



Nanotechnology: A challenge in traditional medicine

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ABSTRACT

Herbal medicines are widely used everywhere the planet since past and are recognized by physicians and patients for his or her better therapeutic value. The western world has begun to acknowledge the importance of traditional medicines as they symbolize safety in contrast to the allopathic medicines, which tend to supply undesirable side effects and are lacking in curative value. With the advanced nanotechnology, the nanophytomedicines could improve the biological availability and therefore the therapeutic effects, with target-oriented administration, which might adequately improve the therapeutic effects, avoid the adverse effects caused by the long-term drug administration, enhance the standard of life and more importantly explore more prosperous markets for the plant medicines. Nano-phytomedicines are prepared from the active phytoconstituents or standardized extracts. The world marketplace for nanomedicine is estimated to succeed in \$130.9 billion by the financial year 2016. It has been widely proposed to mix herbal medicine with nanotechnology. The drug-loaded nanoparticles deliver the herbs (mainly the effective components, regions or the extracts) to the organ at a sufficient concentration during the whole treatment period. This can accelerate the solubility of the herbs and bioavailability, improve the amphipathic property of the surface of the drug-loaded nanoparticles and permeability, and enhance biodistribution and biological effectiveness. Conventional treatments do not meet these requirements. Therefore, integration of the nanocarriers as novel drug delivery systems within the traditional medicine is important to regulate more complicated health problems like diabetes, cancer, disease, neurological disorders, cardiovascular problems, etc.

The traditional medicines are the oldest sort of healthcare systems which are practiced within the different parts of the planet till today. In the advent of nanotechnology these old and traditional

systems must be improved, modernized and advanced for the higher effect within the treatment and management of some serious diseases. In the perspective of worldwide economy, demand for qualitative health care delivery and technological advancement and competitions, nanotechnology-based herbal medicine must be successfully developed by overcoming the challenges of traditional medicines and compromising with nano drug delivery systems. Therefore, integration of the nanotechnology as novel drug delivery systems within the traditional medicine is extremely essential for relief within the diseases like diabetes, cancer, disease, neurological disorders, cardiovascular problems etc. These include the event of the nanostructure or nanoparticles with appropriate components and properties, engineering with optimized manufacturing process, adequate characterization, a positive pharmacology and toxicity profile and demonstration of safety and efficacy.

Nanomedicine is poised to impact all aspects of public health. Public health is defined as “The science and art of preventing disease, prolonging life and promoting health and efficiency through organized community effort.” This often includes community-wide or population-based interventions such as public sanitation, infectious disease control, and clinical preventive services including early screening and detection. In this way, public health works to market the health of every person during a community through organized efforts that impact groups of individuals also as individuals.⁶ The field of public health is broken down into the following five core disciplines according to the Association of Schools of Public Health:⁷

- Epidemiology
- Social and community behavior
- Environmental health sciences.
- Health policy management
- Biostatistics

Epidemiology is the study of determinants and distribution of disease.² It articulates with biostatistics, which quantitatively analyzes the

determinants and distribution of disease. Health policy and management uses information from disciplines in medicine and public health to create laws, regulations, and guidelines for the good of the public's health. Social and community behavior studies individual through organizational level impacts on health outcomes.⁷ Environmental health focuses on how the physical and social environment affects human health, as well as how humans are affecting their surrounding environment.⁸ The knowledge domain achieved through these core disciplines provides a platform for public health professionals to research, understand, and predict the implications of nanomedicine on population health.

Technological advances publicly health have shaped human history. For example, vaccines are successful in eradicating and drastically reducing deadly infectious diseases across the world. Side effects and health risks have also played a role in how vaccines have been developed and utilized. The hepatitis B vaccine is one example of how nanotechnology are often wont to enhance current practice and make a big impact on population health. Hepatitis B is an infectious disease that has affected about two billion people across the world. Currently there is a highly effective vaccine to prevent this disease; however, it must be administered over the course of three to four doses.⁹ Noncompliance with the dosing schedule is a significant problem, particularly in Third World countries, rendering the vaccine less effective or completely ineffective. Ongoing research and development has led to breakthroughs that enable the vaccine to be administered in one dose with equal effectiveness. One group is specifically investigating the effectiveness of different PLGA microspheres to deliver the hepatitis B vaccine in one dose.¹⁰ This type of preventive care for hepatitis B makes it feasible to vaccinate a larger population against a significant public health threat – an infectious disease that leads to approximately 600,000 deaths a year.⁹

In terms of fighting chronic disease, nanomedicine has the potential to dramatically impact health within the United States as well as across the world. In the United States, cancer is the number two cause of mortality; it is estimated that in 2009, there were approximately 1.48 million cancer cases.¹¹ Traditional cancer treatments such as chemotherapy, surgery, and radiation therapy are taxing on patients because these interventions are largely nonspecific; they damage both cancerous and healthy cells.¹² The National Cancer Institute (NCI), recognizing the tremendous potential of nanotechnology to enhance the diagnosis and treatment of cancer, developed the Alliance for Nanotechnology in

Cancer in 2004.¹³ This alliance fosters research and development of nanotechnology-based solutions ranging from diagnosis to treatment of cancer that are more efficient and have fewer side effects. The NCI provides support for several drugs and therapies harnessing nanotechnology in various phases of testing, all the high through clinical trials. Currently, there are multiple nanoenabled drugs that are approved by the FDA for the treatment of cancer, like Abraxane, which is employed to treat carcinoma, and Doxil for ovarian cancer.^{14,15} Advances in regenerative medicine utilizing carbon nanotubes and nanofibers, nanopatterned extracellular matrices, and dendritic nanopolymers are a few examples of new technologies that are being developed to impact other major causes of morbidity and mortality in the United States, including cancer, Alzheimer's disease, and heart disease.^{16–19} Research efforts focused on these highly prevalent diseases demonstrate how nanomedicine are often utilized in a spread of the way to tackle large public health issues.

Keywords:

Challenges, herbal extract, nanoherbal formulation, nanotechnology, novel delivery system, opportunity, traditional medicine