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Nano Technology in the Treatment of Diseases

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Abstract—*The present paper reports the role of nontechnology in the treatment of diseases. The relation between nano system and human diseases is provided one of the broaded and most dynamical area of science and technology and medicine. The role of nanotechnology is increasingly important in our society. Their use has marked the beginning of new era like the press and internet. The implications in the near future are many and surprising, from energy to environment, from medicine to building sector, from engineering to transport and telecommunications. It is a scientific and technological challenge which requires work coordination of project and available resources. Nanotechnology is the manufacturing technology of 21th century, it helps us to build a broad range of complex molecular machines by manipulating matter on an atomic and molecular scale. Nanotechnology is the creation of useful materials, devices and system through the manipulation of matter on atomic molecular level in the length of 1to 100 mm. when a matter reaches on nano scale their physical, chemical and biological properties differ in fundamental and valuable ways from the properties of individual atoms and molecules. In nanotechnology, atoms of matter are aligned in the most effective ways in the very limited place. By using this technology extra ordinal devices are created. In this techniques molecules are arranged in such a way that they produce desire result in the area of strength, ductility, reactivity, conductivity and capacity. This idea provides creating devices and structure that would occupy very small place and having novel properties and function due to their small size. The application of nanotechnology in medical science is called nano medicines. Nano particles having high potential application in the field of medical sciences, new diagnostic tools, imaging agent and methods, targeted drug delivery, pharmaceutical, bio implants and tissue engineering. Drug with high toxic potential as cancer chemotherapeutic drugs can be given with better safety profile by using of nanotechnology. The aim of nanotechnology develops new materials and methods to detect and treat diseases.*

Keywords*: Nanotechnology, Nano particles, Nano medicine, Quantum dot, targetet drug delivery.*

1. INTRODUCTION

In the past few years a little word with a lot of potential has been repeatedly used. That word is nano. This word has almost completely changed the concept of science and technology, Ethics, Economics, International relations and place of living being in the universe. Many people see it as the next step in biological and chemical warefare in the extreme cases an opportunity may be created that may replace the human species [1]. The vision of nano technology introduced in 1989 by Nobel Physicist Richard P. Feynman in dinner talk said "there is plenty of room at the bottom proposed employing machine tools to make smaller machine tools, these are to be used in turn to make still smaller machine tools, and so on all the way done to the atomic level, nothing that this is" a development which I think can not be avoided"[2]. It is suggested that nanomachines, nanorobots and nanodevices ultimately could be used to devlope a wide range of automatically precise microscopic instrumentation and manufacturing tools could be applied to produce a vast quantities.

Feynman's idea remained largely undiscussed until the mid-1980s, when the MIT educated engineers k Eric Drexler published "Engines of creaman" a book to popularise the potential of molecular nano technology[3]. Nano comes from Greek word whose meaning is dwarf. The prefix 'nano' means one billionth. I nm is one arabth part of a meter .To get an idea of nano scale, a human hair has diamerer 4,50,000 nm, a bacterial will measure a few hundred nanometer across the smaller chips those are commercials etched on a microchip are about 13onm across. The smaller objects that our eyes can see without any aid are 10,000 nm across .If 10 atoms of hydrogen are lined up they make tnm [1].

Nano science is the simplest form of the study of fundamental principles of molecules and structure with the size approximately 1 to to o nm. These structure are called nano structures. Nano technology is the applications of these nano structure into useful nano scale derives. It may mentioned here that nano scale is not only small but it is a special kind of small [4]. Nano technology is the creation of useful material, devices and system through the manipulation of matter on this minute scale .The field of nanotechnology involves scientists from many different disciples including physicists, chemists, engineers and biologists. All the natural materials and systems established their foundation at the nano scales. Basically, the biological building blocks of life are the nano entities, that possess unique properties and pattern on nano scales [5]. Old rule do not apply, small things behave differently. Really small things with astonishing property like the carbon nanotube. When a grapheme sheet of one atom thick can be

rolled into a tube then obtained helical tube is called bent carbon nanotube (BCNT). Carbon nano tube is used for fabrications of nano robots acts as nano surgeon, that conducts delivery of drugs in human being also. Other application of nano tube may be part of future improvement for high performance air craft. In nanoland, small difference in size can produce huge difference in function. In nanoland matter is tunable at nano scale. For example charge in size of semiconductor is called quantum dots, and we change the colour of rainbow from a single material. Sergeant made a three nano metric dot that glows blue, four nanometric dot that glows red and five nanometer dot that emits infrared rays or heat[6].

