

Reversing Chemotherapy Resistance Using Ginseng-Derived Compounds

SFU

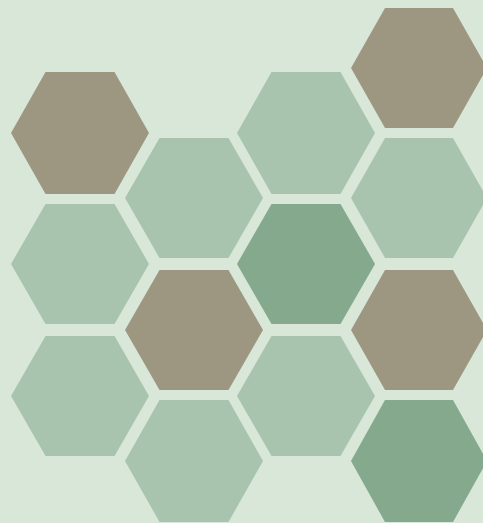
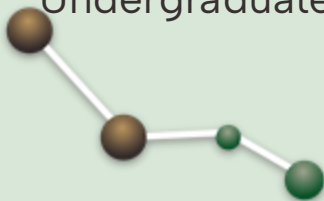
Punchline: The 3D 'shape' of a molecule determines how effectively it can trap chemotherapy inside a cancer cell.

