NANOTECHNOLOGY

IN

TREATMENT OF CANCER

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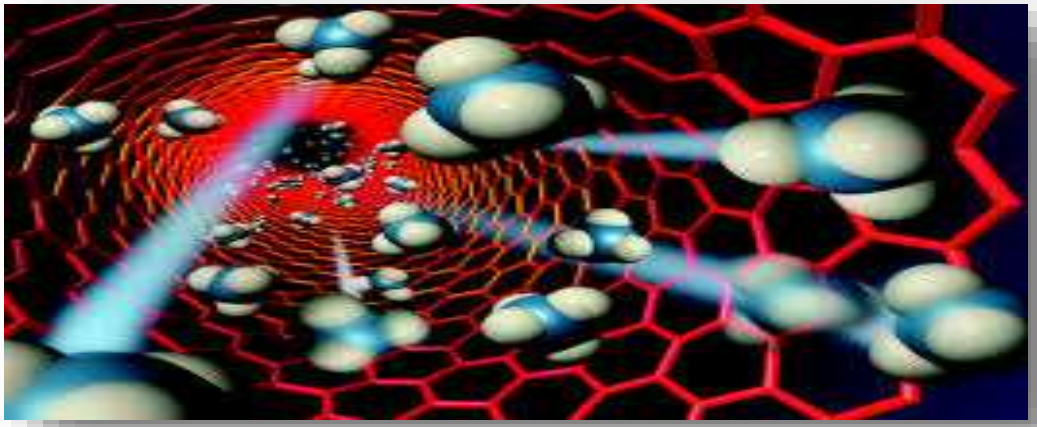
contents

1.introduction

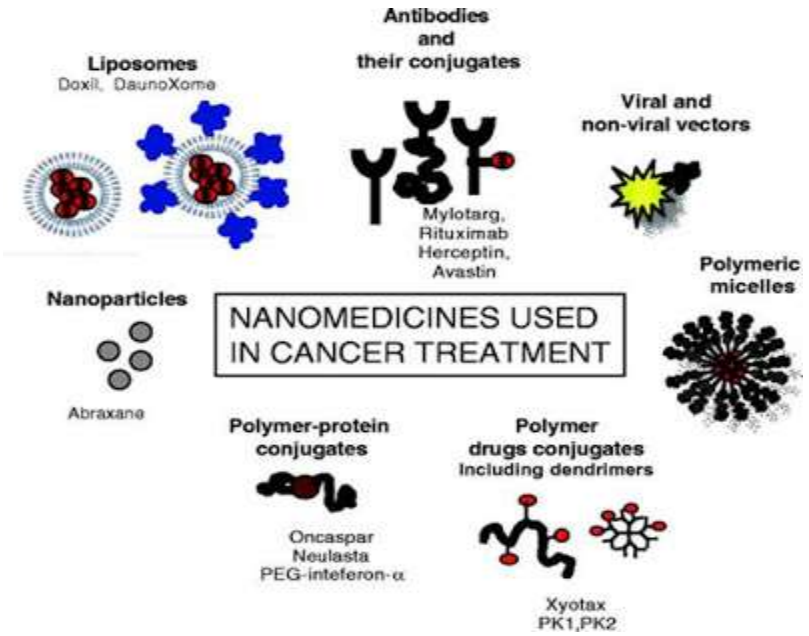
- Nanotechnology willchange the very foundations of cancer diagnosis, treatment, and prevention.
- If we take an imaginative approach. Of course, this is quite logical,
- Since everything around us is made up of atomic and molecular matter
- All of our problems are ultimately rooted in atomic and molecular arrangements. Nanotechnology has at last provided a way for us to rearrange and restructure matter on an atomic scale, allowing us to reach down to the very roots of any problem.

2.OVER VIEW

- Nano technology:-
- Nanotechnology is the engineering of functional systems at the molecular scale.
- Nano refers to the 10^{-9} power, or one billionth. .For comparison, a human hair is about 100,000 nanometers thick.
- The word itself is a combination of nano, from the Greek “nanos” (or Latin “nanus”), meaning “Dwarf”, and the word "Science”.

