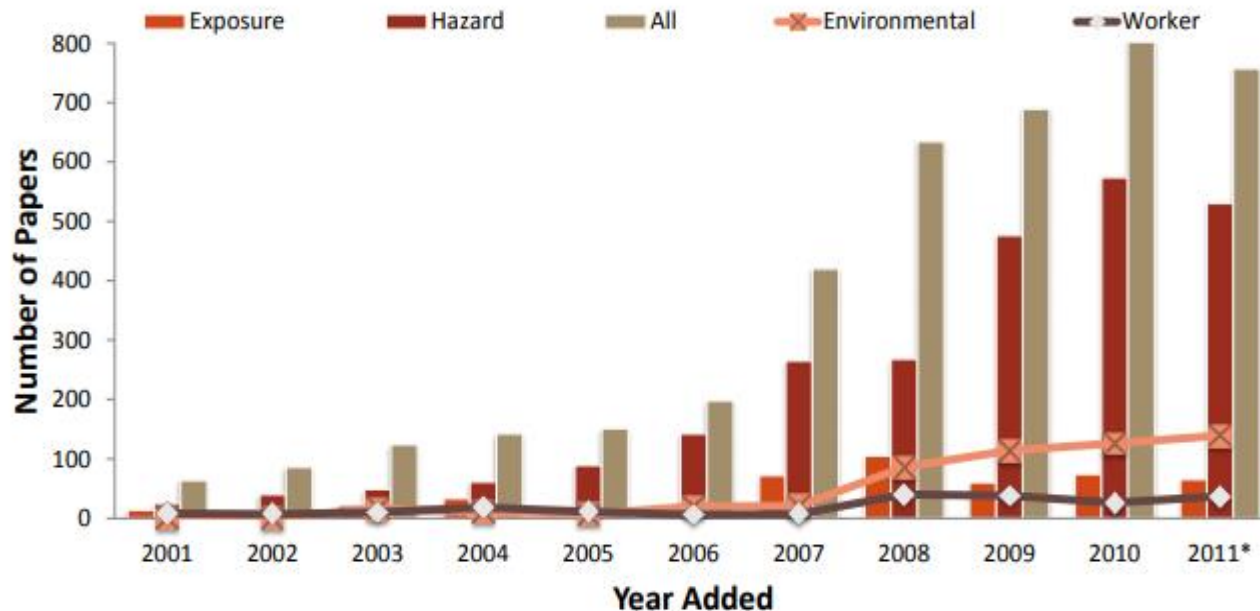


# C. Geraci, NIOSH (2015)

[https://www.nano.gov/sites/default/files/pub\\_resource/103\\_geraci\\_occupational\\_exposure\\_review.pdf](https://www.nano.gov/sites/default/files/pub_resource/103_geraci_occupational_exposure_review.pdf)

## What Does the Nano-EHS Research Tell Us?

Peer Reviewed Nano Environment, Health and Safety Journal Articles



<http://icon.rice.edu/research.cfm>

# 2015: EPA responds to a 2008 NGO petition to regulate nano-Ag as a nano-pesticide



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, DC 20460

OFFICE OF CHEMICAL SAFETY  
AND POLLUTION PREVENTION

March 19, 2015

The International Center for Technology Assessment  
660 Pennsylvania Avenue, S.E., Suite 302  
Washington, DC 20003

Subject: EPA Response to "Petition for Rulemaking Requesting EPA Regulate Nano-Silver Products as Pesticides"

Dear Petitioners:

Enclosed, please find the Agency's response to your petition, "Petition for Rulemaking Requesting EPA Regulate Nano-Silver Products as Pesticides," submitted on May 1, 2008. On November 19, 2008, EPA announced in the Federal Register its receipt of the ICTA petition and solicited public comments. The petition, supporting documents, and comments may be found in the public docket for this action at [www.regulations.gov](http://www.regulations.gov) in Docket ID # [EPA-HQ-OPP-2008-0650](https://www.regulations.gov/docket/EPA-HQ-OPP-2008-0650).

