CHAPMAN UNIVERSITY | Office of Research

Targeted Peptide-Drug Conjugates to Overcome Multi-Drug Resistance in Cancer

Chapman Case #2020-005

Market Need

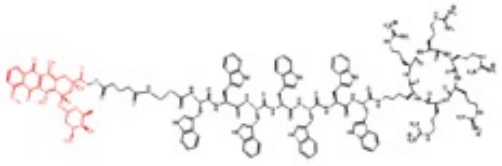
Even though there are new developments of molecularly targeted drugs to treat cancer, the most common treatment today is still chemotherapy. However, there are many challenges that limit the efficacy of chemotherapy, such as drug resistance at the molecular level by some cancerous cells, and the drugs being too toxic to healthy cells. There is a need for a drug delivery system that can effectively deliver chemotherapeutic drugs into drug-resistant tumor cells with minimal toxicity to healthy cells.

Chapman Solution

Dr. Montazeri Aliabadi and Dr. Keykavous Parang, along with a graduate student researcher at Chapman University have invented a new class of hybrid cyclic/linear peptide-drug conjugates that can effectively transport chemotherapeutic drugs such as Doxorubicin (Dox), Paclitaxel, Camptothecin, and curcumin, into the nuclei of tumorous cells. Compared to highly cationic cell-penetrating peptides (CPP), the proposed peptides can enter the nucleus of a cancerous cell without endocytic pathways. Compared to linear CPPs, which are susceptible to hydrolysis by endogenous peptidases, the proposed peptides demonstrated enzymatically being more stable and non-toxic.

Benefits:

- The conjugates have higher activity against drug-resistant cells vs parent drugs
- The conjugates significantly reduce the cell cytotoxcity in heart cells vs Dox



Cyclic $[R_5K]W_7$-Dox

Applications

- Effective delivery of chemotherapeutic drugs into the nuclei of multi-drug resistant tumor cells
- Enable the controlled release of anticancer drugs by inducing an external stimulus such as fluctuations in pH, ionic strength, temperature, or electromagnetic fields

Key Publication

- Design and Application of Hybrid Cyclic-Linear Peptide-Doxorubicin Conjugates as a Strategy to Overcome Doxorubicin Resistance and Toxicity, European Journal of Medicinal Chemistry, September 2021.

Intellectual Property

- Provisional 63/149,771

Stage of Development

- *In vitro* demonstration of conjugated Dox deliveries into Dox-resistant MDA231R cells and Dox-resistant sarcoma (MES-SAMX2) cells, demonstrating significant uptake of Dox in the nuclei of these drug-resistant tumor cells
- *In vitro* demonstration of conjugated Dox deliveries into kidney and heart cells, demonstrating significantly (5 to 10 times) less toxicity damage compared to nonconjugated Dox deliveries
- Available for licensing and further research collaborations

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