

*CASE REPORT ABOUT NANOTECHNOLOGY:*

**Redefining Workplace Safety and Health**

Ilise L Feitshans JD and ScM [1]

*Visiting Scientist Institute for Work and Health (IST) University of Lausanne,*

*Doctoral Candidate in International Relations*

*"Forecasting Nano Law: Risk Management Protecting Public Health under International Law"*

*Geneva School of Diplomacy, Geneva Switzerland*

Tel.: +41 79 836 3965 USA: 917 239 9960

**I. Nanotechnology's revolution for the global economy can also revolutionize public health, especially occupational health, return-to-work rehabilitation, and the delivery of workplace health services.**

Since 2008, an increasing body of international expertise has agreed that nanotechnology holds both great promise and unquantified, unknown major risks to workplace health. In 2012, several international organizations began the first steps towards making a harmonized system of nanotechnology regulation. This report describes a few early steps.

Scientists and governments agree that the application of nanotechnology to commerce poses important potential risks to human health and the environment, but the risks are unknown. Examples of high level respected reports that express this concern include: the Swiss Federation (Precautionary Matrix 2008) [2], the Royal Commission on Environmental Pollution (UK 2008), German Governmental science commission, Public testimony sought by USA, National Institute for Occupational Safety and Health (NIOSH, Feb 2011), the Organisation for Economic Co-operation and Development (OECD) working group (since 2007), the World Health Organization (WHO), working group (in process of formation), the World Trade Organization (WTO), and several non-governmental industrial organizations groups. Yet, qualitative data to protect exposed people and the greater ecological system that surrounds the human environment lags behind industrial use, research and application of nanotechnology to consumer products: Nanotechnology is expected to represent about three trillion dollars of Gross Domestic Product (GDP) by 2015.

The sheer economic importance of nanotechnology will change several antiquated systems regarding industrial processes, scientific understanding and categorization of chemical informatics and ultimately the health care delivery systems that must use or correct the end products of these changes anyway. Therefore, nanotechnology's arrival in commerce provides an unprecedented excellent opportunity to change society for the better, especially benefiting aging and disabled populations. Redefining workplace exposure tools and workers health constituents and removing embedded gender discrimination which creates health disparities between men and women in the workplace and in society in general [3] is a key development that will remain after nanotechnology's tidal wave of economic and social change. Therefore, nanotechnology's arrival in

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(\*) Corresponding Author - e-mail: [Ilise.Feitshans@chuv.ch](mailto:Ilise.Feitshans@chuv.ch) or [ilise@prodigy.net](mailto:ilise@prodigy.net)

commerce provides an unprecedented excellent opportunity to change society for the better, especially using occupational health systems as the vehicle for reaching, vulnerable populations such as aging workers and disabled workers, and for embedding into workplace infrastructures an appropriate place implementing United Nations Millennium Development Goals (MDGs):

- (1) promoting sustainable development among low and medium-income countries;
- (2) deliberately creating a rightful space for instituting Gender Equity where there has been none before, and
- (3) addressing the needs of aging workers and disabled workers whose rights have undergone a major paradigm shift in the first decade of the 21st century, due in part to the international political commitments made by WHO to end documented disparities in the global disease burden which undermine public health.

## **II. Recent Activity: The World Health Organization (WHO) Background Document on Worker exposure to Manufactured Nanomaterials, March 2012, to be finalized in 2013**

"The protection and promotion of the health and welfare of its citizens is considered to be one of the most important functions of the modern state" according to George Rosen, author of a History of Public Health []. It is not surprising therefore that, throughout history, precautionary principles of science have been embedded in many laws and public health policies, both within specific nations and across the borders of international laws. Taken together, the dynamic component of social changes from the combined application of nanotechnology to personal medicine and the new revolutionary rights under disability laws may soon require redesigning the workplace. It is possible therefore, with forethought, to create opportunities that maximize *the benefits of both the social change in disability laws and the economic and scientific changes to society through nanotechnology*. Nanotechnology provides the perfect opportunity to correct long standing system problems in the access, public awareness and delivery of services associated with public health. If applied with forethought when rethinking these vital social values, two sets of benefits can be realized by civilization at the same time: not as competing interests, but as one invaluable social change. This noble and undisputable rationale also provides the basis for regulatory guidelines in process across many international organizations, including the case example of WHO.

### ***A. Overview of WHO Background Paper for guidelines governing Worker Exposure to Manufactured Nanomaterials***

WHO's STATED PURPOSE: "These Guidelines aim to facilitate improvements in occupational health and safety of workers potentially exposed to nanomaterials in a broad range of manufacturing and social environments. The guidelines will incorporate elements of risk assessment and risk management and contextual issues. They will provide recommendations to improve occupational safety and protect the health of workers using nanomaterials in all countries and especially in low and medium-income countries".