# First permit to use nano Ag as a biocide for non-agricultural purposes (2011)

<https://news.bloombergenvironment.com/environment-and-energy/epa-announces-conditional-registration-for-antimicrobial-containing-nanosilver>

Environment & Energy Report

## EPA Announces Conditional Registration For Antimicrobial Containing Nanosilver

Dec. 4, 2011, 11:00 PM



### Antimicrobial Pesticide Product With Nanosilver

**Key Development:** EPA issues conditional registration for antimicrobial pesticide product with nanosilver as an active ingredient.

**Key Finding:** Conditional use of AGS-20 will not pose unreasonable risk to children, environment, EPA finds.

**What's Next:** EPA is requiring further studies, including route-specific toxicity tests, during conditional registration period.



85249-2

12/1/2011



U.S. ENVIRONMENTAL PROTECTION AGENCY  
Office of Pesticide Programs  
Antimicrobials Division (7510P)  
1200 Pennsylvania Avenue NW  
Washington, D.C. 20460

EPA Reg.  
Number:  
85249-2

Date of  
Issuance:  
December 1,  
2011

Term of Issuance:  
Conditional

Name of Pesticide Product:  
HeiQ AGS-20 U

NOTICE OF PESTICIDE:

Registration  
 Reregistration

(under FIFRA, as amended)

Name and Address of Registrant (include ZIP Code):

HeiQ Materials AG  
Zürcherstrasse 42  
CH-5330 Bad Zurzach  
Switzerland

Note: Changes in labeling differing in substance from that accepted in connection with this registration must be submitted to and accepted by the Registration Division prior to use of the label in commerce. In any correspondence on this product always refer to the above EPA registration number.

On the basis of application and information furnished by the registrant, the above named pesticide is hereby registered/reregistered under the Federal Insecticide, Fungicide and Rodenticide Act. Registration is in no way to be construed as an endorsement or recommendation of this product by the Agency. The acceptance of any name in connection with the registration of a product under this Act is not to be construed as giving the registrant a right to exclusive use of the name or to its use if it has been covered by others.



**Registration Decision for NSPW-L30SS (previously referred to as  
"Nanosilva")**

A Materials Preservative for Use in *Textiles* and *Plastics*

Approved by: \_\_\_\_\_

Jack Housenger, Director  
Office of Pesticide Programs

Date: \_\_\_\_\_

5/15/15



# Suing EPA for permitting nano-AG use without nano-relevant risk assessment



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## Suing EPA for failure to regulate nano-pesticides

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Apr 2, 2015

by Dr. Steve Suppan



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# 2017: a court rules EPA did not justify its registration of Nanosilva

<https://product-liability.weil.com/consumer-products/court-finds-epa-lacked-substantial-evidence-to-register-nanosilver-based-pesticide/>



HOME WEIL'S PRODUCTS TEAM CONTACT

## Court finds EPA lacked “substantial evidence” to register nanosilver-based pesticide

CAROLYN R. DAVIS on **JULY 19, 2017**

Posted in CONSUMER PRODUCTS

# 2015: EPA registers a nano-pesticide for organic horticulture, grains and soy

[https://www3.epa.gov/pesticides/chem\\_search/ppls/091411-00002-20150507.pdf](https://www3.epa.gov/pesticides/chem_search/ppls/091411-00002-20150507.pdf)

**Kocide** LLC

**Kocide**<sup>®</sup> 3000  
fungicide/bactericide

## NOTIFICATION

91411-2

The applicant has certified that no changes, other than those reported to the Agency have been made to the labeling. The Agency acknowledges this notification by letter dated:

05/07/2015

### *Dry Flowable*

#### *Active Ingredients*

Copper Hydroxide\* (CAS No. 20427-59-2)

#### *Inert Ingredients*

#### *By Weight*

46.1%

53.9%

TOTAL 100.0%

(\* Metallic Copper Equivalent 30%)

EPA Reg. No. 91411-2

Nonrefillable Container

OR

Refillable Container

Net: \_\_\_\_\_

Net: \_\_\_\_\_

EPA Est. No. 352-TX-003





# EPA's conditions for use of Dupont™'s Kocide® 3000 described in a 19 page label

- For those who mix Kocide® with water or apply it: Personal Protection Equipment (PPE) of long-sleeved shirt, pants, impermeable gloves, shoes and socks
- Comply with EPA Worker Protection Standard
- Users are liable for all damages for use of Kocide®
- Can be applied on the ground or from an airplane in different concentrations
- Warning: stop using Kocide® when plants in greenhouses show signs of phyto-toxicity
- (No corresponding warning for horticulture workers in greenhouses)

