

Ethical and Social Implications of Nanotechnology

Yogesh Badole¹

Available online at: www.xournals.com

Received 18th August 2018 | Revised 30th August 2018 | Accepted 12th December 2018

Abstract:

In this paper, we discussed the impact and fundamentals of nanotechnology and some potentials about its social significances, effects on environmental and health, and the ethical issues. The revolution is occurring in the society in which the custom is being renewed through the creation of material and products. Nanoparticles have high toxicity compare to the mass chemicals for the reason that of the increment in the surface to the ratio of volume as the molecules existing on the superficial layer are more by which the intrinsic toxicity enhances. Few articles discussed about the ethical value of nanotechnology in which it was implied that the nanotechnology's ethical discussion require to start from the scratch. And for establishing the nanotechnology, the discussion have been made by many researcher in the field of ethics. It is claimed that an inspirational method to the nanotechnology's ethics are supposed that a constrained number of simple ethics are frequently acknowledged. More than two million people would be engaged in nanotechnology industries and the people would have the supporting jobs. In spite of having many applications in nanotechnology, it has many ethical issues and threats in its operation. There is known that the nanoparticles are toxic in nature because the elements in the Nano-level behave differently compare to their role in bulk form. These nanoparticles are helpful to penetrate the blood brain obstruction. Hence, it is up to us, whether we use this new emerging technology as a bliss or curse.

Keywords- Nanotechnology, Revolution, Ethics, Bliss, Curse, Challenges.

Authors:

1. Department of Electronics and Communication, Nirma University Ahmedabad Gujarat, INDIA.

Introduction

It is the branch of technology that deals with the particles having the size less than 100 nanometers. Actually it is the technique in which the matter is manipulated at atomic and molecular level, after that taking the advantage of them on the basis of their capabilities and properties. In the short term, nanotechnology is the conversion of numerous functional technologies and disciplines that deals with particles and their configurations consisting the size in nanometer.

Origin of Nanotechnology

On December 29, 1959, the concept of nanoscience and nanotechnology is moved with the title 'there is Plenty of Room at the Bottom' given by Richard Feynman, physicist in the combination of American Physical Society at the California Institute of Technology. In their address, he conferred about the process through which the scientist would be able to change and mechanism of the molecules and atoms. After the decade, Professor, Norio Taniguchi added the term nanotechnology in his examinations of ultraprecision machining. Again in year 1981, scanning tunneling microscope was established through which individual atoms could be seen and began modern nanotechnology (www.non.gov).

For designing the system at the nanoscale, there is need to develop the capability for remodeling the structure of all compounds that may be natural and synthetic. It is reconsidered that the new opportunities have been gained for the rebuilding of overall materials. The increment of strategy strength raised the question about the social and ethics. For making the nanotechnology as a well-developed, sustainable, and ethical followers, then there is need to educate the stakeholders of nanotechnology about the merits, demerits and risks related to the nanotechnology. Nanotechnology have the impact on all areas as their precursor technologies have. For instance, in the field of healthcare, the nanotechnology includes the automated diagnosis that decode into less patients need the physical assessment, less human errors, few period to create a analysis, and broader contact to the related services of healthcare. If by using the nanomedicines, the life span of human increase then the human depends on the nanomedicine that increase their health expenditures. The four social objectives are necessary for the nanotechnology stakeholder It is essential for nanotechnology stakeholders (**Khan 2015**).

Nanotechnology is a new emerging technology in which the manipulation of the materials occur at the atomic and molecular level having the size ranging from 1 to 100 nanometers which is the one billionth of the meter. One journalist stated that the nanometer is appeared as position of nose on face, than the RBC's show their dimension as the Empire State Building, the hair of human displays as 2 or 3 miles broad, 1 finger as the central United States and a normal individual height would be about as tall as six or seven planet Earths. It is unknown about the unexpected properties of the ordinary materials which are being learned still. The physics plays an important role with resources and huge surface to ratio volume of components (more reactive compound) at nanoscale. The materials which are hard at normal scale have the super power at nanoscale even the materials which do not conduct electricity at ordinary scale can be electric conductor at nanoscale because of the change in the physical and chemical properties. To illustrate how the properties change by changing the scale, as the aluminum at ordinary scale make the harmless soda cans but this aluminum in the fine power (nanoscale) it reacts with air and explode. Not only size matters, as the manipulation occur in common elements at the nanoscale, new materials can be developed by scientists. For instance, the carbon atoms in bound in loose-configuration creates the coal and graphite present in pencil or in tight-configuration it make diamonds while in the extra accurate shape, it forms carbon nanotubes which is more powerful resources than the steel at one sixth the weight. The nanotechnology make the thing easy as smaller and quicker giving chips that can be inserted in our body or in computer and also the medical opportunities which provides less invasive, surgical procedures and more targeted drug supply and other ingredients that make transference easier and energy efficient. It is also helpful for making energy weapons and armor and many other enhancements. It has also been predicted that the nanomedicine increase the life cycle by 100 of years or more by repairing the cells and also reverse the age process. Through the help of nanotechnology, we would be able to construct anything which would be needy in future. Nevertheless, on the basis of nanotechnology, companies are trying to productize of their research for generating the applications related to commercial sectors. The products of nanotechnologies are coming in the markets quickly in which the strain-resistant paints to scratch-resistant paint, sports materials, cosmetic and sunblock are involved. In

fact, in 2006 a company announced that it is being observed the emerging nanotechnology in the products seen in markets (O'Donnell, 2006). The similar statement was made by the Other famous companies as well, US\$221 million was invested by BASF's plan in nanotechnology research and enhancement in the coming next three years (James, 2006).