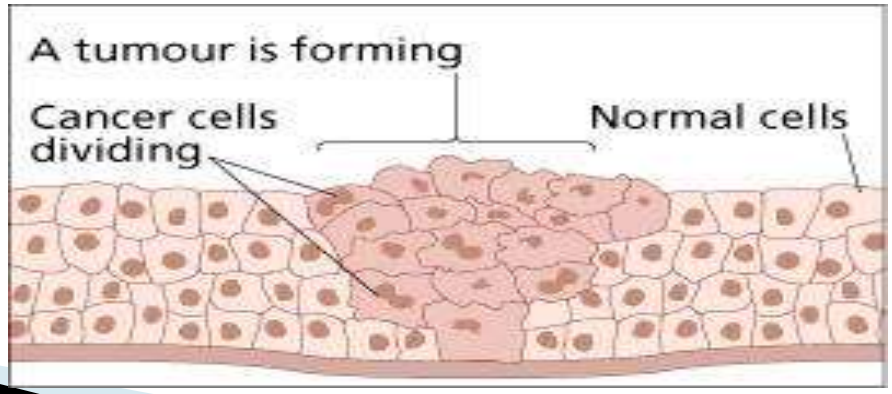


- Nano medicine:-
- Nanomedicine ranges from the medical applications of nanomaterials, tonanoelectronic, biosensors, and even possible future applications of molecular nanotechnology.



cancer

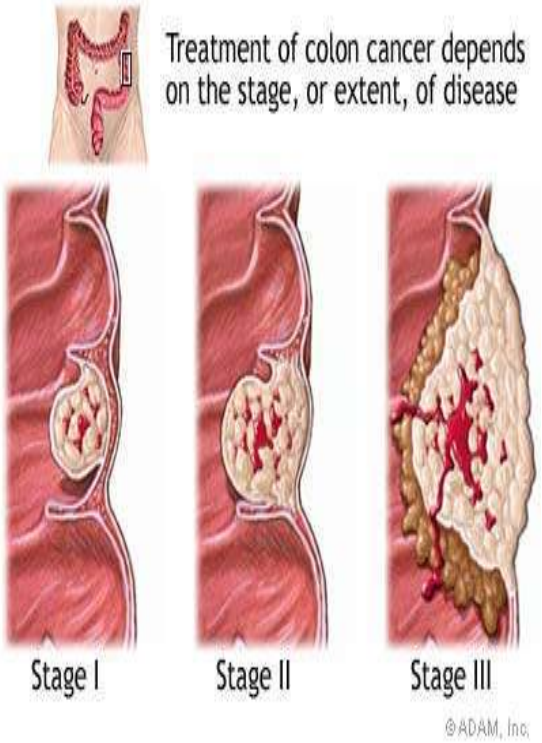
- Cancer is a class of diseases characterized by out-of-control cell growth. There are over 100 different types of cancer, and each is classified by the type of cell that is initially affected.
- Cancer harms the body when damaged cells divide uncontrollably to form lumps or masses of tissue called tumors.
- Tumor cells are basically two types.
- A tumor cell is part of a tissue that is abnormally growing. It may be either malignant or benign in nature



Cancer is a disease of the cell cycle. Some of the body's cells divide uncontrollably and tumors form.

