

Nanomagnetic Drug Delivery

*Most current drug delivery technologies are **PASSIVE** in their approach. Nanomagnetic materials offer the promise of **ACTIVE** drug delivery, using nanomagnetic particles (NMP) and coatings with the capability to be tuned to specific wavelengths of electromagnetic energy.*

THESE MATERIALS ARE DESIGNED to bind a drug or multiple drugs and control the release by application of tuned wavelengths that release the drug selectively at the desired location and time, enabling the physician to precisely control the drug delivery.

This application could be used to load multiple drugs, or multiple courses of therapy of a single drug, into a coating and deliver each course of therapy when selectively released by the application of the appropriate signal.

Highlighted applications

Drug Eluting Devices – Stents and Orthopedics

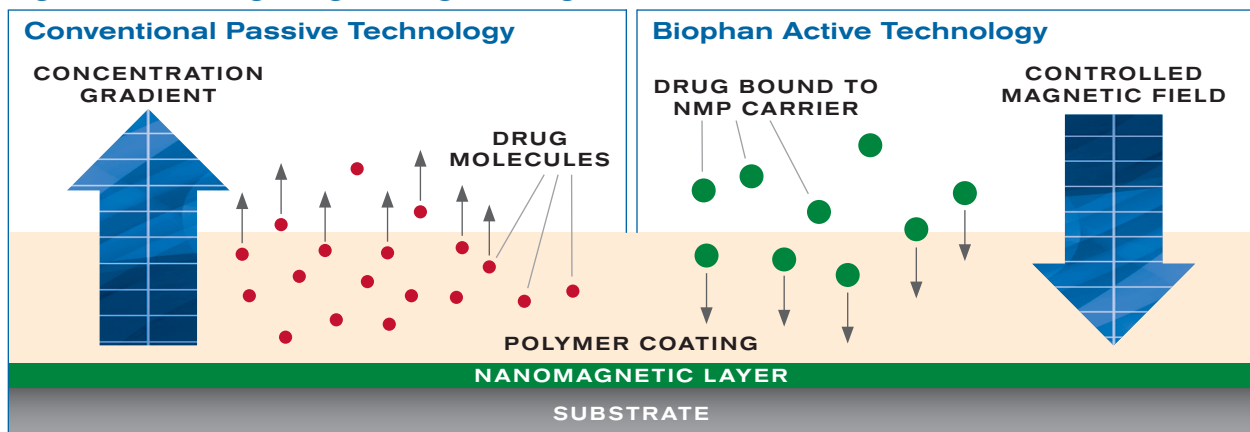
In the case of current drug eluting stents, drugs are released from the stent surface to prevent restenosis (or renarrowing) of the vessel after stent implantation. The inclusion of anti-proliferative compounds to elute from the surface of stents enables a significant reduction in restenosis rates, and a subsequent reduction

in the need for either re-intervention or surgery to treat the complication.

The use of NMP would allow reloading of the drug eluting stent *in situ*, to permit non-invasive drug treatment for the five to ten percent of patients who still experience restenosis requiring a re-intervention (see Figure 1).

Continued on reverse ►

Fig. 1 – Reloading Drug Eluting Coatings



Continued from front ►

Complications with orthopedic implants occur less frequently than complications from stent placement, but the methods for treating these complications are very invasive. It is critical to have the capability to deliver drugs locally to treat complications like infection, or face the possibility of a repeat surgery.

The ability to deliver drugs either from the surface, or targeted to the surface, of orthopedic implants to fight infection or help to promote bone growth and healing can help to reduce the need for costly and traumatic surgery. NMP targeting could help to enable more effective drug treatments around these implants.

Guided Drug Delivery

Nanomagnetic particle technology has the promise of providing a mechanism for guided drug delivery that could vastly improve drug safety and efficacy, with reduced systemic side effects. This technology could be used to improve specificity by guiding the drug to the desired site of action, and providing a high local dose where needed with a low systemic concentration.

Guided delivery can enable a significant improvement in safety profiles. For instance, chemotherapeutic drugs could achieve a high local concentration in the tumor site, with a significantly lower systemic exposure, greatly reducing the side effects associated with these agents (see Figure 2). ■

Fig. 2 – Guided Drug Delivery

