Interactions between immunotoxicants and parasite stress: implications for host health

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Highlights

- We present a model to describe the within-host dynamics of an organism under both immunotoxicant and parasite stress.
- We consider both the direct toxicity and indirect sub-lethal immunosuppression of toxicants.
- Sub-lethal exposure to toxicants can rapidly promote an already-present parasite infection, through the suppression of the immune system.
- We find that within-host parasite density is maximised by an intermediate toxicant level, depending upon the relative strength of immunosuppression and toxicity.
- We classify the breakdown of the within-host dynamics into three phases of increasing toxicant stress, which are determined by the relationship between the statuses of immunity, cellular health and level of toxicant exposure.
- We discuss the implications of our model in the context of individual bee health under multiple stressors.