# Simonin et al (2018): first published environmental risk assessment of Kocide®

<https://www.frontiersin.org/articles/10.3389/fmicb.2018.01769/full>

- Active ingredient: nanoscale  $\text{Cu}(\text{OH})_2$
- Test field: “mesocosm” (precision greenhouse)
- Kocide® applied to 7 plants in soil with “ambient” (existing), low and high degrees of fertilization
- Soil and plant test at 15 days, 10 weeks and one year
- Results: no negative impact on plants or to plant-micro-organism associations
- Risks to soil fertility (e.g. capacity to fix N, micro-organism biomass), especially under the low fertilization characteristic of organic agriculture for which Kocide® is registered
- Future research: environmental impacts of repeated applications of Kocide®

# *In vitro* study: cellular toxicity in onions of Ag and Si NPs compared to trifluralin toxicity in pesticides



*IX Workshop de Nanotecnologia Aplicada ao Agronegócio*



## **CITOTOXICIDADE CAUSADA POR NANOMATERIAIS: AVALIAÇÃO DO MICRONÚCLEO**

**Anny Manrich<sup>1\*</sup>, Silviane Zanni Hubinger<sup>1</sup>, Elaine Cristina Paris<sup>1</sup>**

*<sup>1</sup> Embrapa Instrumentação, Rua XV de Novembro 1452, 13560-970, São Carlos, SP*

*\*anny.manrich@gmail.com*

**Classificação:** Cenários e avaliação dos riscos ambientais e sociais dos nanocompostos

# Review of nano-pesticide studies: almost without data useful for occupational health protection

[https://oem.bmj.com/content/75/Suppl\\_2/A470.3](https://oem.bmj.com/content/75/Suppl_2/A470.3)

- Internet survey of scientific literature (2018)
- Nearly all studies focus on technical benefits (e.g. less mass of Active Ingredient applied)
- Very few *in vitro* studies comparing pesticide and nano-pesticide toxicity
- No *in vivo* studies comparing pesticide and nano-pesticide toxicity
- Most probable vector of human health risk: dermal exposure during the mixing of the nano-pesticide

# 2006 EPA guidance to protect agriculture workers

[https://www.epa.gov/sites/production/files/2015-06/documents/protectyourselffrompesticidesspanish\\_735\\_b\\_06\\_001.pdf](https://www.epa.gov/sites/production/files/2015-06/documents/protectyourselffrompesticidesspanish_735_b_06_001.pdf)

United States  
Environmental Protection  
Agency

Office of Prevention  
Pesticides, and Toxic Substances  
(H7506C)

EPA 735-B-06-001  
Revised June 2006  
(Spanish)



