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Perspective

Nanotechnology in the Detection of Cancer Biomarkers

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DESCRIPTION

A main cause of death and low quality of life worldwide is cancer. Even while many methods have been developed to lower mortality rates, ease chronic pain and enhance quality of life, these cancer medicines still fall short in several respects. Early cancer cell diagnosis and highly targeted medicine application to minimize side effects are essential elements in assuring optimal cancer treatment. In order to better diagnosis and lessen the severity of the disease, alternative including nanotechnology are being used due to rising general toxicity and refractoriness with current cancer treatment and diagnostic technologies. In order to lessen the invasiveness of malignant cells while protecting healthy cells at the target site, immunotherapeutic drugs based on nanotechnology have been used for various cancer types over time.

Genetic alterations can affect how some macromolecules are synthesized which can induce unchecked cell growth and eventually malignant tissues. The two types of cancer are benign and malignant respectively. While malignant tumors shed cells that infiltrate nearby tissues as well as distant organs, benign tumors are restricted to the site of malignancy. Early diagnosis and the prevention of the growth and spread of malignant cells are the main goals of cancer diagnostic and treatment approaches. The use of Positron Emission Tomography (PET), Magnetic Resonance Imaging (MRI), Computed Tomography (CT) and ultrasound is noteworthy among the early diagnostic methods for cancers. However the lack of good clinical information on various cancer kinds and stages limits the use of these imaging technologies.

Research on nanotechnology cancer therapy goes beyond medication delivery to develop novel medicines that are only possible because to the unique features of nanomaterial's. Nanoparticle is large enough to contain numerous tiny molecules of various sorts yet being small in comparison to cells. At the same time ligands such as low molecular weight compounds, DNA or RNA strands, peptides or antibodies can be used to functionalize the comparatively vast surface area of nanoparticles. Such compounds can be applied therapeutically or to control the behaviour of nanoparticles.

These characteristics allow for the delivery of many drugs, multi-modal therapy, and combining therapeutic and diagnostic or "theranostic" action. Application of hyperthermia numerous nanoparticle kinds are now used for molecular imaging as a result of the recent increase in the use of nanotechnology in cancer diagnosis and monitoring. They have been more popular in recent cancer research and detection due to their benefits including tiny size, strong bioactivity and high atomic number. Nanoparticles with structural, optical or magnetic properties that are uncommon in other molecules, such as transistors, quantum dots and iron oxide Nano crystals are used in the treatment of cancer.

For the purpose of early cancer cell detection and screening various anti-tumor medications and biomolecules such as peptides, antibodies or other compounds can be combined with nanoparticles to mark highly specific malignancies. Biomarkers for cancer are biological traits whose manifestation signals the existence or stage of a tumor. These indicators are used to research cellular processes track or detect changes in cancer cells and the outcomes may eventually help us understand malignancies. Proteins, protein fragments or DNA can all be used as biomarkers. To confirm the existence of particular malignancies, tests can be performed on tumor biomarkers which are signs of a tumor. The ideal tumor biomarker should have excellent specificity.

Currently biomarker from plasma, urine or saliva samples is used to screen people for the risk of developing cancer. But it hasn't been shown that these biomarkers are sufficient for cancer screening. Liposomes are one of the most studied nanomaterial's are Nano scale spheres composed of a natural or synthetic phospholipid bilayer membrane and an aqueous core. The amphipathic nature of phospholipids leads to spontaneous liposome formation with hydrophilic drugs preferentially present in liposomes and hydrophobic drugs forming before multi lamellar liposomes. Some drugs can be incorporated into liposomes by switching from acidic to neutral buffers. Neutral

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drugs can also be delivered in liposomes, but are not readily released from within liposomes due to their low propensity for acidic. Other drug delivery mechanisms involve combining saturated drugs with organic solvents to form liposomes. Under appropriate pH, redox potential, ultrasound and electromagnetic fields, liposomes can also release drugs through passive or active ligand-mediated activity.