

# Mathematical models for immune checkpoint therapy

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## Abstract

Our immune system protects us against infectious diseases and also cancer. To avoid unnecessary damage the immune response must be switched off when it is not needed. This occurs via immune checkpoints such as CTLA-4 and PD-1. Cancer cells exploit this in order to promote their own survival. Immune checkpoint therapy uses antibodies to block the off switch and thus help the immune system to fight tumours. The mechanisms of this type of therapy are not well understood and mathematical modelling in one way to try to obtain a better understanding and provide an avenue towards improving the therapies. This talk describes the existing mathematical models for CTLA-4 and PD-1. It concentrates on a model of Arulraj and Barik, a system of ordinary differential equations, which is a mathematical implementation of the work of Hui et al. on the mechanism of PD-1 inhibition.

## References

- [1] Arulraj, T. and Barik, D. 2018 Mathematical modeling identifies Lck as a potential mediator for PD-1 induced inhibition of early TCR signaling. PLoS ONE 13(10): e0206232. <https://doi.org/10.1371/journal.pone.0206232>
- [2] Hui E. et al. 2017 T cell costimulatory receptor CD28 is a primary target for PD-1mediated inhibition. Science 355(6332):142833.