**Protect Yourself from Pesticides –  
Guide for Agricultural Workers (Spanish)**

**Protéjase de los Pesticidas –  
Guía para los Trabajadores Agrícolas**

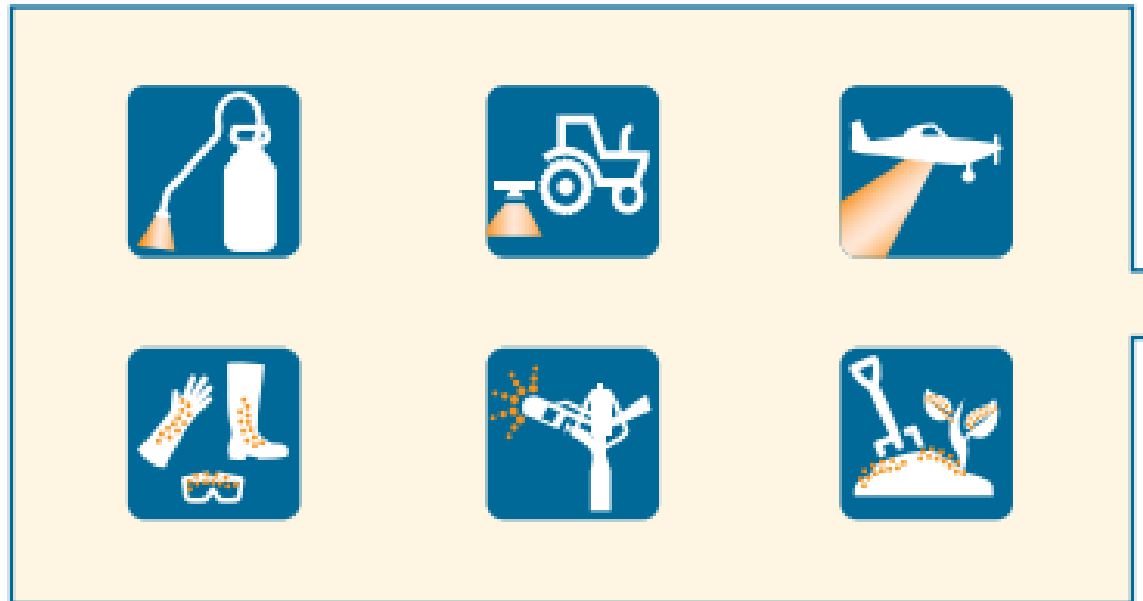
# 2018: Worker Protection Standard enters into force: 146 pages for compliance by employers



## How to Comply With the 2015 Revised Worker Protection Standard For Agricultural Pesticides

What Owners and Employers Need To Know

# U.S. States implement EPA Worker Protection Standard, e.g. a Colorado poster



**Evite que los pesticidas hagan contacto con su piel o entren en su cuerpo.** Los pesticidas pueden estar en muchos lugares. Pueden estar sobre las plantas, dentro de las plantas, en el suelo y en el agua de riego. Los pesticidas pueden ser llevados por el viento desde aplicaciones cercanas. También pueden estar en tractores y otras

# Personal Protection Equipment (PPE) in Colorado

[http://cepep.wptest.agsci.colostate.edu/wp-content/uploads/sites/35/2016/06/PERC\\_CP\\_11x17\\_spanish.pdf](http://cepep.wptest.agsci.colostate.edu/wp-content/uploads/sites/35/2016/06/PERC_CP_11x17_spanish.pdf)

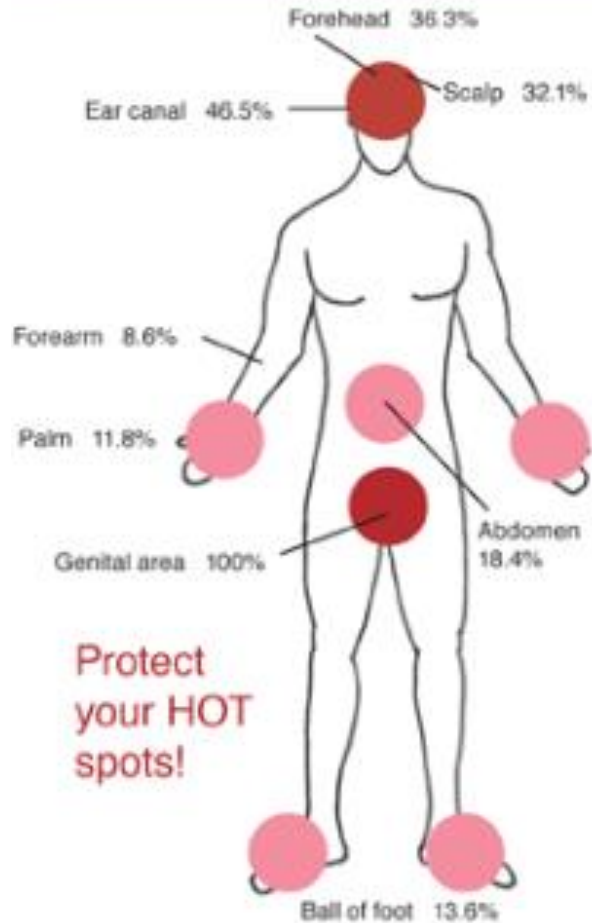


**Proteja su cuerpo de los residuos de pesticidas. Use camisas de manga larga y pantalones largos cuando trabaje. Además use zapatos, calcetines y un sombrero o pañuelo.**



