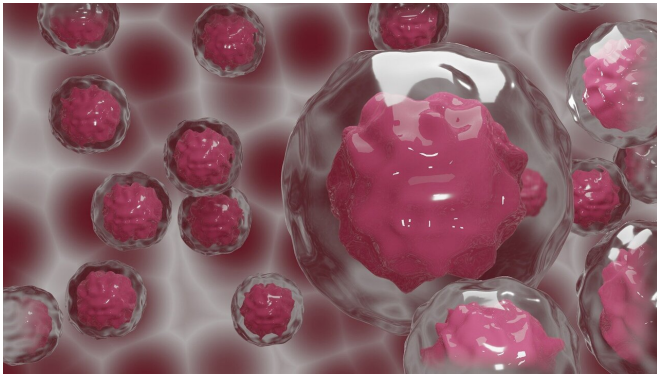


# The bull's eye: New modified stem cells can deliver drugs specifically to tumor cells

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As humans evolve, cancer also evolves in parallel, making the race for finding efficient treatment methods for cancer patients challenging and constant. In addition to designing drugs for treatment, the delivery of these drugs to targeted organs is also a major challenge faced by the cancer research community.

Many research groups have tried to develop techniques to efficiently deliver anti-cancer drugs to tumors. An interesting way utilizes a distinct group of cells in our body, the mesenchymal stem cells (MSCs), which have a special ability to find and move towards tumors. This means that theoretically, we can load these "tumor-homing" MSCs with [anti-cancer drugs](#) and use them to hinder cancer progression. However, pilot studies show that the anti-cancer drug loading capacity of MSCs is limited, and they tend to lose their ability to target and reach tumor cells upon drug loading.

In a recent study published in *Journal of Controlled Release*, researchers from Japan, led by Dr. Kosuke Kusamori and Professor Makiya Nishikawa from Tokyo University of Science, sought to find out how to modify MSCs to bypass these

problems. Dr. Kusamori, Assistant Professor in the University's Department of Pharmacy says, "We wondered if the answer to our dilemma of modifying mesenchymal stem cells with an anticancer drug was to exploit the property of [mesenchymal stem cells](#) to accumulate in tumor tissues."

Using the well-known "avidin-biotin complex" (ABC) method, the researchers used liposomes—cellular lipid bags popularly used as drug delivery systems—to carry the anti-cancer drug doxorubicin (DOX) to the surface of specific mouse MSCs. They named these lipid bags carrying DOX "DOX-Lips."

The researchers found that the MSCs loaded with DOX-Lips could carry and selectively target mouse colon cancer cells growing in artificial cultures in the lab. These modified MSCs could not only carry a significant amount of the drug, but also efficiently deliver it inside the target cancer cells. To test if this feature is replicated in a living system, they used a mouse model with skin and lung cancer. They found that in both cases, DOX-Lips were able to efficiently reach cancer cells and release the drug into the cytoplasm of the cancer cells. The researchers concluded that the modified MSCs could completely suppress tumor growth in mouse models.

There are several advantages to this new method. First, the process is relatively faster than previously known methods. As Yukiya Takayama, a doctoral student in Professor Nishikawa's lab and a co-author of the study observes, "The relatively short duration of the ABC method made it possible to quickly modify the cell surface with DOX-Lips and avoid cell damage." Second, this method did not affect the process of cell attachment to cancer cells, thereby ensuring maximum efficiency in drug delivery. Third, contrary to previous observations that lipid bags of only a certain size can be used to deliver drugs, this new study suggests that the size of the lipid bags very likely does not affect drug

delivery; this finding can be exploited to deliver many different doses of drugs as well.

The combination of the ABC method and the use of Lips thus seems to be the answer to the researchers' dilemma. Professor Nishikawa is excited about these results. "We have succeeded in developing a new targeted cancer therapy," he observes. "Mesenchymal stem [cells](#) can migrate to brain tumors and minute cancer lesions that are otherwise inaccessible to conventional drug delivery systems. Our method may thus be effective against intractable cancers," Nishikawa says.

This study is thus a promising advancement in the field of cancer research; the new method identified by the researchers may prove to be the answer on how to send the treating [drug](#) to [cancer](#)'s doorstep.

**More information:** Yukiya Takayama et al, Anticancer drug-loaded mesenchymal stem cells for targeted cancer therapy, *Journal of Controlled Release* (2020). [DOI: 10.1016/j.jconrel.2020.10.037](https://doi.org/10.1016/j.jconrel.2020.10.037)

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