Nanotechnology will affect even thing. The unique quantum phenomena theta happen at the nano scale, indicates researcher from many different disciplines to the field such as medicine, chemistry, physics, engineering and other as dentistry. The scientist in the field of regenerative medicines and tissue engineering are continentally looking for new ways to apply the principle of cell transplantation, material science and bio engineering to construct biological and drug substitutes those will restore and maintain normal function in diseased and injured tissue .Development of more refined means of delivering medicines at the therapeutic level to specific sites is an important clinical issue for application of such technology in medicine and treatment of human diseases.

2. PREPARATION OF NANO PARTICLE

Nano particle is prepared by a method celled Nano sphere Liftoff Lithography, that is demonstrated in fig.1.If we place marbles together on a board as tightly as possible, they will form a tight group, with each marble surrounded by six marbles. If this array were spray painted from the top, and then the marbles were tipped off the board, then paint would appear as a set of painted dots, each shaped like a triagle but with a concave sides. Now if the marbles are on nanoscale so are the paint dots. This technique called nano sphere liftoff lithography[1].

With nano scale material many of atoms reside on surface of material with respect ot macro scale matter, therefore surface to volume ratio is much garger.

From the biological point of view nano devices match the typical size of naturally occurring functional units of living organism and enable more effective interaction with biological system. Most animal cells are 10,000 to 20,000 nm in diameter .This means that nanoscale devices(less than 100nm) can enter cells and organelles inside them to interact with DNA and proteins. Nano devices developed through nano technology are able to defect diseases in very small amount of cell or tissue [05].

3. CLASSIFICATION OF NANOMATERIALS

The classification of nonmaterial is described in fig 2. The electronic, optical and chemical properties of nano particles can be very extra ordinary from these of each component within the bulk.

Advantages of using nano particles:- Use of nano particles having the following advent ages (1) smaller derives are less invasive (II) They can be implemented the inside of body (iii) Biochemical reaction time is much shorter (iv) devices are faster and more sensitive than typical drug delivery. Use of some nano materials is shown in tablet-1.

Characteristics of nanomaterials:- When we used material science then it is necessary to perform the measurement of dimension of material particle at nano scale, when nano technology is usable. It is a fundamental process in the field of material science, without which no scientific understanding of engineering material can be achieved. Hence imaging and measurement are necessary condition for a nano particle. The following microscopes are of great importance for the imaging and manipulation of individual atoms of molecules in nano technology,

(1) STM- Scanning Tunneling Microscopy by Gerd Binnigh
(2) AFM- Atomic Force Microscopy by Henric Rohrer
(3) TEM- Transmission Electron Microscopy

Supporting terminology in nanotechnology:-

(a) Nanomedicines – The field of nanomedicines indicates the science and technology of
diagnostic, fretting and preventing diseases and traumatic injury and preserving and improving human health using nanostructure scale material, biotechnology, genetic engineering and eventually complex machine system as nano robots[7].Five main sub disciplines are shown in fig.3.

(b) Nanoshells:- The first engineered material that is tiny sphere of glass coated with gold to enter into human trial is called nanoshell. Metal nanoshells are excellent optical absorber .Particularly it is the gold because of the strong optical absorption from the metal and responsible to light. This is similar of quantum dots. Its nano scale size and thickness play a vital role in optical tuning of certain wavelength[8]. Gold nanoshell is demonstrated in fig.4.

