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# World Drug Delivery Summit

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### Formulation of iron-coated liposomes of SERM and design development of magnetic belt for the management of breast cancer during earlier stages and protection from invasive cancer

**Prashant S Khemariya**
SRK Pharmaceutical, India

Breast cancer remains the utmost common invasive cancer and the second leading cause of cancer mortality for women in the United States. Worldwide, breast cancer comprises 22.9% of all cancers (excluding non-melanoma skin cancers) in the women. It is estimated that, globally, over 508,000 women died in 2011 due to breast cancer (Global Health Estimates, WHO 2013). Liposomes are attractive due to their unique opportunities together with negligible side effects not only in cancer but also in the treatment of other diseases. In this study, our aim is to develop combined prospective of iron-coated liposomes (of raloxifene hydrochloride) and design a magnetic belt (magnetism < 0.1 T) for the management of breast cancer during earlier stages and prevention from developing invasive cancer, and osteoporosis in post-menopausal women. Keeping this objective, the present systematic study was focused to design magnetic belt in shape of women's breast that will contain few magnetic fires having enough magnetism to attract iron-coated liposomes only during oral administration of raloxifene hydrochloride, in order to overcome the poor bioavailability issue with the drug as well. Raloxifene or methanone, [6-hydroxy-2-(4-hydroxyphenyl)benzo[b]thien-3-yl]-[4-[2-(1-piperidinyl)ethoxy] phenyl] hydrochloride (a Selective Estrogen Receptor Modulator-SERM) is FDA approved drug and is used to decrease the chance of invasive breast cancer in post-menopausal women who have a high risk for developing the disease or who have osteoporosis. After oral administration of iron-coated liposomes, they will distribute throughout the body through the systemic circulation while the magnetic belt will be on the cancer site (breast). This belt results in accumulation of liposomes which will concentrate at the site of cancer because of the iron and magnet interaction. Ultimately, drug concentration and absorption will also enhance on the surrounding areas of cancerous cells where the cancerous cells will be denatured quickly.

dr.p.khemariya@gmail.com

### Nanoparticulate systems for better delivery for anticancer and CNS active drugs

**R N Saha**
BITS Pilani Dubai Campus, UAE

Advancement in technology and insight of disease conditions, led to use of nanotechnology in better drug delivery, efficient therapeutic efficacy and better patient compliance. Study of nanoparticulate drug delivery systems, like polymer based nanoparticles, solid-lipid nanoparticles, liposomal nanoparticles, showed promising results with several advantages over conventional or other particulate delivery systems. Studies with anticancer drugs, CNS active drugs and antiviral drugs produced modified and selective distribution, long term plasma circulation with controlled release for long term therapy. *In vitro* evaluation and characterization of the designed nanoparticles (NPs) showed that nature, amount and combination of materials used for design of nanoparticulate systems play important role of characters of NPs like size, zeta potential, polydispersity index and release profiles. They also play important role inlong term retention and high plasma drug concentration, modification of biodistribution. In pharmacokinetic and biodistribution studies in animal model showed selective but different distribution profiles based on nature and amount of carriers. Our group worked on some anticancer, antivirus and CNS active drugs and found long term plasma circulation and higher plasma drug concentration with respect to pure drug and thus reducing frequency of administration. Selective distribution were found to some organs/tissues and lower to other tissues. *In vitro* cell uptake study found to produce better cellular uptake and much lower IC50 values in case of NPs. Pharmacodynamic studies in animal model showed better therapeutic efficacy and longer survival period. Targeting index found to be enhanced in case of NPs. The findings suggest NPs are going to be future of novel drug delivery systems.

rnsaha@yahoo.com