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A CONTINUOUSLY STRUCTURED POPULATION MODEL OF CLONAL SELECTION IN ACUTE LEUKEMIAS

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We present a continuously structured population model of selection dynamics in acute leukemias, which consists of a system of coupled integrodifferential equations. Compared to classical ordinary differential equation models, which can become difficult (if not impossible) to treat analytically in scenarios which are clinically relevant, our model is more tractable and can be analysed in a more efficient way. Exploiting the analytical tractability of our model, we first study the long-term behaviour of the solutions, and thus illuminate how clonal selection is shaped by the properties of leukemic cells at different maturation stages. We combine the results of our asymptotic analysis with numerical solutions of a calibrated version of the model based on real patient data. In summary, our mathematical results (analytical and computational) formalise the biological notion that differences between the self-renewal fractions of leukemic stem cells provide the necessary substrate for clonal selection to act on.

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