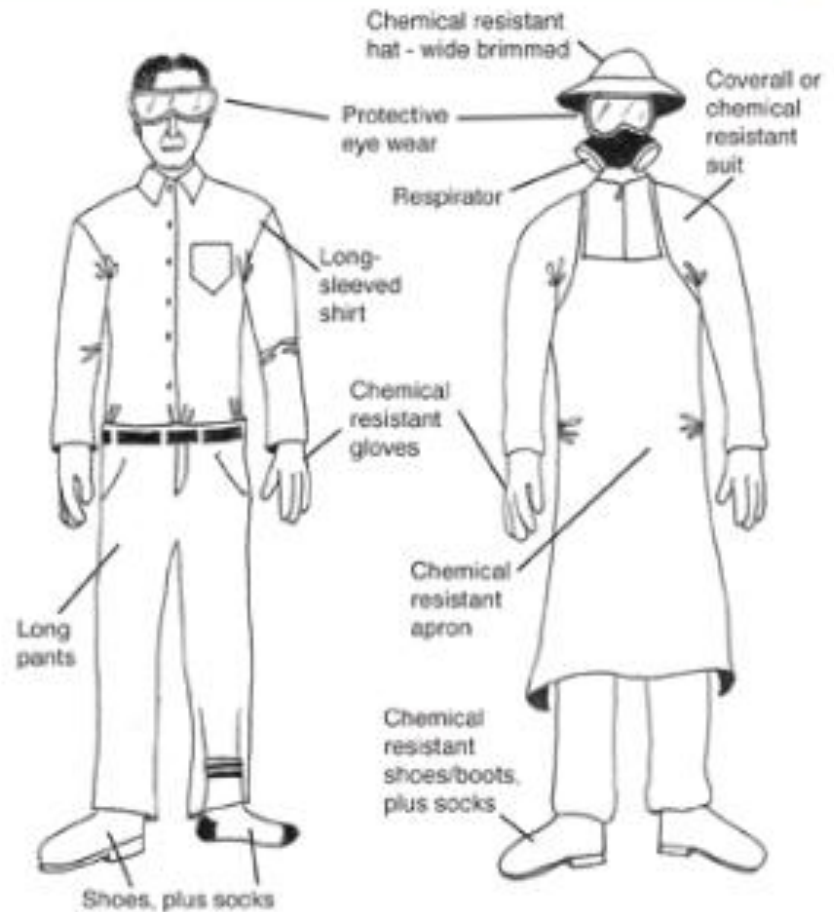


# Personal Protective Equipment (P.P.E.)



Protect your HOT spots!

Percents indicate relative amount of absorption of pesticide over a 24-hour period. (Feldman and Maibach, 1974. Percutaneous penetration of some pesticides and herbicides in man. *Toxicology and Applied Pharmacology* 28, pp. 399-404).



P.P.E. must be washed and dried after each day's use and stored away from chemicals. Change gloves and respirators as per manufacturers' specifications.

# Even in Syngenta's experimental farm in Hawaii

<https://legalnewsline.com/stories/511065024-epa-targets-syngenta-seeds-seeks-4-8-million-for-alleged-worker-protection-law-violations>

