T Cell Immunotherapy of Infection Disease and Cancer

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1) Project Summary

This project was focused on improving the immune response to infectious disease and cancer. We have engineered T cell receptors with 1000-fold increase in affinity and will characterize their value as diagnostics and therapeutics. In addition, we examined changes in T cell function due to the co-receptor CD5. We also examined how T cell responses to infection are dependent upon metabolic and epigenetic regulation.

A) Evaluation of how well the academic objectives were met:

*We were able to meet our goals of better understanding the T cell response to cancer as evidence by the published 6 papers describing our work.*

B) Evaluation of the mentoring environment

*We have met our goals of high-quality mentoring for a number of students. On our 6 publications there are 23 student authors and on our 37 student poster presentations there are 135 student authors.*

C) List of students who participated and academic deliverables

*See 6 publications and 37 posters with the students listed below*

D) Description of the results

*While the details are found in the published papers listed, we have successfully found that CD5 plays a key role in regulating T cell responses and these findings are being applied in the development of novel cancer immunotherapies.*

E) Description of how the budget was spent

Graduate student wages – $7,500

Undergraduate student wages $2,500

Supplies (antibodies, flow cytometry, cell culture media, metabolism kits) $10,000

2) Published papers that the MEG supported

* = BYU Undergraduate † = BYU Graduate Student


3) Student presentations supported by MEG

*= BYU Undergraduate †= BYU Graduate Student W = Oral presentation S =Poster presentation


5. Freitas C†, Cox T*, Dunne A*, and Weber KS. CD5 co-receptor plays a role in T cell metabolism. Midwinter Immunology Conference. Jan 26-29, 2019. Asilomar CA


7. Freitas CMT†WS, Cox TD*, Johnson DK†, and Weber KS. CD5 expression influences T cell metabolism and mice behavior. The American Association of Immunologists Annual Meeting. May 4-8th Austin TX


14. Freitas CM†W, Cox TD†, Johnson DK†, Franson JJ†, Bridgewater LC, and Weber KS. Role of CD5 expression on T cell metabolism. Tri-Branch American Society of Microbiology Meeting. April 7th, 2018. Durango CO


22. Johnson D† and Weber KS. T cell receptors specific for a naturally occurring Listeria monocytogenes epitope engineered in vitro for high affinity. American Society for Microbiology Intermountain Branch Meeting. April 15th Ogden Utah
23. Freitas CT†W, Hamblin GJ*, Larsen CM*, Weber KS. Naive Helper T Cells with high CD5 expression have increased calcium signaling. American Society for Microbiology Intermountain Branch Meeting. April 15th Ogden Utah


△Poster won first place in the competition.


33. Johnson DJ† and Weber KSW. Role of affinity for antigen and self in T cell activation and memory generation. LDS Life Science Research Symposium. July 20-22nd Lehi Utah

34. Crandall J*S, Vaden K†, O’Neill K, and Weber KS. Sequencing an antibody specific for an epitope overexpressed on cancer cells. 10th Annual Utah Conference on Undergraduate Research. February 19th Salt Lake City. Utah

35. Hamblin G*S, Freitas C†, Steadman N*, Williams K*, and Weber KS. Calcium Signaling in Primary and Secondary Responses of Listeria specific T helper cells. 10th Annual Utah Conference on Undergraduate Research. February 19th Salt Lake City. Utah