Effects of Nanotechnology on Organism

It is estimated that the proportion of nanoparticles is similar to the biological molecules (such as nucleic acids and protein). Hence, when the nanoparticles come in the contact with the body's tissue or fluid, they are absorbed by them but the phenomenon of absorbance depends on the properties of individual nanoparticles like surface properties and energy. The absorbance phenomenon depends upon the surface energy and properties of the individual nanoparticles. After absorption these nanoparticle reacts with the body organ like blood cells, liver heart, kidney etc. the toxicity of the nanoparticles depends upon the shape, size, surface structure, solubility and chemical composition of nanoparticles which control the mechanism. As we have been discussed above the nanoparticle is more toxic than the bulk chemicals of their materials for the reason that of the increment in the surface to ratio volume in the molecules extant on the surface and improve the intrinsic toxicity. Some studies show as the shape change, the toxicity change. The nanoparticle is toxic in nature for example CNT is more toxic for lungs than the quartz particles. The shape does not matter while the chemical composition is the factor that affects the reactivity. Solubility is another factor which is most important that also affect the interaction between the nanoparticles and biomolecules. The particles that have the high solubility is less life time while the particles which have the low solubility can stay longer (Purohit et al. 2017).

In short, few articles discussed about the ethical values of nanotechnology which have been published. In their articles, they demonstrate that the nanotechnology require their beginning from scratch. Since the development of academic discipline of bioethics, researchers raised the questions about Nanotechnology in the area of ethics and by ethical boards.

Review of Literature

Roco (2003), discussed the chief aim for emerging nanotechnology is to progress wide social areas like better understanding of nature, enhanced healthcare, improved efficiency and spreading the boundaries of supportable growth and of prospective of human. The paper summarized social association actions in nanotechnology R&D programs. The US National Nanotechnology Initiative yearly share in research with societal and educational inferences is projected at around \$30 million and rewards around \$23 million consisting influences to student companionships, and in Nano scale research having significance to atmosphere at around \$50 million. An application is formed for funding and researcher's organizations universally to create liable and timely merits of recent technology for supportable as well as monetary growth, to start public inferences works since establishment of the programs of nanotechnology, and to connect efficiently the areas and possible threats involving research workers and the community.

Roco and Bainbridge (2004), discussed about judgments conveyed by academe, prominent industry and government specialists at U.S. National Nanotechnology Initiative supported the gathering. The consequences were shortened in numerous themes connected to commercialization and economic impacts; societal situations, quality of life, technological convergence, governance, ethics and law, education and public perceptions.

Lewenstein (2005), discussed regarding amounts as an ethical and social issue and a characteristic such as environmental health, confidentiality, and security media publicity, and other seemingly distinct matters. Present articles, reviews those proposes and matters that concerned regarding essential ideas of ethics, like justice, fairness, especially power, equity, unite the numerous matters recognized as 'ethical issues and social' in nanotechnology. The capability to observe beliefs of fairness, objectivity, especially power and justice and hence defined as the main social connections that structure the importance of society and science. Numerous aspects of nanotechnology proposes that can give the outline on which to create a detail meaning of 'ethical issues and social issues'. Certainly, the efforts to explain 'ethical issues and social issues' hardly itself an application of control that can avoid us from sympathetic that in what ways essential social issues towards the growth of scientific information and its related application with the help of technology in the

current time. Also the effort to divide ethical issues and social issues from further areas of nanotechnology research protects from accepting the manner that justice, equity, and strength are essential features of technology as well as science.

Khan (2015), Studied that the probable influence of nanotechnology has been plugged as a secondary industrial rebellion and hence in spite of same estimates for skills and technologies like robotics and computers, nothing up till now concealed initially. In US as well as other numerous countries several partnerships between governments, university and industries have been produced to simplify growth, commercialization and research of advances of nanotechnology. These association is predictable to bring about the following nanotechnology generation as well as nanotechnology dependent new markets and products with a potential job formation and monetary growth. Regardless of numerous advantage of nanotechnology, there present possible threats and ethical concerns consisting in its application. The social environment or society is counting to be at verge of a revolution that will alter the methods in which products and resources are formed. The chances that will progress in the upcoming aspects on the basis of considerably manner in which a different challenges are fulfilled. In a manner to allow our upcoming leaders to preform verdicts for supportable monetary growth related to nanotechnology, it is found to be authoritative that we instruct all the stakeholders of nanotechnology regarding the long-term and short-term profits, limits and threats of nanotechnology. The societal consequences of nanotechnology include various important parts like privacy, ethics, environment, and safety. The presents study focus an outline of developing and recent nanotechnologies and their social as well as moral consequences to named twenty-first century tasks as well as matters. Nanotechnology has the probability to alter positively, society, or undesirably. Since it will affect everybody, all supporters of society including investors must consider an opinion in its commercialization and development stages. Currently, nanotechnology is in its embryonic stage, and absence of knowledge regarding its belongings on human beings and the atmosphere and its uses in parts of agriculture, medicine and food.