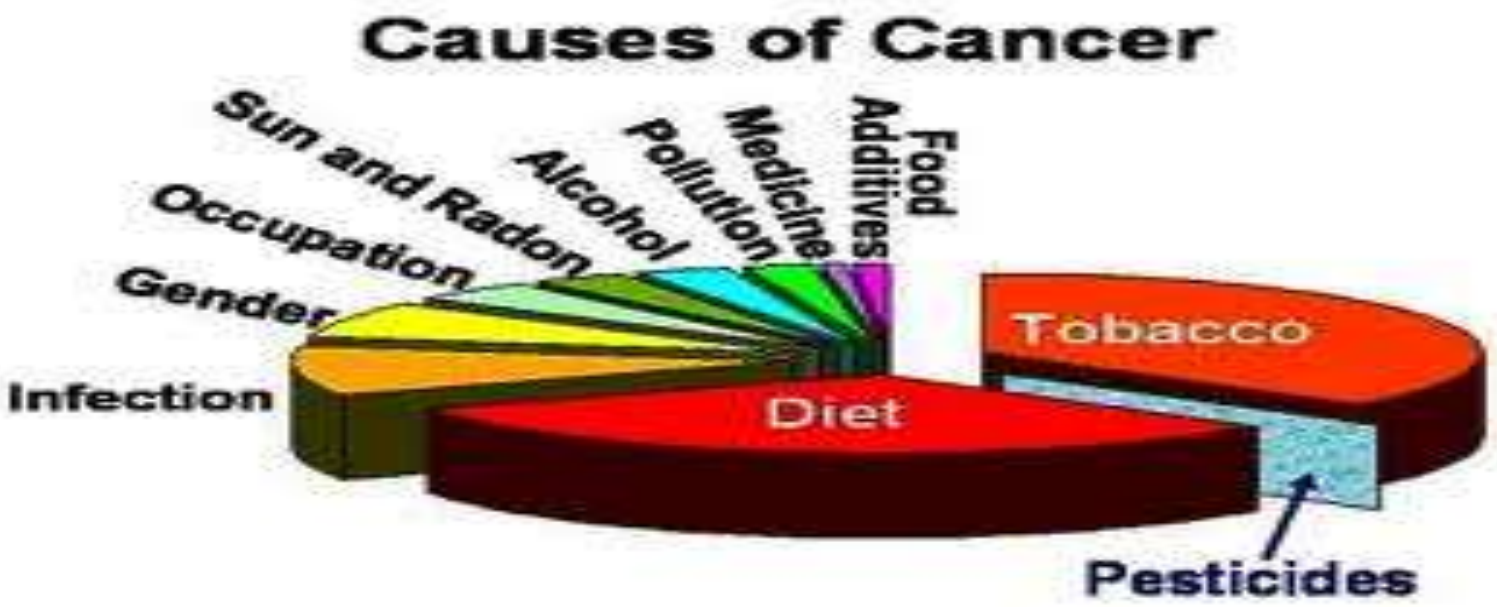
Tumors in Liver

Tumor in Colon



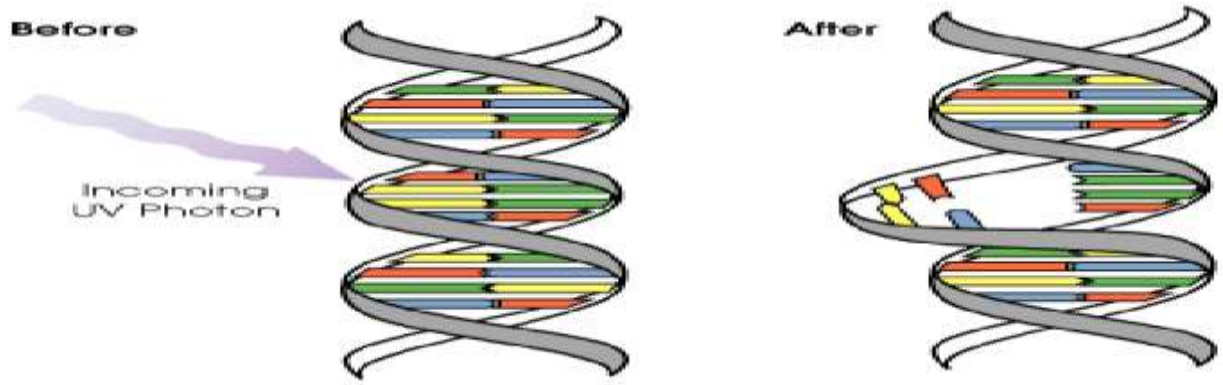
causes of cancer

- External factors – chemicals, radiation, viruses, and lifestyle
- Internal factors – hormones, immune conditions, and inherited mutations
- Cellular change



3.Preventive approach

- Let us consider melanoma for example. Melanoma, a form of skin cancer, is caused primarily by ultraviolet radiation from the Sun .
- To prevent we use a suspending a substance that either absorbs or scatters ultraviolet radiation in a thick emulsion(sun screen) .But this emulsion is easily rubbed off and we need to apply periodically
- An even bigger problem is that we leave openings during the application of emulsion due to macro-scale and micro-scale imperfections in our skin. So **the UV radiation allows through dead layer of skin and causes wide damage.**