By: Nandini Joshi

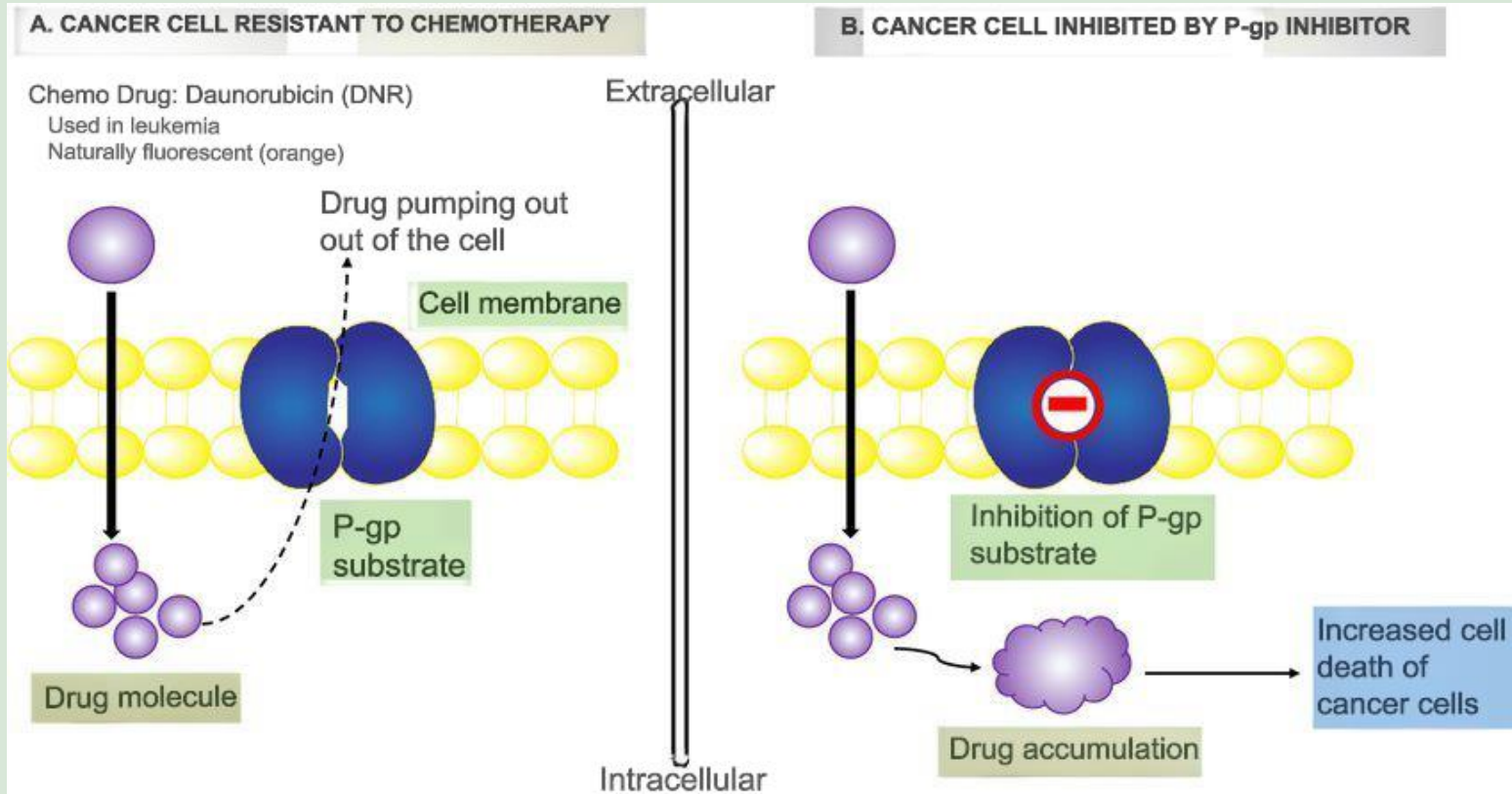
Lab: Li Lab

Supervisor: Dr. Paul Li, Dept. Of Chemistry, SFU

Undergraduate Research Symposium | April 1, 2026



The Problem: Why Chemotherapy Fails

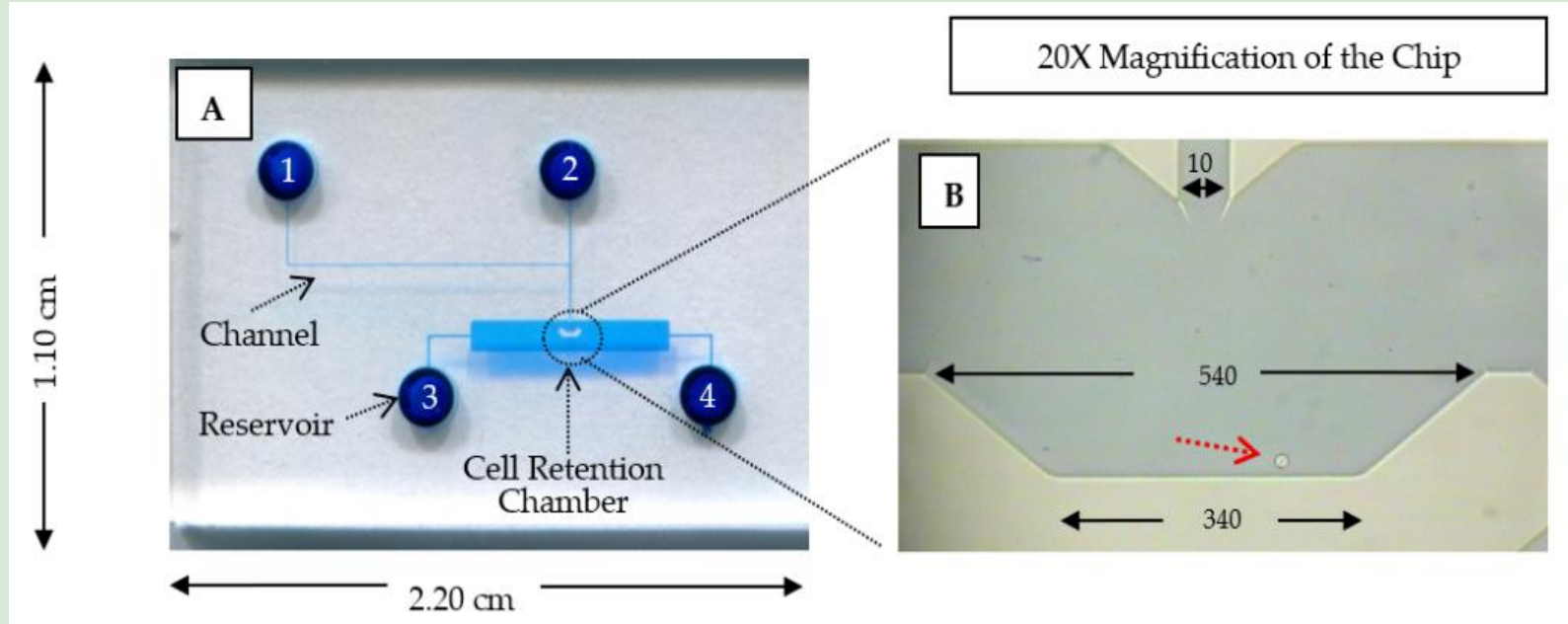


Single Cell Biochip

- Requires $<100\ \mu\text{g}$ compound
- Uses <10 cells
- Real-time measurement



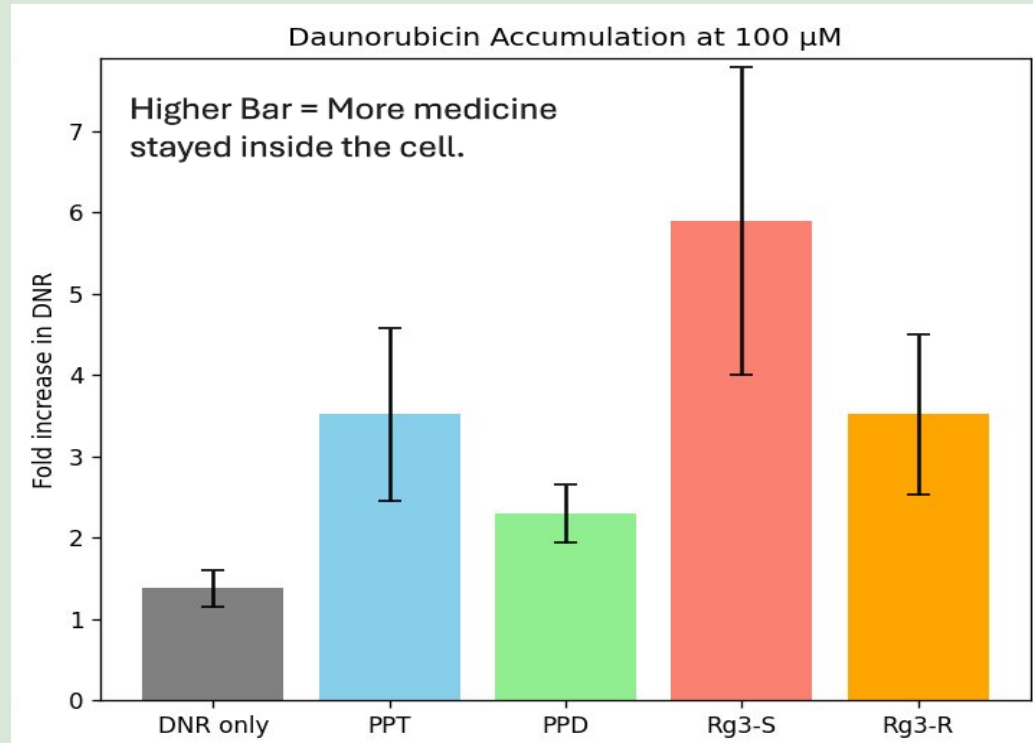
Allows us to test rare medicines that are too expensive for traditional tests.



Source: Chen, Y., Joshi, N., Chiem, M., Kolesnyk, I., Li, P. C. H., Yue, P. Y. K., & Wong, R. N. S. (2026). *Reversal effects of 20(R)- and 20(S)-ginsenoside-Rg3 on daunorubicin uptake in multidrug-resistant leukemia cells studied in the single-cell biochip*. *International Journal of Molecular Sciences*, 27(6), 2661.

Key Scientific Insight

Stereochemistry matters!



Data adapted from:

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Scientific Findings

- Shape Matters: 20(S)-Rg3 is the most potent shape for jamming the pump.
- Efficiency: Biochip uses 100x less material than traditional tests.
- Discovery: Rg3 isomers outperform parent molecules (PPD/PPT).

My Contributions

- Lab Management: Prepared solutions and maintained resistant cell cultures.
- Chip Operation: Achieved precise single-cell trapping in micro-chambers.
- Data Analysis: Quantified real-time drug accumulation and fluorescence.
- Publication: Co-authored the peer-reviewed research paper.