(c) Quantum dots (nanocrystals)-

Quantum dots are light emitting semiconductor nano crystals. Its diamerer be 2-10 nm. It has very vast applications in medical sciences. These are so small that they can enter in the cells. They obey quantum mechanical principle of quantum confinement. These can be used to detect cancer in the body [9]. when quantum dots used in conjunction with magnetic resonance imaging can produce exceptional image of cancer[10]. Nano size quantum dot entering into a cell is demonstrated in fig.5.

(d) Nano wire:- A wire of diameter in the order of nanometer is called nanowire. Generally its width range be from froty to fifty nanometers, whe as its length be not limited. Their length

be increasing more to more when wires are attached by end to end and they can be as long as to desired .The nanowire having unique metallic, semiconducting and insulating properties [11]. Their extremely high surface to volume ratio of ID (1dimensian) biosensor like nano wires and nano tubes make them ideal building block for biosensors development. They have non electronic transport properties. Nanowires can detect the slight disturbance from the surrounding environment due to their high surface are to volume ratio. The constituent atoms reside on ist surface of nanowire whose can generate electrical signal even with slight disturbance. Nanowire are far smaller than the smallest capillary in the body, it means in principle it could be treated through, the circulatory system to any point in the body without blocking the normal flow of blood or interfering with the exchange of gases. One there the nanowire would spread out branching into tinier and tinier blood vessel. Nanowire is usud to record the electricals activity of single nerve cell [12]. A nanowire having thickness of 4.3nm is demonstrated in fig.6.

(e) Liposomes- when dry mixture of phospholipids and cholesterol ane immerged in water under laboratory condition, they spontaneously formed a closed structure with internal aqueous environment bounded by phospholipids bilayer membranes called liposome. Liposomes are small vesicle an make ideal drug carrier system as demonstrated in fig.7.

Liposmes are drug carrier loaded with great variety of molecules, such as small drug molecules, proteins, nucleotides and even plasmids. liposomes are lipid based nano particles used extensively in pharmaceutical and cosmetic industries because of their capacity of breaking down inside cells [13].

(f) Nano- cantilever- Nano Electro Mechanical Sensors (NEMS)- It is a nano sensor that detect the bimolecular interaction and fundamental biological processes. This is a biosensor based on nanoscale and nano mechanicals system. Due to biological adsorption of interaction between the analytic and surface of cantilever some mechanical phenomena occur which shows a biological response. Nano cantilever works on this principle[14]. A biosensor (cantilever) is demonstrated in fig.8.

(g) Dendrimeters:- The word dendrimeter having meaning of part of tree. Dendrimeter contains a molecular chain whose branch out from a common center just like a tree. Dendrimeters are defined by thiree components: a central core, an interior dendrite structure (the branch) and an exterior surface with functional surface groups. It modifies with a wide variety of function, allowing to finally tuning the chemical, physical and topological properties of molecule. They are used in medical sciences for targeted drug delivery. Dendrite becomes a nanosized container for various molecules[15]. Dendrimeter is demonstrated in fig.9.

Research and development in the field of nanotechnology and diseases treatment: The recent drug delivery systems based on nanotechnology method is being tried in the treatment of most recent diseases like cancer, diabetes fungal infections, viral infection and in gene therapy. The main advantages of this recent treatment are targeting of the drug and enhances safety management. An account of nano particle in the treatment of dig cases in field of biology and medicines is as fluorescent biological levels, drug and gene delivery, bio detection of pathogens, detection of proteins, probing of DNA structure, tissue engineering, tumour destruction via heating, separation and purification of biological molecules cells, MRI contrast, enhancement and phagokinetic studies etc[16].

Different systems, theories, engineering in the field of nano technology and treatment of diseases-

Drug delivery system- In the recent years significant efforts have been made to use nano technology for the purpose of drug and vaccine delivery. The nano particles offer a suitable means to deliver small molecular weight drugs as well as macromolecules such as proteins, peptides or gene in the body using various routes of administration .The nano sized materials provide a mechanism for local or site specific targeted delivery of macromolecules to a tissue /organ of interest. Drug delivery systems, lipid or polymer based nanoparticles can be designed to improve the pharmacological and therapeutic properties of druf [17].

