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Editorial on Role of Biomarkers in Nanotechnology

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Editorial

Nanotechnology can provide inimitable detection capabilities for high sensitivity biomarker sensing that was previously not capable. Although many new nanoplatforms are not fully optimized for manufacturing scale up and commercial use, they can provide alternative and irreplaceable diagnostic models. Nanomaterials are increasingly used in diagnostic, imaging, and targeted drug delivery applications. Nanotechnology promises to facilitate the development of personalized medicine, in which patient therapy is tailored by the patient's individual genetic and disease profile.

The main method to detect cancer cells relies on binding of nanoparticle probes conjugated with moieties (protein, short peptides, antibodies, oligonucleotide aptamers) to surface markers on cancer cells and on those entering cells and detecting genetic content. Nanotechnology has the capability of dramatically improving surveillance devices and producing new weapons, thus leading to an increase in incentives to private companies producing security nanotechnology.

Nanotechnology can provide rapid and sensitive detection of cancer-related molecules, enabling scientists to detect molecular changes even when they occur only in a small percentage of cells. Nanotechnology also has the potential to generate entirely novel and highly effective therapeutic agents. Disadvantages include: Potential dangers to humans and the environment. Loss of manufacturing and agricultural jobs. Economic market crashes related to a potential lower value of oil due to more efficient energy sources and gold or diamonds, materials that can be reproduced with molecular manipulation.

Nanotechnology is the term given to those areas of science and engineering where phenomena that take place at dimensions in the nanometre scale are utilised in the design, characterisation, production and application of materials, structures, devices and systems. Nanoparticles are a promising treatment option for cancers that are resistant to common therapies. In a new study that demonstrates an innovative and non-invasive approach to cancer treatment, Northwestern Medicine scientists successfully used magnetic nanoparticles to damage tumor cells in animal models. Nanotechnology offers the potential for new and faster kinds of computers, more efficient power sources and life-saving medical treatments. Potential disadvantages include economic disruption and possible threats to security, privacy, health and the environment. The completion of the human genome project has led to intensified efforts toward comprehensive analysis of proteomes. New possibilities exist for efficient proteomic technologies. However, primary attention is given to the discovery of new predictive biomarker patterns. Understanding proteomes and, in particular, protein-mediated interactions underlying their complexity and diversity, is critical for the development of more reliable and robust diagnostic platforms, which are anticipated to enable personalized medicine. Of immediate relevance in this respect are those approaches that capitalize on the application of nanotechnology, which is seen as a powerful tool for the diagnosis of early-stage diseases. Here we highlight the current state of the field exemplified by recent nano-enabled technologies for biomarker discovery.

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