

GREEN NANOTECHNOLOGY—IMPLICATIONS IN NANOMEDICINE FOR THE CREATION OF HOLISTIC INTEGRATIVE MEDICINE (HIM)

Kattesh V. Katti, M.Sc.Ed, PhD, DSC, FRSC, FNAI

Curators' Distinguished Professor of Radiology and Physics, Director, Institute of Green Nanotechnology,
School of Medicine, University of Missouri, Columbia, Missouri 65212, USA

<http://katteshkatti.com/>

This lecture will discuss discoveries made in Dr. Katti's laboratories of novel nanomaterials through Green Nanotechnology and their important applications in Holistic Nano-Medicine. According to the World Health Organization (WHO), nearly 9 million people died of cancer in 2015 (1, 2). As June 20, 2016, over one million (1,351,134) people have died from cancer just in the first three months globally. The number of new cases is expected to rise by about 70% over the next 2 decades, most of those deaths occurring within India and within the Indian and African subcontinents. Among men, the 5 most common types of cancer diagnosed are lung, prostate, colorectum, stomach, and liver cancers, whereas the 5 most common sites, diagnosed in women across the world, were breast, colorectum, lung, cervix, and stomach cancer. Therefore, the development of therapeutic modalities that address cancer risks and treatments that are relevant to living styles, health and hygiene conditions for various different populations are imperative. As part of our ongoing efforts toward the development of new, novel and relatively non-toxic antitumor agents (2-4), we are currently interested in combination therapies that take advantage of well-established FDA approved cytotoxic chemotherapeutic agents (such as cisplatin, doxorubicin, etoposide and the likes) in conjunction with naturally available phytochemicals with capabilities to modulate important cell signaling pathways such as the NFκB family of redox transcription factors. Our rationale is derived from sound scientific foundation that most of the human cancers become resistant to therapies based on traditional FDA approved cytotoxic chemotherapeutic agents and that such drug resistant cancer cells can be sensitized through interaction with redox active phytochemicals via cellular redox system modifiers. Our overall objective is to utilize the tremendous healing and curing power of naturally available phytochemicals in order to make the currently available FDA approved chemotherapeutic agents more effective, less toxic, through combination therapies via modulation of ROS and stress kinase pathways at the cellular level—all through novel Green Nanotechnology approaches. The intervention of phytochemicals from herbs, plants, fruits and various herbal roots is expected to create a new paradigm in integrative medicine which combines holistic approaches of herbal medicine to make the overall combination therapy more effective, less toxic and ultimately bringing down health care costs globally. Our new Holistic-Integrative Medicine (HIM) approach (2-4) utilizes novel green nanotechnology to encapsulate cellular redox system modifying phytochemicals-based antioxidants to afford effective delivery, enhance bioavailability and thus achieve modulation/deactivation of NFκB family of redox transcription factors—in order to control malignancies of breast, prostate, pancreas, colon, leukemia, lymphoma and various human tumors. In this lecture, discussions will focus on novel Green Nanotechnology approaches for (i) the development of nanoparticles derived from redox active phytochemicals from tea, grapes, and various herbs/roots; (ii) combination therapeutic approaches involving FDA approved cytotoxic agents and nanoparticles with capabilities to modulate cellular redox systems and (iii) Overall oncological implications of Green Nanotechnology within the Indian and the global context of reducing the burden of cancer in terms of cost, achieving enhanced efficacy and making phytochemical-based Holistic Integrative Medicine therapeutic agents available globally at affordable costs.

1. World Cancer Report (2014): <http://www.iarc.fr/en/publications/books/wcr/wcr-order.php>
2. **Kattesh Katti's Gold standard | Stanford Medicine (2016) -**
<http://stanmed.stanford.edu/2016winter/gold-standard.html>
3. **Katti, et al; et al.** The application of nanotechnology in medicine: treatment and diagnostics. *Nanomedicine (Lond.)* (2014), 9(9),1291-1294
4. Kattesh V. Katti: '**Renaissance of nuclear medicine through green nanotechnology: functionalized radioactive gold nanoparticles in cancer therapy—my journey from chemistry to saving human lives**'; Journal of Radioanalytical and Nuclear Chemistry, (2016); 309(1), 5-14