Nanotechnology : A tool for the diagnosis of diseases

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Abstract: Nanotechnology (Prefix Nano comes from a Greek word *nanos,* meaning dwarf or one billionth part of something when quantifiable), is an emerging branch of science for designing tools & devices having size of 0.1 to 100 nm with unique function at cellular, atomic & molecular levels. In this fast paced era of life where stress has made it difficult to refocus on what matters most & presented several challenges in the area of healthcare, early diagnosis of diseases has become a goal for prompt treatment & management of diseases. Over the past decade, this has become possible by the aid of nanotechnology whose application in life science for diagnosis is termed as Nanomolecular diagnostics. Contribution of nanotechnology in the medical diagnosis is extremely vast with improved traditional diagnostic tools and methods in the field of clinical diagnosis, imaging and electro-diagnosis. Biochip, microarray, nanobarcode, nanorobots, micro-electromechanical systems and nanobiosensor are some of the examples which are evolving and have revolutionized the field of medical diagnosis.

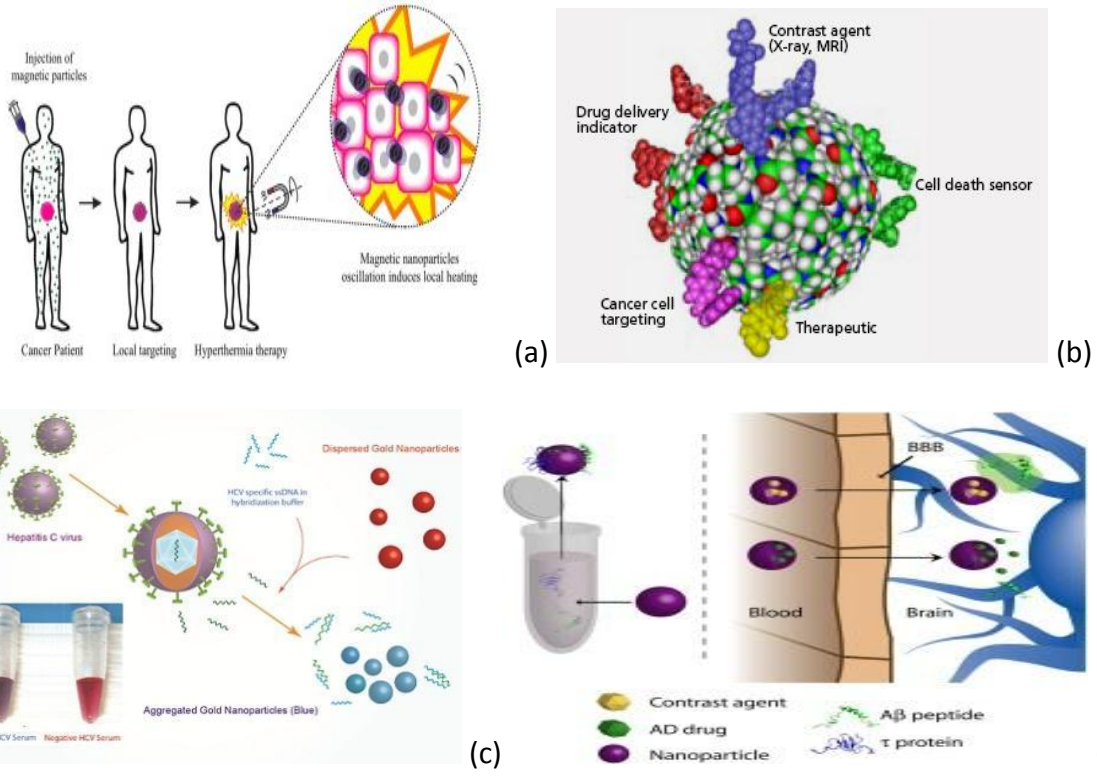

Figure 1: (a) Magnetic nanoparticles for in vivo cancer diagnosis, (b)Multifunctional Dendrimer Capable of Detecting Cancer, (c) Nanoparticles used for the diagnosis of Alzheimer's disease,(d) Nanoscale gold particles to help diagnose HCV infections.

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Several nanoscale particles like dendrimers, gold nanoparticles, carbon nanotubes, quantum dots & magnetic nanoparticles (Figure 1) and nanoenabled techniques like wearable sensing technologies (Figure 2) are used for diagnosis of cancer, diabetes, cardiovascular and various infectious, musculoskeletal and neurodegenerative diseases etc. Nanodevices can also be implanted as a preventive and prophylactic measure in early diagnosis of diseases. The present review takes a panoramic view of available nanotechnological advances in current use for early diagnosis of diseases and their potential role in improving the health care system.

(a) (b) (c)

Figure 2: (a) Graphene wristband sensing blood sugar levels, (b) wearable cancer monitors, (c) wearable ultrasound patch tracks blood pressure in a deep artery or vein.

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