Committee/Council: Special Conference
Issue: The dangers of Nanotechnology
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Position: President

Introduction

Nanotechnology is an expanding branch of science that deals with particles 1-100 nanometers in size, materials that are 10,000 times smaller than the width of a single hair. In this field, engineers are creating countless new microscopic materials which are being used in thousands of consumer goods, from cell phones to clothes, from cosmetics to even aliments. Researcher K. Eric Drexler was the first person to popularize this technology in the early 1980's. Drexler was interested in building fully functioning robots, computers, and motors that were smaller than a cell. He spent much of the 80's defending his ideas against critics that thought this technology would never be possible. There are currently more than 800 products on the market having at least one nanocomponent. Yet experts don't hesitate while stating that there are some dangers. Scientists believe that possible dangers of nanotechnology lie in how these unnatural particles might interact with the environment, and the human body. Nanotechnology offers great potential for benefit to humankind, and also brings severe dangers. While it is appropriate to examine carefully the risks and possible toxicity of nanoparticles and other products of nanoscale technology, the greatest hazards are posed by malicious or unwise use of molecular manufacturing. [14] Considering that nanotechnology is the science of the future, eradicating such dangers is vital for the world...

Definition of Key-Terms

Nanotechnology:

"Nanotechnology, the manipulation and manufacture of materials and devices on the scale of atoms or small groups of atoms." *Encyclopedia Britannica*

"A technology executed on the scale of less than 100 nanometers, the goal of which is to control individual atoms and molecules, especially to create computer chips and other microscopic devices." *Unabridged Dictionary*

Risk assessment:

"A risk assessment is simply a careful examination of what, in your work, could cause harm to people, so that you can weigh up whether you have taken enough precautions or should do more to prevent harm." *Health and Safety Executive*

Background Information

It is assumed by scientists that nanotechnology will be used in every single field of life, and will enter to every household in MEDCs within the next 2-3 decades. Even now, it's already used in a wide array of products. Paints with nano particles allows graffiti to be washed off more easily. Tooth fillings with nano particles are less likely to fall out. Nanotechnology is also used in a variety of food products, such as sugar where the particles make the sugar crystals sprinkle better.[7] The 2004 UN Task Force on Science, Technology and Innovation noted that some of the advantages of nanotechnology include production using "little labor, land, or maintenance, high productivity, low cost, and modest requirements for materials and energy",[4] and therefore declared it as the "technology to change the future". Considering this massive growth in its usage it is quite understandable for people to question its safety. Nanotechnology also has the potential to contribute to the targets set for achieving the UN Millenium Development Goals, particularly in the areas of affordable energy, clean water, human health, and the environment. Various nanotechnologies show promise for providing cleaner more affordable and more efficient ways to harness renewable energy. This can help to reduce dependency on conventional energy sources and support greater energy self-sufficiency, an important goal for developing nations.[10] Nanofiltration may improve access to safe and affordable drinking water and basic sanitation, with direct implications for sanitation and public health. To bring these promises to fruition public research programs funded by governments or private companies, have an important role to play in providing greater incentives and encouragement for nanotechnologies that support sustainable development and therefore have a major impact on our future. With the arrival of new technologies, including nanotechnology, people consider the potentially harmful consequences to human health and the environment that might escort the development and the use of the mentioned technology. This evaluation of the benefits to society and the potential hazards is called "risk assessment". Even though risk assessment studies are relatively frequent measures aren't always as concrete as the findings.

Most new technologies are produced without full investigation of their long term effects in the real world environment. Scientists have been quite successful in characterizing and predicting the behavior of nanoparticles in the laboratory. Exposure to nanomaterials may occur unintentionally in the environment or through use of nanotechnology containing products. While the human body has its immunity system for natural particles it encounters, the danger of nanotechnology is that it is introducing entirely new types of particles. Particles some experts say the body is likely to find toxic. [2] Nanopollutants are nanoparticles small enough to enter your lungs or be absorbed by your skin. Such materials are vastly found in sunscreens. The concentration and density of nanomaterials in the environment will depend on various factors such as the amount of the nanomaterial released, its physical and chemical properties, and time before it contaminates the nature. Nanomaterials released into the environment may change form due to environmental conditions such as temperature, salinity, and the presence of co-contaminants. After, the transformed nanomaterials may have maleficent effects on the atmosphere, soil, or water. Biological or environmental systems may be exposed to these engineered nanomaterials if they're not disposed properly. This could perturb human health or adversely impact the environment, if all safety measures aren't properly taken.

