ETHICAL ISSUES OF NANOTECHNOLOGY
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Nanotechnology is the study of controlling matter on an atomic and molecular scale, and it deals with structures of the size one hundred nanometers or smaller and the development of materials or devices within that size. Nanotechnology is very diverse, ranging from extensions of physics, chemistry, biology, to a whole new approach based on self-assembly and the ability to control matter on the atomic scale. The field of nanotechnology has immense potential to create many new materials and devices that could be applicable in the field of engineering, medicine, information and communication, environmental, energy, and will help provide solutions to some of the global challenges we face. Benefits of nanotechnology range from improved energy systems, better manufacturing and food production methods, while requiring little labor, low in cost, and small requirements for materials and energy. Applications and products of nanotechnology include nanofilms, nanotubes, water filtration techniques, solar plastics, and many more. On the other hand, this very same field prompts many issues and has seen much debate on the future implications it may have on the world. These implications include medical, ethical, mental, legal, and environmental. When it comes to these issues, the effects of nanomaterials on the human biology, on the environment, and the effects of the availability of nanotechnological devices will have on politics and human interaction raises discussions and debates on the potential risks of nanotechnology. There are many critical issues facing nanotechnology and ethics, but the defining issue is human enhancement.

When talking about nanotechnology and ethics, the first thing that comes to mind is the materialization of the topic human enhancement. The ultimate goal of nanotechnology is to be able to fully manipulate molecular and atomic structures, and since humans are made of the very same basic building blocks, nanotechnology and humans go side by side. The ability to change human tissues and cells at the molecular level will open many doors to the enhancements of the human body in terms of intelligence, appearance, capabilities, etc. This issue differs from the application of technology for remedial purposes on the human body. Human enhancement in this context is the ability to use technology to enhance the human body and mind, and it also extends to the topics of human life longevity, artificial intelligence, etc. Even though these enhancements will be beneficial, they do raise the underlining issue of morals and ethics. Improvements of medicine today would include advancements that result in the end of disease, aging, reparation of an aged body and brain, or nursing a diseased person back to full health. The more controversial enhancements are those deemed “unnatural”, which include extreme intelligence, expanded memory capacity, heightened athletic capability and strength, beauty enhancements, and in some cases, human birth. Enhancements such as steroids, plastic surgery, and other medical forms already attract immense scrutiny and controversy, and one can only expect the same kind of reaction towards nanotech enhancements in a more intensive way.
Now, the issues regarding this topic go even deeper and further. One side of the argument is that humans are already entrusted with decisions about their own health and welfare, and that nanotech enhancements should just be an extension of those decisions. The only exception to this rule would be children and the mentally handicapped, who then would require a guardian to make decisions on their behalf. Although this sounds good in theory, the underlined issue with this is that even guardians do not necessarily make decisions in the best interest of who they are protecting. The ethical issues that come along with human enhancements now become competition with people who are mentally enhanced, or competition with somebody who has been athletically enhanced against those who are not. Others also worry the evolution of classism and social disparities when it comes to human enhancements and nanotechnology, meaning if the technology were to be expensive and limited, only a specific class of people would be able to become more advanced and enhanced. In a sense, “the rich would become stronger, smarter, and more beautiful – and as a result, richer”. This in turn would widen the social gap, and the creation of a “super human” could become a reality while the division between the enhanced and the underclass could also be permanent.

Also, another perspective and stance that has been yet to be touched upon is that of religion. Many believe that humans should not become the hand of God hence should not “play God”. The attempt to artificially enhance the building blocks of life falls in this category, but has been often disputed because it conflicts with the medical studies and advancements of today. As stated by the nanoethics group, “there are also practical considerations about placing limits on human enhancement. As long as the technology exists, some will want to enhance themselves, and some doctors will be willing to provide enhancements, regardless of their legal status. If enhancements are banned within a given country, people will simply leave the country to become enhanced. If they are banned worldwide, there would likely be an extensive black market.” This in a sense provides no guaranteed way to limit or stop human advancement from gaining full force. On the other side of human enhancement are the arguments of pro-enhancement in terms of self-improvement and current attempts to improve ourselves through education, hard work, etc which are all uncontroversial and acceptable. Many arguments can be made for pro-enhancement and anti-enhancement and are all under discussion and debate today to the fullest extent.

One of the proposed solutions to the ethical issues facing nanotechnology is the regulation of nanotechnology and nanotechnology-based products itself. The emergence of nanotechnology today have triggered and raised awareness for the effective regulatory arrangements. Presently, there is no comprehensive regulation to administer research and the commercial application of nanotechnologies, or any comprehensive classification for products that contain nanoparticles or products derived from nano-processes. There is debate as to who should be responsible for the regulation of nanotechnology. There are some non-nanotechnology agencies that currently administer existing regulations, but there are gaps into what they oversee. With that being said, there is no international regulation of nanoproducts as well, nor are there internally agreed definitions or terminology for nanotechnology. Neither are there internationally agreed protocols for testing nor standardized protocols for evaluating the environmental impacts of nanoparticles.
This only gives you a small idea of about the immense range a proposed regulation agency would have to cover. This however is not the sole reason as to why regulation is not in full effect, because even large gaps in scientists understanding of the materials are slowing the development of a regulatory scheme. Equally important and unresolved is who should pay for these studies. Nanomaterials are already in the mainstream life of consumers, ranging from the integration of sports equipment, computers, sunscreens, and many more. Of course, studies already shows that risks involved with these nanoparticles embedded in these products already on the market are close to none, but the same claim cannot be said to these nanoparticles by themselves.

The reason a regulatory agency is being pushed for is because there is an estimated seven hundred types of nanomaterials being manufactured at about eight hundred facilities in the United States, which prompts serious concerns about safety. The only thing close to a regulatory agency here in the United States is the Environmental Protection Agency (EPA), but is already being deemed inadequate. Manufacturers of today are not required to make reports of environmental or health risks uncovered about nanoproducts they are making, but are asked to alert officials if any risks exist. This in turn creates a voluntary process, which can develop into something and can be used to gain experience said Charles Auber, Director of the EPA’s Office of Pollution Prevention and Toxics. There is however some encouraging news about where a regulatory process is heading. The United States Government is slated to spend $39 million this year on research to investigate the issues and implications of nanotechnology. This however leads to criticisms that the future of nanotechnology will fall in the hands of the government, and that the future of nanotechnology will be at the agenda of what the government has planned for it. This however goes back to the ultimate question, which is who should be in charge of regulation.

In conclusion, this paper only goes over one of many issues facing nanotechnology and its future. Also, this paper also only provides one proposed solution to the issues facing nanotechnology in terms of its pros and cons, and there is no definitive answer as to what should be done regarding these issues. However, one thing can be clear and that is the evolution of nanotechnology is ever constant and growing. The benefits can already be seen, and there will be many more to come. On the other side, the downfalls and potential dangers are also apparent with the new technology being developed by nanoparticles. There is no answer one way or another, but constant discussion about the issues can help provide relief for either side of the spectrum, and help bring about a viable solution regarding these heated discussions and debates.
REFERENCES