Advantages of nano carrier in drug delivery process:- Exhibit higher intracellular uptake. Can penetrate the sub muscular layers while the micro carriers are predominantly localised on the epithelial lining. Can be administrated into systematic circulation without the problems. The development of regretted delivery is formally built an extensive experience in pharmacology, toxicology and now a day in being pursued as a multi and inter disciplinary effort.

Cancer therapy- The small size of nanoparticles can be very useful in oncology, particularly in imaging. As for example quantum dots used in conjunction with magnetic resonance imaging can produce exceptional images of tumor sites. These nano particles are much brighter than organic dyes and only need one light source for excitation .The small size of nanoparticles (10to 100nm) allows them to preferentially accumulate at tumor site[18].

Tracking of nanoparticle- Nano particle can be tracked by their characters. Their tracking movement can be help to determine how wells drugs are being distributed. But it is very difficult to track a small group of cells through out the body, for this non-scientist used to dye the cells. The solution of this problem is used of a quantum dots, which is a tiny particle or nano particle of semiconductor materials of metals in all three dimensions. They are more superior to traditional organic dyes. Quantum dost are twenty times brighter and hundred time more stable than traditional dey [19].

Tissue engineering – This engineering is the most current research in the field of engineering. Here we discuss this field in the context of nano technology. This engineering has been

defined as the applications of principles and methods of engineering and life sciences towards fundamentals understanding of structural functions relationship in normal and pathological tissue and the development of biological substitutes to restore, maintain or improve tissue function [20]. The product that arise from the techniques may provide and alternative to available therapies to replace damaged, injured or missing body tissues .Nanotechnology provides new possibilities or the extra cellular matrix, often referred to as the scat fold .The extra cellular matrix serves three primary roles. First it facilitates the localisation and delivery of cells in the body. Second it defines and maintains a three dimensional space for the formation of new tissues with appropriate structure .Third it guides the development of new tissues with appropriate function and structure [21].

Future direction – As it stands now, the majority of commercial nano particle applications in medicines are geared towards drug delivery .In biosciences, nano particles are replacing organic dyes in the applications that required high photo stability as well as high multiplexing capabilities. There are some developments in direction and remotely controlling the functions of nano probes, for example driving magnetic nano particles to the tumour and then making them either to release the drug load or just heating them in order to destroy the surrounding tissues .The major trend in further development of nano materials is to make them multi functional and controllable by external signal or by local environment .Thus essentially turning them into nano devices .If nano technology produces some difficulties then we have to work on pico technology that may be provides a great advantages on nano technology. As we know that in inventions and research we convert real dreams into reality. So we can consider a pico technology after nanotechnology.

4. CONCLUSION

As we know that nano science and nanotechnology influence every sphere of our life. When a material can break into smaller to smaller shape as it goes on nano scale, then one can discover unlimited possibilities and potential of the basic building block of the material those are different to observed for the same material at bulk level. When we reach on the nano scale, it is found that same principle and tools are used for physics, chemistry, biology, material science and engineering coverage. Hence nanoparticles and technology has potential applications in the field of material science, medical science including new diagnostic tools .We also concluded that nano technology provides remarkable relief, tools including all kinds of means for the prevention of all kinds of diseases.

Figures and table

(a) TABLE

Table 1: Used of nano materials in biological imaging is shown in table -1

Sl. No	Nano materials	Application
01	Nanotubes	MRI Contrast agent
02	Quantum dots	Imagine in Vitro diagnostics
03	Polymer Carrier	Drug/gene delivery
04	Dendrimeters	Drug Delivery
05	Gold nanorods	Biological Imaging
06	Gold Duster protein	Cancer Imaging
07	Diamond Nanoparticle	Lebelling Image
		for celluler imaging

(b) FIGURES:-

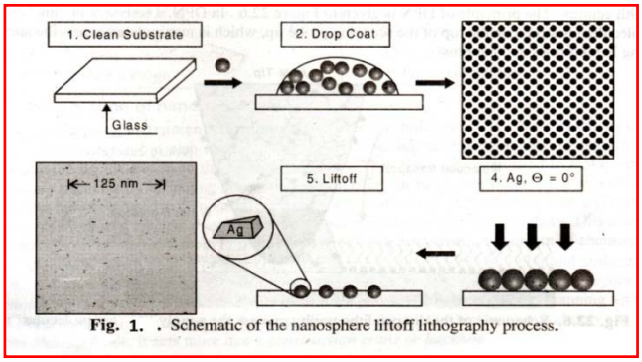

Fig. 1. . Schematic of the nanosphere liftoff lithography process.