- By using nano technology
- We manufacture nano particles UV scattering substances like zinc oxide(Zno) and titanium oxide(Tio2) or UV absrobing substances like octyl methoxycinnamate and titanium oxide.
- We target these nanoparticles to skin cell surface protiens,
- we can effectively coat these cells with the sunscreen

4.CANCER TREATMENT

- A relatively long-standing strategy dating back to the 1950s is to flood the body with substances that are especially toxic to tumour cell
- A drug that is especially toxic to tumour cells is usually also toxic to healthy cells, and simply flooding the entire body with it causes system-wide damage and serious side effects

The few treatments are:-

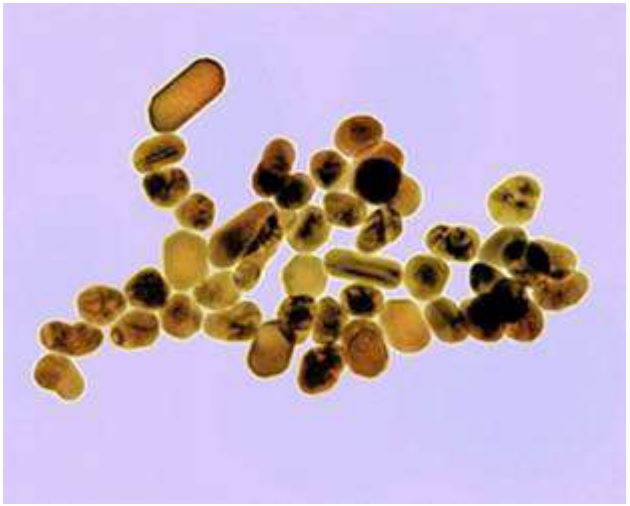
- CHEMPOTHERAPY
- RADIATION THERAPY
- IMMUNOTHERAPY
- HYPERTHERMIA
- STEM CELL TRANSPLANT (PERIPHERAL BLOOD, BONE MARROW AND CORD BLOOD TRANSPLANT)