Purohit et al. (2017), mentioned the study of the essentials of nanotechnology and some expectations

around its social significances, ecological properties, and ethical concerns increases. The specific features of nanotechnology have been establish that are expected to be authoritative in defining its influence on the parts of environment as well as society. Hence, significantly, replying to the challenge of nanotechnology will entail challenging “philosophical” interrogations regarding the type of society we want to produce and the part that technology also focused in generating it and improved expert of technical improvement in the aspects of nanotechnology with clearer supportable purposes and advanced quality environmental threat and life cycle valuation are needed. Most of the time, the nanotechnology is an instance of struggled technological-fix to difficulties that in genuineness needed economic, social and political elucidations. We are consequently connected with moderately than giving absolute solutions to our significant difficulties, nanotechnologies will shore up a recent wave of developed growth that will expand present reserve and energy usage and make worse environmental damage. Eventually, the numerous assessment of the nanotechnologies will reflect advantage for human beings, as dignified through monetary development, better longevity and health, strengthened security, environmental protection, enhanced human capabilities and social vitality.

Conclusion

In the present study, there focused on the outline of the nanotechnology and more importantly its uses in the contrast of both ethical and social implications. The challenges related to nanotechnology emphasis on ethical factors of biotechnology as well as its difficulties were focused in the paper within the boundary of consciences. The present paper details that although there are very less work done on the ethical problems of nanotechnology and hence this study present to be worthy for the groundwork and initiation of ethical discussion on nanotechnology. Besides that it is also stated in the paper that motivating approach towards the nanotechnology beliefs is found to be claim a very limited amount of ethical morals are accepted.

The social consequences of nanotechnology and the mortalities consisting social disciplines have an serious purpose concerning the application of new technologies which putting important interrogations such as what sort of influence on humanity occurred by thei recent technology? Also Will this recent

technology influence the understanding of a worthy life?

The purpose of posturing these interrogations is not to create recognition and faith in the public, but to create a severe valuation of recent technology so that the community may create an updated and valid judgement. The ethics reflected as a co-player initially discussing the requirements and purposes of

the society, and furthermore helping as a construction to control the social order on the way to these objectives. The aims of focussing for participating the humankind and the social disciplines may also generate interdisciplinary surroundings, and for example nanotechnologists as well as ethicists are in regular flow of flow for shortening moral consideration as an essential role of the process of research relating nanotechnology.



References:

Ebbesen, Mette. "What Can Nanotechnology Learn from the Ethical and Societal Implications of Biotechnology?" *Http://Citeseerx.ist.psu.edu*, citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.465.5350&rep=rep1&type=pdf.

Khan, Ahmed. "Ethical and Social Implications of Nanotechnology." *QScience Proceedings*, 2015, www.qscience.com/doi/pdf/10.5339/qproc.2015.elc2014.57.

Lewenstein, Bruce V. "What Counts as a 'Social and Ethical Issue' in Nanotechnology." *International Journal for Philosophy of Chemistry*, 2005, www.hyle.org/journal/issues/11-1/lewinstein.pdf.

Nano Societal Implications of Nanotechnology." *Scholarworks.umass.edu*, scholarworks.umass.edu/sinano/.

Purohit, Rajesh, et al. "Social, Environmental and Ethical Impacts of Nanotechnology." *ELSEVIER*, 2017, www.researchgate.net/publication/318647293_Social_Environmental_and_Ethical_Impacts_of_Nanotechnology.

Roco, M.C. "Broader Societal Issues of Nanotechnology." *Journal of Nanoparticle Research*, Mar. 2003, link.springer.com/article/10.1023/A:1025548512438.

Roco, M.C., and W.S. Bainbridge. "Societal Implications of Nanoscience and Nanotechnology: Maximizing Human Benefit." *Journal of Nanoparticle Research*, 3 Dec. 2004, pdfs.semanticscholar.org/b777/aba5fe4cb7b1994e5041b6d3c1d418af3c58.pdf.

Vance, Marina E, et al. "Nanotechnology in the Real World: Redeveloping the Nanomaterial Consumer Products Inventory." *Beilstein Journal of Nanotechnology*, 21 Aug. 2015, www.ncbi.nlm.nih.gov/pmc/articles/PMC4578396/.

WOLFSON, JOEL ROTHSTEIN. *Social and Ethical Issues in Nanotechnology: Lessons from Biotechnology and Other High Technologies*. 2003.

Www.nano.gov, www.nano.gov/nanotech-101/what/definition