# Targeting cancer cells with an implantable drug delivery system

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An article published in *Experimental Biology and Medicine* (Volume 242, Issue 7, March, 2017) describes a new drug delivery system for the treatment of cancer. The study, led by Dr. Horst A. von Recum from the Department of Biomedical Engineering at Case Western Reserve University in Cleveland Ohio, reports that an implantable local delivery system, which is activated by the acidic environment surrounding a tumor, provides sustained drug release without damaging healthy tissues.

The clinical standard of care for cancer often requires patients to receive drugs intravenously. This route of administration allows drugs to distribute throughout the patient's entire body, including normal tissues. In some cases, the amount of drug administered and the time the patient receives the drug must be reduced to prevent damage to normal tissues. However, this also reduces the number of cancer cells that are killed. In fact, some very effective cancer drugs cannot be used due to their toxicity to normal tissues. For example, doxorubicin, which is effective against a large number of tumors, is toxic to the heart, liver, kidneys and healthy tissue surrounding the tumor. Alternate drug delivery systems that minimize damage to normal tissues without decreasing drug effectiveness would improve the clinical outcome for many cancer patients.

Several studies suggest that pH sensitive delivery systems can overcome the toxicities associated with doxorubicin therapy. However, most of these systems do not provide the sustained release that is necessary for killing tumor cells. In this study, Dr. von Recum and colleagues, report

that a modified form of doxorubicin which is activated in the slightly acidic environment surrounding cancerous tumors was capable of preferentially releasing doxorubicin at the tumor site for 40 days. Negligible release of active drug occurred in the neutral environments surrounding healthy tissues. Furthermore, the effectiveness of this modified form of doxorubicin was equivalent to the unmodified drug. This system is capable of delivering the drug for a substantially longer (10X) time period than other pH-sensitive doxorubicin delivery systems, which translates into fewer doses for patients. Dr. von Recum said "we feel that this is a new lease on the life of doxorubicin, a great anti-cancer drug, since the total contained dose is far lower than that used systemically, and well below the toxicity threshold of the heart."

Dr. Steven R. Goodman, Editor-in-Chief of Experimental Biology and Medicine, said, "von Recum and colleagues have provided a pH-sensitive DOX delivery system that allows delivery at a slow and steady rate that is specific to tumor tissue. The next step would be animal testing."

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