Nanoparticles can penetrate cells, they are much smaller and more active than the cellular material they seek to penetrate and can literally slip through the cell wall in many cases. [7] There are no long-term studies available on the impact of nano particles on human health.

Protection of the environment, human health and worker safety while producing nanotechnological material in developing countries often suffers from a combination of factors that can include, but are not limited to, the lack of robust environmental, human health, and worker safety regulations, poorly or unenforced regulation which is linked to a lack of physical equipment and human capacity (properly trained regulatory staff). [5] Also products containing nanotechnological material cannot be understood. Apart from some cosmetic products such as sunscreens etc. products aren't labeled as containing such material.

Just like atomic energy, nanotechnology also can be very dangerous and has the potential to be used as a mass destruction weapon if handled incorrectly. The ability to alter substances at a molecular level is a powerful skill and, left in the wrong hands, could lead to misuse. One fear is manipulating particles to intentionally cause physical harm to one or more persons. Especially dangerous is the prospect of a terrorist applying this technology to create small, undetectable biological or atomic weaponry. With current weapons of mass destruction, testing, obtaining exotic precursors, and specific evidence, such as radioactivity, make monitoring and control possible in many instances. In contrast, nanoweapons, by definition, very small and made from common materials, would be almost undetectable. [13]

Nanotechnology not only will allow making many high quality products at very low cost, but it will allow making new nanofactories at the same low cost and at the same rapid speed. This unique ability to reproduce its own means of production is why nanotech is said to be an exponential technology. It represents a manufacturing system that will be able to make more manufacturing systems (factories that can build factories for example) rapidly, cheaply, and cleanly. The means of production will be able to reproduce exponentially, so in just a few weeks a few nanofactories conceivably could become billions. [14] Lately scientists have proven that the "Grey Goo" end-of-the-world scenario is actually possible. Grey Goo was once only a science-fiction script; and it was described as this; "*Imagine, sometime in the far future, that an oil tanker has run aground and is spilling its billions of gallons of cargo into a pristine natural habitat. A flotilla of tiny oil-munching nanorobots is deployed to break down hydrocarbons, rendering the spill harmless. In this science fiction scenario, the nanorobots have the capability of self-replicating, making hundreds of copies in minutes. And, instead of eating only hydrocarbons, the robots begin to eat everything around them. It doesn't take long before everything on Earth is consumed by the proliferating mass of robots. Life, as we know it, would be gone."* [8] The available biomass could be destroyed by gray goo very rapidly.

There is also a social aspect of nanotechnology. Depending on the speed of processes in the field of nanotechnology a massive cliff may occur between the upper class and below. For example nanotechnology which strengthens the human body would be directed towards the high-income section of society according to the modern capitalist laws and could further divide the population into a “super” class of intelligent, strong beings and a lower class of "average” people. [11] Also the use of

nanotechnology will cause labor problems, loss of manufacturing and agricultural jobs. Another threat of nanotechnology socially is what called as "cyborgs". Taking nanodevices into human bodies, either to extend its powers or to extend its life, creates an intimate relationship between the machines and humans. Whether the result is viewed as symbiotic or parasitic, at some point, the needs, values, and orientation of these new individuals may become drastically different from what is currently defined as human. These scenarios may seem to be exaggerated science-fiction scenarios but such stories are very much expected. [13]

"*Technology will remain a double-edged sword."*[12] It represents vast power to be used to satisfy all humankind's needs, to develop the human kind. Nanotechnology will provide the means to overcome massive problems such as illness and poverty, but also will empower destructive ideologies. Humanity must strengthen its defenses while applying these technologies to advance its human values. Possible dangers are not to be forgotten.

