Understanding the Mechanism behind Nanoparticle Enhanced Oral Absorption of Chemotherapeutic Drugs

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Cancer is one of the leading causes of death in the United States, and currently treatment requires patients to receive chemotherapeutic drugs intravenously, which is both inconvenient and expensive. Oral administration of chemotherapeutic drugs, like doxorubicin, would be convenient, but cannot be easily done, due to poor absorption of the drug by the human gastrointestinal tract. Last year, I was able to show that doxorubicin, a chemotherapeutic agent, can be delivered orally to cancer patients if it is encapsulated in sodium alginate-AOT nanoparticles. However, doxorubicin is only one chemotherapeutic agent that is delivered intravenously to patients. In order to make my findings more applicable to other drugs, I looked to find out the mechanism behind nanoparticle enhanced absorption. I hypothesized that presence of AOT caused the doxorubicin to be taken in by the cells in the gastrointestinal tract. In order to test this hypothesis, MDCK cells were cultured, a cellular uptake study to compare free drug versus doxorubicin and AOT was conducted, and a BCA assay was completed. Later, cell permeabilization studies were also completed to further support previous data. The experiments showed my hypothesis was correct. The AOT significantly increased the permeability of the doxorubicin across the MDCK cell layers. This information could allow for other nanoparticles to be synthesized in the future for increased availability of oral chemotherapeutic treatment. With in vivo studies, chemotherapeutic agents, including doxorubicin, could be delivered orally to cancer patients.

Awards Won:
Third Award of $1,000