# NK Cell-Derived Extracellular Vesicles For Glioblastoma

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## Introduction

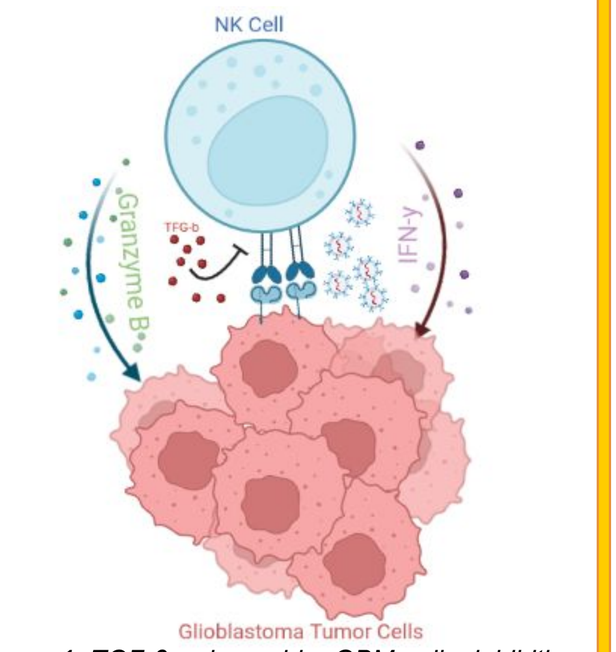


***Figure 1.*** *TGF-β, released by GBM cells, inhibiting NK cell receptor from releasing apoptotic proteins. Nk-sEVs are present targeting the cancer cells*
*Pc:Annie Cai*

- Glioblastoma (GBM) is an aggressive form of brain cancer, and is surrounded by the blood brain barrier which is a major obstacle for GBM treatments
- Natural killer (NK) cells target tumor cells and release cytokines along with other apoptotic factors which induce cell death
- However, cancer cells can escape NK cells by producing TGF-β protein, which inhibits the signaling pathway necessary to produce an anti-cancer response
- NK cell-derived small extracellular vesicles (NK-sEVs) are not inhibited like NK cells, and express similar anti-cancer mechanisms
- Studies have shown that NK-sEVs can kill cancer cells, but require a high dose of sEVs to induce an anti-cancer effect
- **To improve targeting and efficiency, we synthesized a targeting peptide to improve sEV efficacy**

## Methods and Skills Learned

- **Isolation of the sEVs**
  sEVs were isolated through differential centrifugation and ultracentrifugation

- **Nanoparticle Tracking Analysis (NTA)**
  Used to track and measure the range of sizes of specific nanoparticles

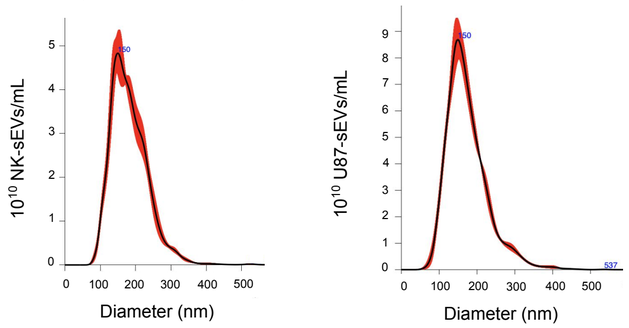


***Figure 2.*** *NTA of isolated NK-sEVs and U87-sEVs showed mean diameter of 183.3 ±2.5nm and 174.3 ± 1.8 nm, and mode diameters of 154.1 ± 8.5nm and 155.6 ± 3.7nm, respectively*

- **Quantitative Polymerase Chain Reaction (qPCR)**
  Used to quantify the expression of RNA (or DNA)

