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Brody H Foy* (bfoy1@mgh.harvard.edu), Simches Research Building, Massachusetts General Hospital, 185 Cambridge Street, Cambridge, MA 02114, and **John M Higgins**. *Estimating the age of red blood cells through mathematical simulation: a validated, population dynamics approach.*

Understanding how red blood cells (RBCs) develop, grow, and respond to pathological scenarios is of immense importance to haematology, and more broadly to medicine. However, due to the challenges of in vivo experimentation, precise measurement of the age distribution of RBCs is extremely difficult.

To address this issue, we use a partial differential equation model to simulate the growth of red blood cells from initial release into the bloodstream through to senescence (death). The model uses patient-specific parameters, estimated from clinical blood sample measurements, and produces realistic estimates of RBC age distributions.

To validate the model these estimates are compared to mean RBC age estimates derived from a previously published haemoglobin glycation model (Malka et al. 2016, *Sci Trans Med*). For 52 diabetic subjects, model-derived mean red cell ages show strong concordance with glycation-model derived estimates ($\rho = 0.55, R^2 = 0.33$). However, unlike the glycation model, the proposed dynamics model does not require accurate estimates of average glucose, and thus can be applied to a much wider array of scenarios.

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