Medical Rewrite

-Mini-introduction

Nanotechnology is projected to be a trillion dollar industry within ten years and open up the possibility of thousands if not millions of new jobs. Nanotechnology aims to manipulate matter at the atomic scale, and nanotech devices are measured by the nanometer - one billionth of a meter[1]. For instance, one micrometer is 10^{-6} meters while nanotechnology is 10^{-9} meters. The idea and thoughts about nanotechnology have been around for years (1959), but it is just now becoming a real thing and being introduced to the general public. There have been surveys conducted by the Woodrow Wilson center and the results show that hardly anyone has a thorough understanding of nanotechnology. If the projections are correct, nanotechnology is going to change the world as we know it.

-Why should the audience care and why did we choose this subgroup?

"Nanomedicine is the preservation and improvement of human health using molecular tools and molecular knowledge of the human body."[2] Nanomedicine can perform simple tasks that advanced biotechnologies can not accomplishment. The audience should be involved in this process since nanotechnology is on such a small scale. The general public needs to know that in a few years there may be robots small enough to be injected into the blood stream available for doctors to use. The medical field was chosen because there are a lot of medical applications that are starting to become available to doctors and the whole medical industry could become revamped. Another reason why it is important for the public to know about nanotechnology in the medical field since it may come to the point where small machines are placed in the body for repairs. There have been no tests done to ensure that these products won't affect the patients in the long term. All biological processes happen at the cellular or molecular level. This is roughly the same scale as nanotechnology. Though most research in this mixed field between nano and biotechnology is still preliminary, it's obvious that at some point we will be able to put things into the body for better or for worse. Nanotechnology could have a substantial impact on different medical products ranging from drug delivery to molecular diagnostics to bone replacement materials. However, few companies have successfully obtained Food and Drug Administration ("FDA") approval to commercialize nanoscale materials and devices[3].

-What are we going to tell them?

The idea behind this research and paper is to get the audience more up to date about nanotechnology and the applications within the medical field. To go along with the applications we want the audience to know about the lack of regulations and laws regarding nanotechnology in the medical field.

-Tell them who the key players are, what the applications are, how they are used, and the when this is taking place (timeline)

Currently companies are trying to ensure that their applications with nanotechnology are safe. The first company to receive FDA approval was Angstrom Medica. As of May 2005, Angstrom is developing NanOss^{TM} formulations for creating: (1) structural, weight bearing medical devices; (2) injectable, endothermic, weight bearing bone cements; and (3) programmable bioactive coatings that can act standing alone or as a carrier for pharmokinetic agents and orthobiologic materials. NanOss^{TM} is an innovative structural biomaterial that is highly osteoconductive and remodels over time into human bone with applications in the sports medicine, trauma, spine and general orthopedics markets[3]. Besides this application, there did appear to be any others in the production phase. Most of the applications are all concepts at this point. A Scanning Tunneling Microscope was used in 1989 to spell out "IBM" using 35 individual xenon atoms on a nickel surface. Atomic Force Microscopes (AFMs) have performed nanomachining operations on planar MoO_3 crystals: applying 100 nanonewtons at the tip, two rectangular slots and a 50-nm rectangular sliding member were milled from a crystal, and then the member was slid repeatedly from one slot to the other, making a reversible mechanical latch[4]. There are numerous applications that Nanomedicine can be applied towards and some of them include tumor therapy and diagnostics, fetal and child-related disorders, treatment of anemia, and respiratory diseases. One potential application that is really interesting is the under watering breathing. A diver would be able to hold his breath for up to 4 hours at a time, and then resurface to hyperventilate and recharge[4]. More than 60 drugs and drug delivery systems based on nanotechnology, and more than 90 medical devices or diagnostic tests, are already being tested, according to NanoBiotech News, a weekly newsletter that tracks the field[5]. Medical nanomaterials also may include “smart drugs” that become medically active only in specific circumstances[6]. A good example is provided by Yoshihisa Suzuki at Kyoto University, who has designed a novel drug molecule that releases antibiotic only in the presence of an infection[6]. In 2000, a collaborative effort between UCLA and Hewlett Packard produced the first laboratory demonstration of completely reversible room-temperature molecular switches that could be employed in nanoscale memories, using mechanically interlinked ring molecules called catenae’s[6].

-Implications of what we told

There are currently hardly any long term or toxicology studies that are available. Nanotechnology is very difficult to address using the existing regulations. If there is not enough regulation then nano may become too powerful and take over things that it was not intended for but on the other hand, if it is over regulated then nano may never reach its potential. There may be new laws that are required to manage potential risks on nanotechnology[7]. The problem with nano size particles is that they defy the human body processes of absorbing and filtering particles. Potential hazards to humans and the environment resulting from nanotechnology can not be entirely excluded[7]. There have been some tests done on the nanosizing of drugs and there are no reports on any adverse reactions which relate to the nanosizing. There are many issues that will and have already

appeared with nanotechnology such as patents, trademarks and licensing[7]. There is a question of how much the government should be involved with nanotechnology and the growth of it. Along these lines, there is a small war going on between the scientists doing the research on nanotechnology and the businesses that want to use it. The scientists want everything thrown out, such as the positives and negative aspects of nanotechnology while the businesses think this approach will hurt them and risk their businesses. If you think about the under water breathing application, it eliminates the risk decompression sickness or caisson disease, the formation of bubbles in the divers' blood when resurfacing[4]. All of the applications that are currently being brainstormed and that are being toyed with will in some way improve life. The problem with these applications is that they may be an immediate resolution for one problem and later re-appear as an even larger one. What the public needs to know is that they may be risking their long term health for a present solution. A formidable regimen of laboratory, field, and clinical testing lies ahead of all applications before they can be deemed ready for routine medical use[4].

-Closing

Nanomedicine appears to be nothing but beneficial and this is both a good thing as well a bad thing. We do not know at this point if the general public is being withheld information regarding pitfalls and dangers with nanotechnology or there may not be any at this point that are known of. Like previously mentioned, Nanomedicine will drastically change how we live our lives. This alone will make some uncomfortable with nanotechnology. The general public does not like change and have to become accustomed to new things, familiarity is a nice thing and the introduction of nanotechnology will take this away. Another thing that will be discussed and argue when nanotechnology emerges is that these applications will mess with human nature. People will start to be able to do things that defy natural human capabilities such as the four hour under breathing. The general public is going to have to decide for themselves about nanotechnology and without a through knowledge and background of this topic it is not possible for them to make the right decisions.

-References

[1]http://practice.findlaw.com/feature-0604.html
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