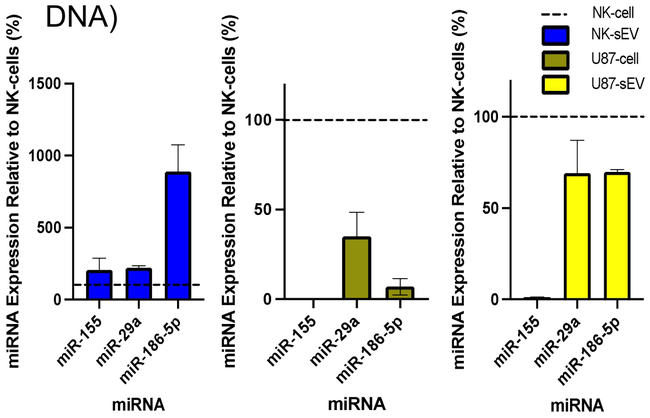


***Figure 3.*** *miR-155, miR-29a, and miR-186-5p are expressed more in NK cells compared to U87 cells and U87 sEVs (GBM cells).*
*Photo credit: Abby Lim*

- **ELISA Assay**
  Colorimetric antibody assay that quantifies the amount of specific proteins

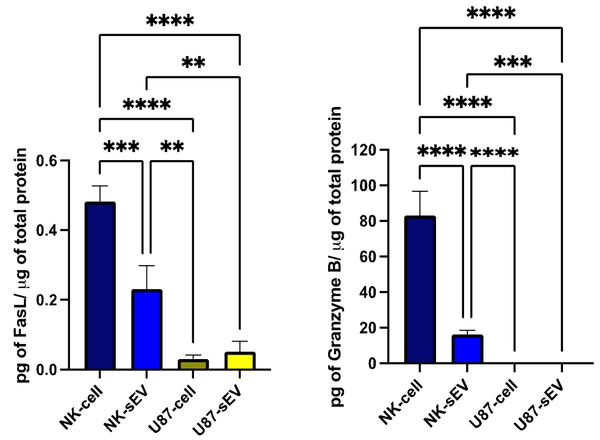


***Figure 4.*** *ELISA of the anti-cancer proteins FasL and Granzyme B demonstrate more of these proteins in NK cells and NK sEVs than in U87 cells and U87 sEVs.*
*Photo credit: Abby Lim*

- **Micelle Binding**
  Created micelles to confirm specificity and binding capabilities of our IL13αD targeting peptide

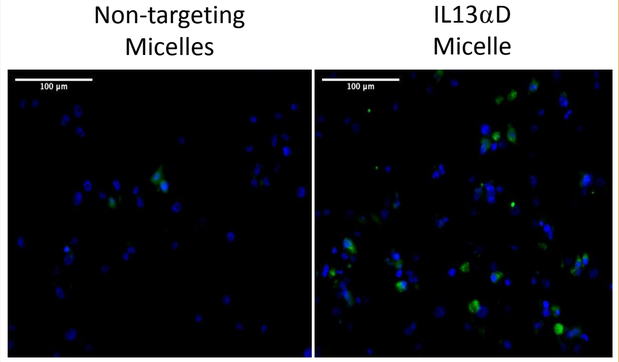


***Figure 5.*** *Micelle binding of the GBM targeting protein IL13aD is shown to effectively bind to cells in comparison to our non-targeting micelles*
*Photo credit: Abby Lim*

## Next Steps & Advice for Future SHINE Students

This research program has greatly furthered my interest in biomedicine related research.

**Advice:**

- Never be afraid to ask questions, your mentor and SHINE staff are there to help you
- Go to your Centor Mentor and any other SHINE staff's office hours to ask for help or just to get to know them
- Try and make new friends
- Enjoy your time here at SHINE!

## Acknowledgements

I would like to thank Dr. Katie Mills for creating the SHINE program, to USC NAI and Professor Chung who gave me this amazing opportunity to learn about research, to my Ph.D. mentor, Abby Lim, for helping me understand the different procedures and giving me helpful college advice. Thank you to the Alfred Mann Institute for providing me the scholarship to attend this wonderful program. I also like to thank my family, friends, and teachers for their support that led me to this life changing opportunity.

## References

[1] Zhu, L, et al. *Biomaterials*, October 2018.