### ***B. Stakeholder Comments The Role of Non Governmental Interest Groups***

A sound starting point for this analysis must demonstrate the role of workplace safety and health for applying the rule of law under the WHO Constitution, and also must convince readers-manufacturers, suppliers, end users and workers-- of the overarching importance of occupational health for the survival of all civil society, in order to justify the time, money and research resources that are dedicated to the implementation of the Guidelines once they will have been finished. This purpose is best achieved by underscoring the inextricable link between work, health and the economic viability of any employer or corporate entity. Thus, there exists

an inevitable need to address occupational health problems in order for civil society to survive. The stakeholder organizations participating in the WHO Comments therefore objected to the narrow rationale offered in the background paper.

### **C. Critique of WHO Draft Text**

#### **1. Risk Mitigation**

The term of art risk mitigation is a result-oriented process designed to prevent, detect, report and correct potentially dangerous conditions that can result in harm to human health or the global environment. The degree of acceptable risk, the methods of risk assessment and the measures of effectiveness for the same or similar hazards change in different circumstances. Key building blocks for "risk mitigation" infra structures include : (1) Managerial statements in writing that demonstrate the enterprise commitment to workplace safety and health and to protection of the global environment in order to reduce or stabilize the global disease burden; (2) Documentation of the components of the compliance infrastructure, using internal audits on a cyclical basis that can capture health disparities, isolate particular exposures that have heightened hazards and provide documentation of the best practices that were applied in response to potential harm; (3) in house communication to staff including interactive video training and web-based elearning regarding the safe response to problematic conditions in the workplace (regardless whether chemical or circumstantial, and embracing emergency response); (4) two way communication that enables complaints about problems to be recorded with response in a timely manner, using hotlines in -house newsletters and intranet ; (5) Documented ongoing interaction with regulators, insurers, consumers, suppliers, end-users and the general public in advance of developments and in case of emergency.

#### **2. UN Millennial Development Goals: Developing Nations and Transfer of Technology**

WHO is a signatory to the United Nations (UN) Millennium Development Goals ("MDGs", <http://www.un.org/millenniumgoals> <http://www.un.org/millenniumgoals>). The UN MDGs reflect an Organization word consensus of political will to correct antiquated working assumptions which in turn created long-standing systemic social problems. By definition, the UN MDGs embrace the needs of specific populations whose stakeholder rights were not fairly reflected in the first generation of UN documents in order to correct embedded systemic harms. Correcting such long established inequalities requires a deliberate conscious effort by each and every UN agency, every time a new programmatic effort is established. And, each program must prove it has met this test of consciously correcting historic inequalities in order to gain approval by the greater UN community. In this regard, WHO has undertaken to transfer technology not only concerning basic medical needs, applied research and primary health care, but also advancing transfer of State of the Art methods for understanding unquantified risk in any new technology, including nanotechnology.

#### **3. UN Millennial Development Goals: Gender Equality Promoting Reproductive Health**

According to UN WOMEN, the agency of the UN Charged with promoting gender equality, "Raising gender on the global development agenda", Posted on March 28 2012 the established method for achieving integrated implementation of the MDGs requires application of "Four key principles" across the board in all UN programming and strategic planning, including the development of Guidelines for risk management of public health:

"1. Equality: the goals need to be framed from an equality perspective and address biases and discrimination based on gender, class, race, ethnicity, among other factors in order to reach those that need it the most. 2. Holistic and integrated: ... This requires strong multi-sectoral approaches and forms of collaboration among actors in the social, economic and environment fields. 3. Participatory and inclusive: the goals need to emerge from strong participation and ownership at all levels: local, national, regional and global levels. Only when

the process is in the hands of the people-both women and men-and their decision-makers, will there be true ownership and accountability for the required progress and results.... and 4. Implementation: ... aligned with existing declarations and normative frameworks.

Goal 8, mandating development support for low and medium income countries, also can only happen after a deliberate effort has been made for conquering long standing inadequacies in the health system. This includes research for areas of public health that have traditionally been neglected in the workplace, such as reproductive health, asking also about transplacental transfer of nanoparticles whether by happenstance or as a deliberate nanomedicine. Overall, the result of integrating these principles into the Guidelines consistent with UN accountability will not be a "one size fits all" standard. Instead, the Guidelines can embrace these goals within the framework for compliance, by including specific criteria that will capture the data pertaining to emerging health disparities from exposures and contextual workplace conditions. This approach is accepted methods under international law in the text of International Labour Organization (ILO) ILO Convention 187, the promotional framework for occupational health management.