## EPA targets Syngenta Seeds, seeks \$4.8 million for alleged worker protection law violations

By **Mark Iandolo** | Jan 4, 2017



# Adapt NIOSH research to protect farmworkers

<https://www.cdc.gov/niosh/docs/2019-116/pdfs/2019-116.pdf>

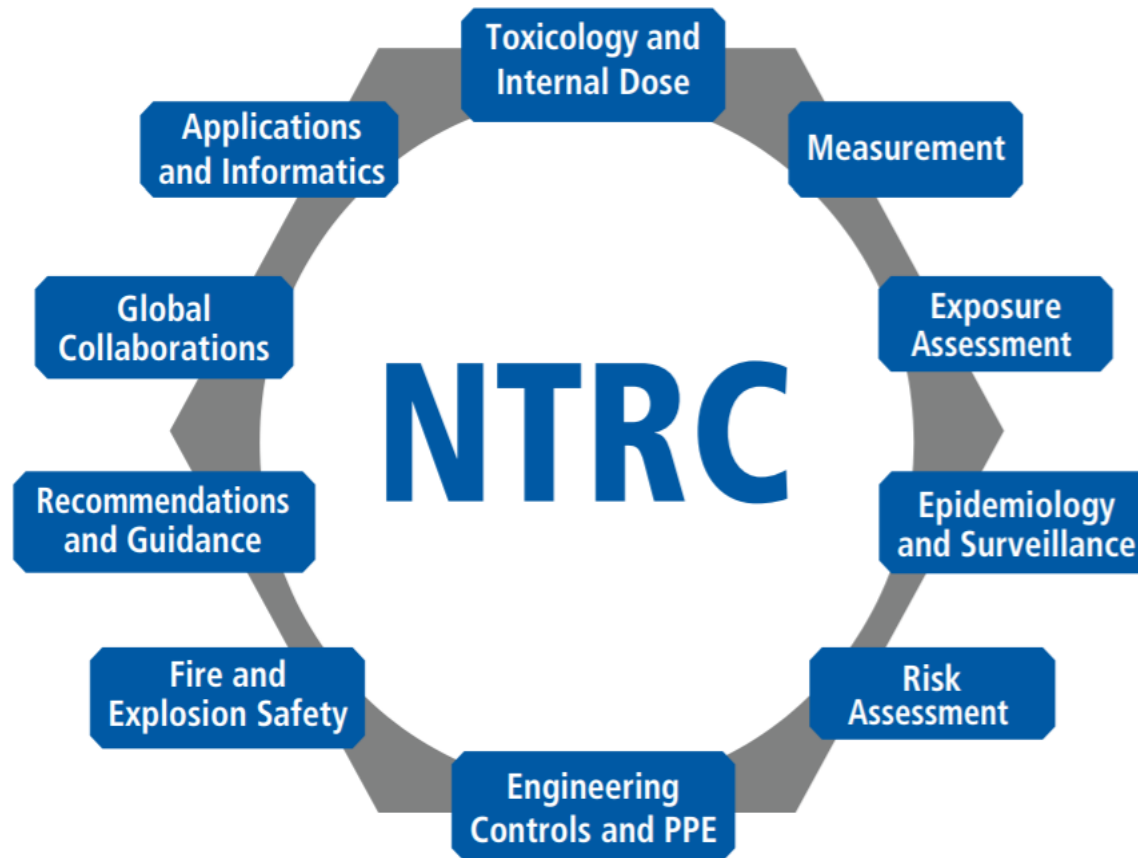


Figure 3. The critical research areas of the NIOSH Nanotechnology Research Center (NTRC).

# Steps towards protecting farmworkers

- Develop PPE adequate to prevent exposure to nano-pesticides, e.g. much better HEPA masks
- Monitor worker exposure to NPs with appropriate instruments, e.g. on instruments on PPE
- Take biological samples in the field or greenhouse
- Analyze the samples per initial route of exposure in the working environment of nano-pesticide use
- Use sampling and monitoring data for “Safe by Design” NPs in nano-pesticides and PPE design

# C. Sayes, "Exposure in Biological Systems: State of the Science" (2015): adaptable to farmworkers?

[https://www.nano.gov/sites/default/files/pub\\_resource/204\\_sayes\\_exposure\\_in\\_biological\\_systems\\_review.pdf](https://www.nano.gov/sites/default/files/pub_resource/204_sayes_exposure_in_biological_systems_review.pdf)

*The most useful monitoring data is when personal, area, and biological samples are collected within the same system*

- 1 Screen areas and processes**  
Consider the particular characteristics of a facility
- 2 Collect samples at source and personal space**  
Including chemical and physical properties of the nanomaterial
- 3 Analyze biological fluids**  
Probing for changes in biomarker levels  
Attention to immediate biological response

**Area**

**Personal**

**Biological**

## REFERENCES:

UC Santa Barbara (<http://www.cns.ucsb.edu>)

SafeNano (<http://www.safenano.org/knowledgebase/guidance/safehandling/>)

NanoSafe, Inc. (<http://www.nanosafeinc.com>)

NIOSH (<http://www.cdc.gov/niosh/topics/nanotech/>)

