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Effector CD8$^+$ T cells migrate via chemokine-enhanced generalized Lévy walks EDWARD BANIGAN, Physics & Astronomy, University of Pennsylvania, TAJIE HARRIS, DAVID CHRISTIAN, Pathobiology, University of Pennsylvania, ANDREA LIU, Physics & Astronomy, University of Pennsylvania, CHRISTOPHER HUNTER, Pathobiology, University of Pennsylvania — Chemokines play a central role in regulating processes essential to the immune function of T cells, such as their migration within lymphoid tissues and targeting of pathogens in sites of inflammation. In order to understand the role of the chemokine CXCL10 during chronic infection by the parasite *T. gondii*, we analyze tracks of migrating CD8$^+$ T cells in brain tissue. Surprisingly, we find that T cell motility is not described by a Brownian walk, but instead is consistent with a generalized Lévy walk consisting of Lévy-distributed runs alternating with pauses of Lévy-distributed durations. According to our model, this enables T cells to find rare targets more than an order of magnitude more efficiently than Brownian random walkers. The chemokine CXCL10 increases the migration speed without changing the character of the walk statistics. Thus, CD8$^+$ T cells use an efficient search strategy to facilitate an effective immune response, and CXCL10 aids them in shortening the average time to find rare targets.

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