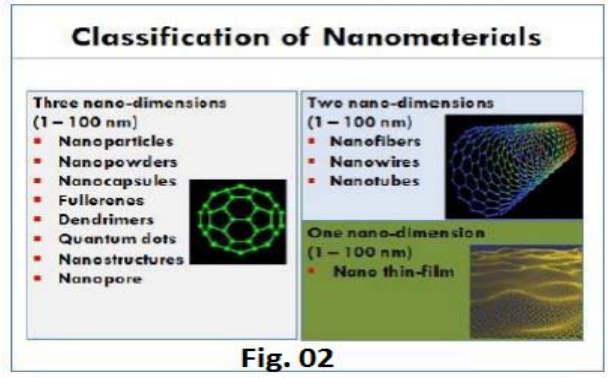

Fig. 02

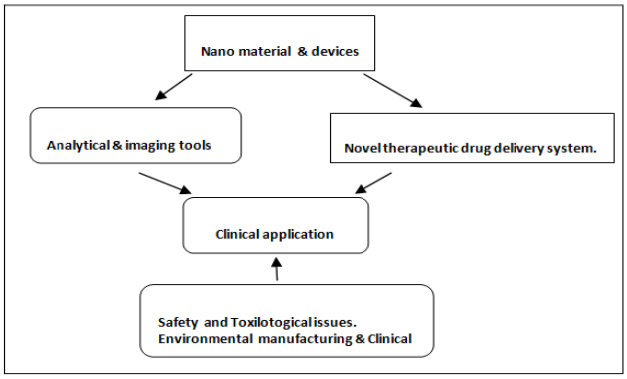

Fig. 04

Fig. 04

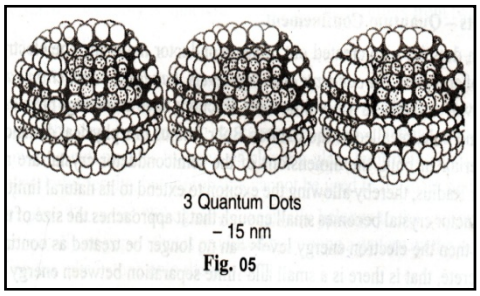

Fig. 05

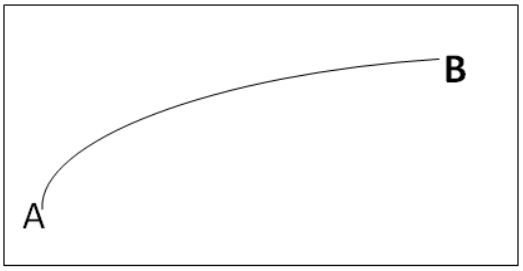

Fig. 06

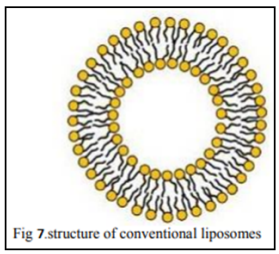

Fig 7.structure of conventional liposomes

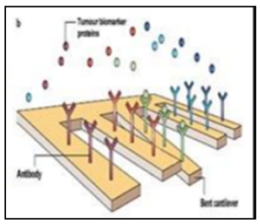

Fig. 08

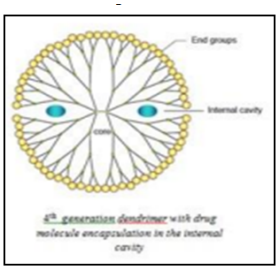

Fig. 09

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