# Detection and Measurement of Nanoparticles - PERSONAL

## Protective Equipment

- Dermal exposure reduction
  - Gloves
  - Lab coats
  - Based on conventional IH
- Inhalation exposure reduction
  - Respirators, dust masks
  - HEPA filtration
- Ocular exposure reduction
  - No contact lens
  - Safety glasses or goggles

## Monitoring

- Personal samplers
- Gravimetric measuring (filter-based)
- Photometric measuring



Image courtesy Wikimedia

# EU project to reduce NP risk before NPs are incorporated into products

**NanoSafety Cluster**



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[ACEnano](#)

[Calibrate](#)

[CERASAFE](#)

[EC4SafeNano](#)

[GRACIOUS](#)

[Hisents](#)

## NanoREG II

**NanoREG II: Development and implementation of Grouping and Safe-by-Design approaches within regulatory frameworks**

Coordinator: [Institut National de l'Environnement Industriel et des Risques \(INERIS\)](#)

Participants:

- EUROPEAN VIRTUAL INSTITUTE FOR INTEGRATED RISK MANAGEMENT EU VRI EWIV (Germany)
- NANOTECHNOLOGY INDUSTRIES ASSOCIATION (Belgium)

# With or without nano rules: a hierarchy of controls with SdB NPs in first place (P. Schulte, NIOSH)

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5923569/>

Journal List › Nanomaterials (Basel) › v.8(4); 2018 Apr › PMC5923569



*nanomaterials*



*Nanomaterials* (Basel). 2018 Apr; 8(4): 239.

PMCID: [PMC5923569](https://pubmed.ncbi.nlm.nih.gov/29661997/)

Published online 2018 Apr 14. doi: [10.3390/nano8040239](https://doi.org/10.3390/nano8040239)

PMID: [29661997](https://pubmed.ncbi.nlm.nih.gov/29661997/)

## Implementation of Safe-by-Design for Nanomaterial Development and Safe Innovation: Why We Need a Comprehensive Approach

[Annette Kraegelh](#),<sup>1</sup> [Blanca Suarez-Merino](#),<sup>2</sup> [Teun Sluijters](#),<sup>3</sup> and [Christian Micheletti](#)<sup>2,\*</sup>

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# Nano-informatics: crucial for converting data into SbD NPs