### **III Additional International Activities**

#### **A. NIOSH Recommended Exposure Limits ("RELs") 2011**

In the realm of implementing the precautionary principles, the USA National Institute for Occupational Safety and Health (NIOSH) has already taken a stand by holding public hearings regarding the question *"Whether the hazard identification, risk estimation, and discussion of health effects for carbon nanotubes and nanofibers are a reasonable reflection of the current understanding of the evidence in the scientific literature"* 4 Final text, underscoring the statutory justification for the NIOSH proposed Recommended Exposure Limits (RELs) and proposed methods of risk management to protect workers Governing Occupational Exposure to Carbon Nanotubes and Nanofibers appears on the NIOSH webpage free of charge.

#### **B. Council of Europe**

The Council of Europe has expressed concern about the implications of nanomaterial safety for consumer products impacting human health and the environment. Although no detailed studies have been authorized by the Council regarding nanotoxicity in humans or other species, there is a clearly articulated interest in exploring these questions in response to constituent and stakeholder needs.

#### **C. OECD Working Group (since 2007) and "good Laboratory Practices**

In November 2007 OECD founded a Working Party on Manufactured Nanomaterials to raise awareness about- and harmonize approaches for- exposure measurement and mitigation for nanomaterials. This was followed by the OECD Workshop on Exposure Assessment & Exposure Mitigation led by NIOSH on October 20, 2008 in Frankfurt, Germany

#### **D. ISO, SICAM and Public Private Partnerships**

Many privately funded organizations have also offered to voice their concerns not only about dangers and risks, but also about potential methods for instituting risk management, best practices. Some have offered text for draft regulations. Organizations such as the International Standards Organization (ISO) are privately funded and lack legitimate governmental accountability, but nonetheless command in the marketplace great influence and authority. They have established their own working groups regarding nanotechnology and risk management, and their recommendations will surely be used as a counterpoint to more formal regulations, and may be followed by leading industries whether or not there are regulations created by international

governments. These issues therefore will be hotly debated in a variety of organizations around the world, and will not go away

#### IV. Suggested Procedures to Avoid danger

*There is no such thing as "zero risk" but these short steps may help to protect against danger.*

Yet, most of the tools required for Risk Mitigation and protecting worker health already exist. Indeed, each of the stakeholders represented here produces or participates in public comment about at least one component of sound occupational health compliance infrastructures that promote risk mitigation.

The key components of sound occupational health training and best practices to implement that training include: certification programs, occupational safety and health training materials, nanotoxicity assessment organizations, and outside training materials produced by non-governmental organizations, using clear understandable language. Key facets of corporate compliance successes, using tools include:

Documentation of Management Commitment and Due Diligence to detect, report and prevent problems, In-house Communication through newsletters and hotlines, maximizing global access and use of interactive videos and online "elearning" for worker training, embracing the needs of aging workers, disabled workers, women and creating flexible programs with strong leadership support from management, in order to meet unexpected or sudden problems.

#### V. Conclusions: Bringing Health to Work Using Nanotechnology

Soon, if not already, every worker and employer and health professional in this audience will need a Nanomedicine Planning Strategy in order to maximize their company's benefits from these changes. The arrival of nanotechnology, praised and heralded as a welcome revolution reshaping industry, also provides the perfect opportunity for rethinking rehabilitation design, followed by drafting of special laws that will deliberately strike the workplace safety balance to protect and catalyze long needed social change. Research scientists and pro-active employers can play an important proactive role in shaping the destiny of these millennial changes in the global economy, workplace safety and health programs, and the future of society.

#### REFERENCES

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2. Swiss National Science Foundation, Opportunities and Risks of Nanomaterials Implementation Plan of the National Research Programme NRP 64 Berne, 6 October 2009, Royal Commission and Swiss Federal Office of Public Health (FOPH) and Federal Office for the Environment (FOEN) Guidelines on the Precautionary Matrix for Synthetic Nanomaterials Version 1.0 Berne 2008.  
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suva.ch/webshop/4D/4D212E53C9BB06F0E10080000A630358.pdf Aufgrund der aktuellen Datenlage können folgende Richtwerte formuliert werden: Kohlenstoffnanoröhrchen und -fasern (Länge über 5 µm, Durchmesser weniger als 3 µm, Länge - zu Durchmesser - Verhältnis von über 3:1): 0.01 Fasern/ml; dieser Wert entspricht dem Grenzwert für lungengängige Asbestfasern.

3. See: Ilise L Feitshans, ASSE Special Invited Presentation 2012 "Forecasting Nano Law: The Bright New Path for Workplace Safety Applying Nanomedicine" Proceedings, American Society of Safety Engineers Illinois USA 2012.

- 4 Review and Comment NIOSH Current Intelligence Bulletin: *Occupational Exposure to Carbon Nanotubes and Nanofibers* [PDF-804KB] Docket Number NIOSH-161, Feitshans Ilise L "LEGAL BASIS AND JUSTIFICATION: NIOSH RECOMMENDATIONS PREVENTING RISK FROM CARBON NANOTUBES AND NANOFIBERS" Comments on behalf of the International Safety Resources Assication (ISRA) of Fullerton California USA February 2011.