



Nano-Medicine Global Market

Govind Girase.

Department of Infectious Diseases, K.E.M. Hospital, Mumbai.

ABSTRACT

Late 19th century was evident of intelligent biomaterial; which has changed researcher's perspective towards science and technology. This intelligent biomaterial is envisioned to have huge impact on Healthcare from sequential signalling of biomedical molecule, mimicking natural gene, an effective drug carrier, to high resolution diagnostic tool. From drug discovery aspect many of NCE fail to reach therapeutic potential due to PK/ PD profile. Nanotechnology has changed the face of drug discovery form chemical evaluation to structure of proteins in signalling pathways and development of chemical antibody. Nanotechnology from lab to market approval is long process due to regulatory evaluation. Though it seems to be bright future market it has to go through a long process from being innovation to complete market product. This makes whole process expensive making investor reluctant to invest in big projects. Western countries is aware of dramatic potential of nano-projects; which has its limitation in financial investments; with major challenge of transforming nano science to commercial pharmaceutical product.

Keywords: Nanotechnology, Chemotherapeutics, Biomolecule.

INTRODUCTION

Late 19th century was evident of intelligent biomaterial; which has changed researcher's perspective towards science and technology. This intelligent biomaterial are envisioned to have huge impact on healthcare from sequential signalling of biomedical molecule, mimicking natural gene, an effective drug carrier, to high resolution diagnostic tool. Dec.29 1959 Fore father of Nanotech science Finman said at American physical society that there is plenty of space at bottom. A highly specific molecule that can act at cellular and gene level¹.

From drug discovery aspect many of NCE fail to reach therapeutic potential due to PK/PD profile. Nanotechnology has changed the focus of drug discovery form chemical evaluation to structure of proteins in signalling pathways and development of chemical antibody. It has offered major success in view of biodegradability,

Biocompatibility, effect of pH and temperature to targeted drug delivery. As we know toxicity profile of a drug depends on Absorption, Distribution, Metabolism. Nanotech science has excellent therapeutic response in targeted drug delivery. This biomaterial have offered powerful tool to identify diseases early as at the level of single cell of cancer.

Western world is aware of dramatic potential of nano-projects; which has its limitation in financial investments; with major challenge of transforming nano science to commercial pharmaceutical product.

Example of Nanotechnology drug used in Chemotherapy,

1. Molecule nano generator
2. Cyclic peptide.

Molecular nano generator is a case of molecules attached with specific antibody surrounding to a radioactive atom. Antibody helps molecular mono-

* Corresponding author: Govind Girase
E-mail address: gdgirase@live.com

generator to reach inside of cancer cell; the case then break out to release radiation resulting in death of cancer cell. Cyclic peptide has a specific amino acid group which lodge itself in bacterial cell wall disrupts which result in cell death. Both of these drugs have overcome side effect of system generalised drug administration. Nanoarchitecture have focused on chemical structure of cell and signalling protein molecules. Target validation and identification of protein Drug modification.

Investment community have seen growth of nano product in disease detection, drug delivery, molecular targeting to radiofrequency cure of diseases in past decade. Business expert have to look into scientific discipline of nanotechnology from initiation to marketization of a product.

Types of Nano molecule

1. Quantum dots
2. Nanoparticles
3. Nanoshells
4. Nanotubes
5. Nanodevices

Quantum dots

It has potential to emit light under UV light influence. Wavelength of colour depends on the particle size. Researchers have designed nano particle with ability to find defective gene according to size of defective gene. This will help in Identifying defective gene. It also seems to eliminate need of biopsy in future

Nanoparticles

These particles allows identification of affected tissue in disease. Its physical property has allowed transfer of toxic chemical entity inside of cell specially in case of cancer therapeutics. It has been used in medicine as contrast media as diagnostic tool.

Nanoshells

Nanoparticles are already developed with antibody which attaches to nanoshells which has affinity toward cancer cells. These nanoshells have property to generate intense heat on absorption of infrared light; heat generated by molecule is lethal to cells.

Nanotubes

Nanotubes are carbon rods sized around half the molecule of gene .Nanotubules can identify shape of DNA, Identifying tag for important mutations associated with cancer.

Nanodevice

Nano-architecture aim to design device which will identify precancerous stage, Deliver to target site, to assess effectiveness of treatment².

Financing in Nano project

Nanotechnology from lab to market approval is long process due to regulatory evaluation. Though it seems to be bright future market it has to go through a long process from being innovation to complete market product. This makes whole process expensive making investor reluctant to invest in big projects. Clinical scenario is of prime importance as it demonstrates market potential to attract investors. Eg. There are 20 million patients of kidney failure in US which is expected to double in next decade. A drug marketed by Wyeth and Elan immunosuppressant in kidney transplant has proven market returns with enhanced bioavailability and convenient dosage. Nano cure has already yielded opportunities in diagnostic and cancer cure. Company tie ups and government encouragement will play major role in financing of future projects in Europe and US. With improvement in life expectancy and reduction in mortality below 5 years of age, assured drug delivery part, field of oncology and diagnostics nano technology has promising growth. In Developing countries Increase in lifestyle diseases on back ground of communicable diseases will surely affect impact of future intelligent biomaterial³.

Market Perspective

There is great disparity between diseases in developed and developing countries. In area of communicable disease 80% of HIV deaths and 90% malaria deaths occurred in sub-Sahara African countries. On the other hand lifestyle diseases are more prominent in developed world. Stringent regulatory evaluation for developing a nano-product for safe use in public at clinic setup increases cost. Till now commercial driver for nano market are oncology product 38% of market share in nanotechnology based product. Nanomedicine has potential to cross blood brain barrier; so we may expect chemotherapeutic drug acting on brain tumour cells. Another field is cardiovascular diseases with large patient pool. From regenerative neuropathy to nano cosmetics will attribute high growth rate in upcoming future.

Tech novist analyst reported nano market will grow at compound annual growth rate (CAGR) 12.5% between 2011 -2016. CNS product CAGR will be 16% between same years. Anticancer products will grow at CAGR of 10%.

Another survey of BBC market research which was prepared on basis of established market of nanomedicine. Report was prepared after discussion with 60 leading companies with 5 year sale forecast.Nano drug have shown increase in

patent filing in USA 53%, Europe 25 % and Asia 12%. Till 2014 Anticancer drug will achieve largest growth in market segment. Nano market was worth 53 billion in 2009 is projected to grow at CAGR of 13.5% surpassing 100 billion in 2014.

A study of national burro economic research in US reported that there is decrease infunding from 40% to 24% of US share in R&D investment. Whereas competitive position appears to be strong with most nano technology related inventions.

REFERENCES

- [1] John F. Sargent Jr. December 16, 2013.,Nanotechnology: A Policy Primer,Specialist in Science and Technology Policy.
- [2] Renzo Tomellini et.al, Sep 2005. European technology and platform on Nanomedicinenano, technology for Health.
- [3] MoustafaMoustafa Mohamed Ahmed An Overview of NanomedicineProfessor Biophysics and Medical Physics Department, Medical Research Institute, Alexandria University.