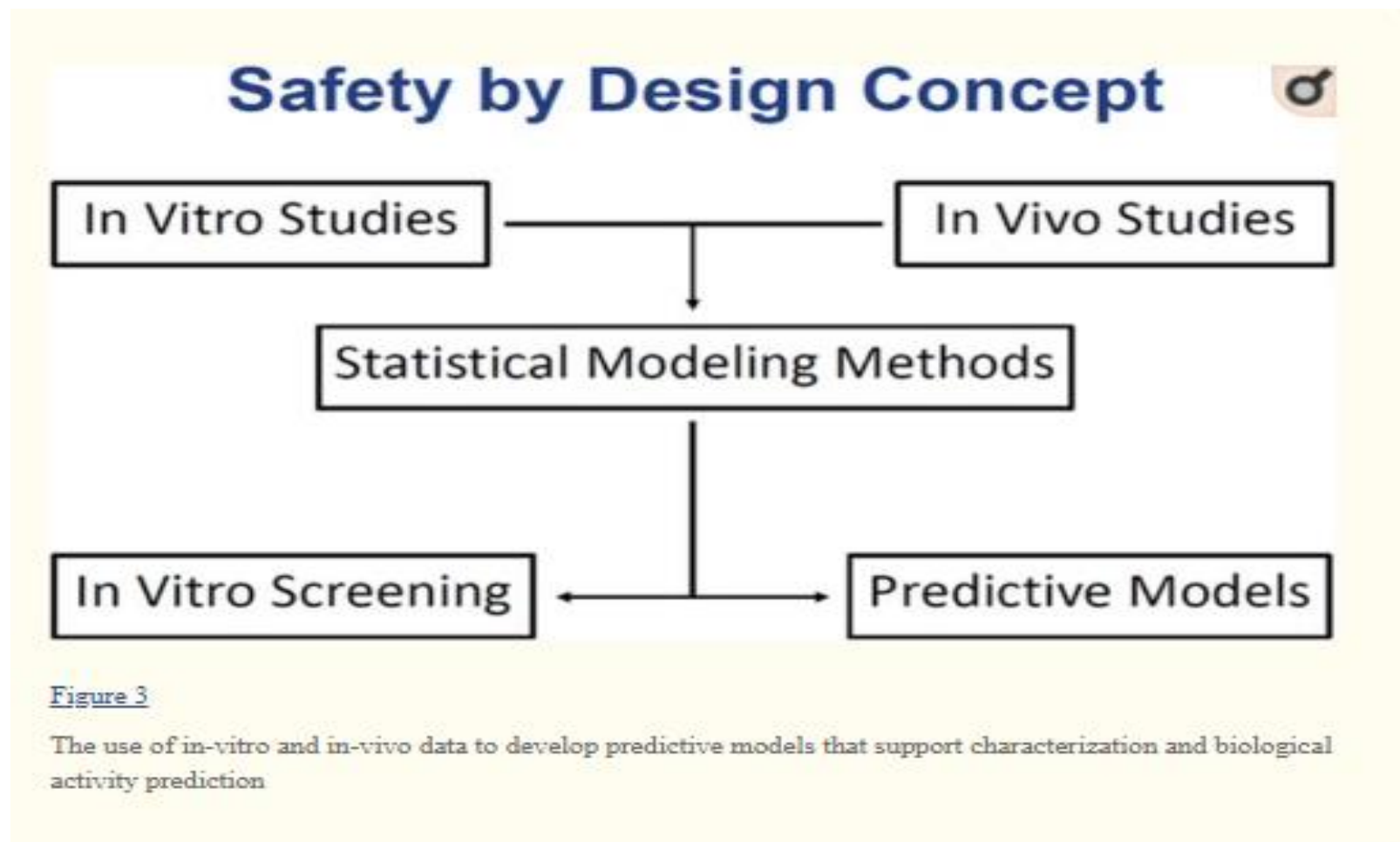


Table 1

Safe-by-Design (SbD) strategies described in scientific publications (2011–2018).

<b>SbD Strategy</b>	<b>Measure</b>
<b>Design out hazard (direct and indirect effects of nanomaterials)</b>	NanoParticle (NP) doping
	Surface passivation
	NP coating
	Reduction of photo-catalytic efficiency
	Formation of composites
<b>Reduce release</b>	Surface functionalisation
	Adaptation of the processing
<b>Reduce bio-persistence</b>	Selection of nanofiller
	Carbon NanoTubes (CNT) Doping
<b>Testing strategies for safety evaluation</b>	High throughput screening, alternative testing strategies and biological mechanisms
<b>Material characterisation</b>	
<b>Identification of risk hotspots for potential SbD approaches</b>	End of life cycle: thermal decomposition
	Life cycle assessment
<b>Pilot plant development</b>	Risk mitigation

# Safe by Design cannot reduce nano-pesticide risks if deregulation to protect agribusiness increases pesticide risks

<https://thehill.com/policy/energy-environment/467357-trump-administration-rule-to-shrink-exclusion-boundaries-near>



## Trump administration rule to shrink exclusion boundaries near pesticide applications

BY MIRANDA GREEN - 10/24/19 04:33 PM EDT

46 COMMENTS

# Conclusions and questions 1

- State of the science for nano-pesticides: environmental health (incipient); human health (non-existent)
- How to analyze nano-pesticides risk in the field conditions of its use?
- According to the EU, the OECD standards on biocides are inadequate for risk analysis of nano-biocides (industrial and agricultural uses)
- Nevertheless, the EPA allows use of nano-pesticides based on data submitted by the applicants as confidential business information

# Conclusions and questions 2

- Consensus: nano metal (e.g. Ag, Cu) and metal oxides (e.g. TiO<sub>2</sub>) are most hazardous NPs, due to their bio-persistence and other properties
- Which types of nano-pesticides pose the greatest risks?
- Does nano-encapsulation reduce AI risks?
- Can SbD techniques reduce exposure to NPs to reduce risks for farm workers using nano-pesticides?
- PPE for use with nano-pesticides does not yet exist
- Can PPE for lab technicians be adapted to protect farm workers?

# Government response to non-nano means to reduce the volume of pesticide use



TAKE ACTION

THE PESTICIDE PROBLEM

## A Brazilian agroecology training center is a target for eviction