Major Countries and Organizations Involved

United States of America

The United States is the leading country for nanotechnology innovation worldwide. With the National Nanotechnology Initiative (NNI) launched in 2000, USA now has a federal organization specialized in nanotechnological research & development projects. Since then, more than 60 nations have launched similar initiatives on nanotechnology. Businessmen are collaborating to promote the use of Nanotechnology by means such as The NanoBusiness Alliance which is the first industry association founded to advance the emerging business of nanotechnology. [3]

Germany

Nanotechnology holds great technological and economic potential for Germany. Today, about 950 companies work on the development, application and distribution of nanotechnology products. About 63,000 jobs are involved, with an upward trend. The Federal Government's "Nanotechnology 2015 Action Plan", presents a concept that pools lines of action and fields of application in the context of nanotechnology. It focuses research and research funding on the societal challenges for example climate and energy, health and nutrition, mobility, security and communication. Economic exploitation, responsible use, a regulatory framework and a public discussion are other important factors. [9]

Timeline of Events

Date	Description of event
1974	Professor Norio Taniguchi came up with the term Nanotechnology [6]
1981	Gerd Binnig and Heinrich Rohrer invented the "scanning tunneling microscope" (STM) which is an instrument for

	imaging surfaces at the atomic level. This invention is to be considered the debut of nanotechnology. [1]
1986	Gerd Binnig, Calvin Quate and Christoph Gerber invented the atomic force microscope, which is very important in Nanotechnology. [6]
1990	Early nanotechnology companies began to operate; Nanophase Technologies in 1989, Helix Energy Solutions Group in 1990, Zyvex in 1997, Nano-Tex in 1998….
1996	The first European conference is held to discuss matters of Nanotechnology [6]
1999	Safety guidelines are founded for dangers in handling Nanotechnology [6]

Relevant UN Treaties, Resolutions and Events

- United Nation's Annual Report of the Global Environment 2007 / Emerging challenges - nanotechnology and the environment.

- The Ethics and Politics of Nanotechnology 2007 / UNESCO

Previous Attempts to solve the Issue

Various documents were published by various organizations clearing the public opinion on the dangers of nanotechnology, but measures are very light. United Nations itself doesn't have any measures taken towards the establishment of global nanotechnological standards. Universities and educational foundations mainly do the researches on this matter.

Possible Solutions

Significant debate exists relating to the question of whether nanotechnology or nanotechnology-based products merit special regulations. So far, neither engineered nanoparticles nor the products and materials that contain them are subject to any special regulation regarding production, handling or labeling. Researches indicate that people are more likely to be "for" nanotechnology when they are aware of where it is being used. It has been argued that the development of comprehensive regulation of nanotechnology will be vital to ensure that; the potential risks associated with nanotechnology do not overshadow its potential benefits.

Relinquishment at the right level is needed and researchers must place their highest priority on the continuing advance of defensive technologies, staying ahead of destructive technologies. An overall strategy should include a streamlined regulatory process, a global program of monitoring for unknown or evolving biological pathogens, raising public awareness, international cooperation, software reconnaissance, and fostering values of liberty, tolerance, and respect for knowledge and diversity. [12]

Regulation may also be required to meet community expectations about responsible development of nanotechnology, as well as ensuring that public interests are included in shaping the development of nanotechnology. *"With environmental impacts of nanotechnology yet largely unknown and public controls absent, more systemic research and sector-specific policies on nanotech are necessary,"* states United Nation's Annual Report of the Global Environment 2007, *"It is essential to correct this imbalance by directing more resources to investigating the impacts of nanomaterials, minimizing the health and environmental risks and supporting sustainable development."*[10]

A transparency policy must be followed. Public must be aware of all the possible consequences of the materials they consume and therefore all the products containing nanomaterials are to be examined by various professional organizations. Such researches are the only way of clearing people's minds and rendering this technology trustable.

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