NANOPARTICLE TECHNOLOGIES

- GOLD PARTICLE
- NANOBARCODES
- QUANTUM DOTS
- NANOPARTICLE PROBES
- MAGNETIC NANOPARTICLES

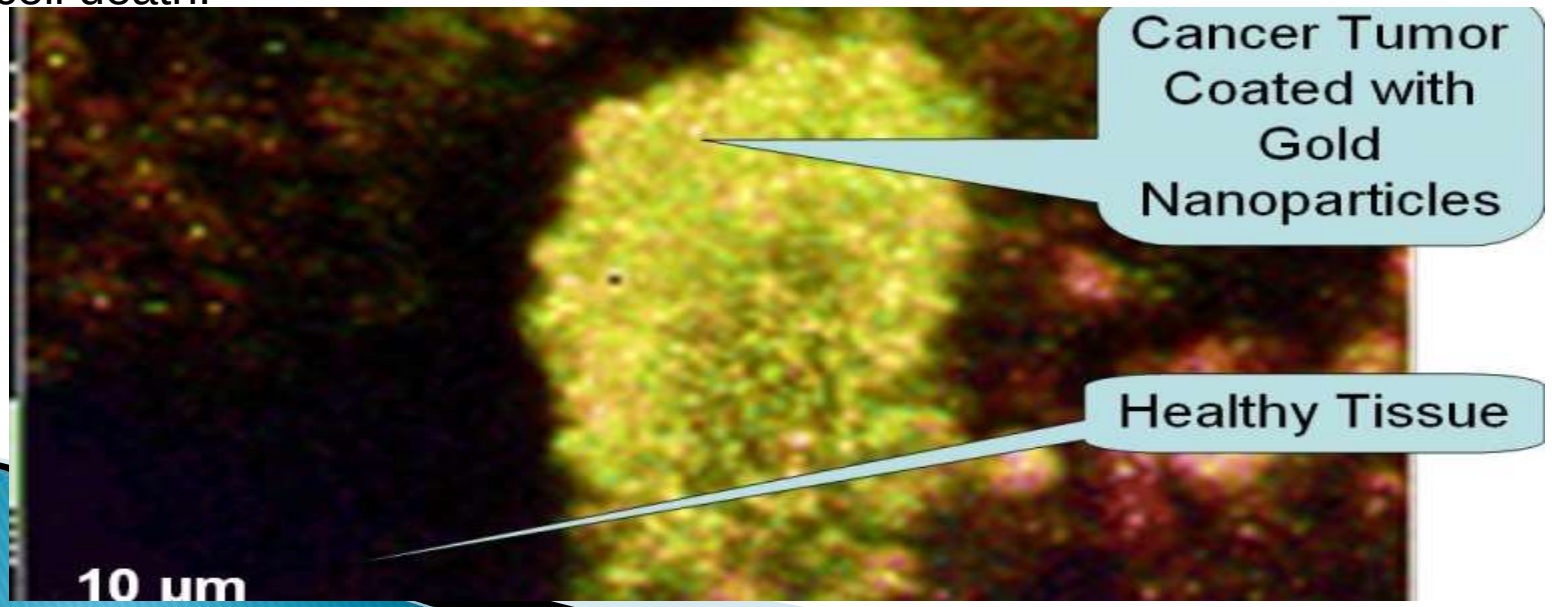
Using Gold Nano Particle

- Gold nanoparticles (‘nanogold’) occur as clusters of gold atoms up to 100nm in diameter.
- Biological electronic microscopy is one of the areas where gold nanoparticles have been extensively used as contrast agents.
- Gold nanoparticles are produced in a liquid ("liquid chemical methods") by **reduction** of chloroauric acid ($H[AuCl_4]$), although more advanced and precise methods do exist. It can also be synthesised by laser ablation.



Treatment

- Once the nanoparticle has safely traveled through the blood stream, it binds to the tumor cell. Most work is being done with near-infrared light, which is harmless to humans but can only penetrate human tissue about 1.5 inches
- Nanoparticles can be tuned to be excited only by certain ranges of light
- Then by using principle of photo thermal ablation it will convert into heat
- Cancer cells die at 42° C (108° F), normal cells die at about 46° C (115° F)
- The impact can be so violent that for smaller particles then subsequently cell death.



5.APPLICATIONS

Applications of various Nanosystems in cancer therapy	***Applications in cancer therapeutics***
Carbon nanotubes	DNA mutation detection, disease protein biomarker detection
Dendrimers	Controlled release drug delivery, image contrast agents
Nanocrystals	Improved formulation for poorly-soluble drugs
Nanoparticles	MRI and ultrasound image contrast agents, targeted drug delivery, permeation enhancers, reporters of apoptosis, angiogenesis, etc.
Nanoshells	Tumor-specific imaging, deep tissue thermal ablation
Nanowires	Disease protein biomarker detection, DNA mutation detection, gene expression detection
Quantum dots	Optical detection of genes and proteins in animal models and cell assays, tumor and lymph node visualization.

6.ADVANTAGES

- Nano scale devices have the potential to radically change cancer therapy for the better
- to dramatically increase the number of highly effective therapeutic agents

- Nanotechnology may also be useful for Protect drugs from being degraded in the body before they reach their target enhance the absorption of drugs into tumors and into the cancerous cells themselves.

7.DISADVANTAGES

- Cancer targeting is highly dependent on surface chemistry. Not just any nanoparticle will work.
- The need for biocompatible and stable nanoparticles
- Side-effects and toxicity

8.FUTURE

- Human clinical trials within the next 2-3 years
- Highly specific team of communicating multifunctional nanoparticles used
- in the discovery, treatment, and prevention of Cancer growth
- Safer, more consistent, and highly specific nanoparticle production

9.CONCLUSION

- Over the past 150 years, many innovative and groundbreaking techniques have been developed in order to treat cancer .But these approaches has its own series of undesirable side effects that are both dangerous and damaging to the overall health of the patient.
- There have been significant improvements largely due to breakthroughs, both, in the bottom-up and in the top-down nanotechnology.we will make early detection, prevention and treatment with a high degree of accuracy and ease possiblee that is effective and can be made it safe.