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Geographic Tongue as a Reaction-Diffusion System[1] MARGARET MCGUIRE, CHASE FULLER, JOHN LINDNER, NIKLAS MANZ, The College of Wooster — Geographic tongue (GT) or benign migratory glossitis is a condition of an unknown cause characterized by chronic lesions that slowly migrate across the surface of the tongue. The condition's wavefronts suggest that it can be modeled as a reaction–diffusion system. We present a model for geographic tongue pattern evolution using reaction–diffusion equations applied to portions of spheroids and paraboloids that approximate a tongue shape. We selected the Barkley model for our reaction-diffusion equations modified the reaction-diffusion system to account for surface curvature using the Laplace-Beltrami Operator then numerically integrated the model over spheroids using the Finite Element Method on desktop computers. We report images of simulations where wavefronts of excitation are initiated under different conditions on spheroids and paraboloids resembling the tongue. We show the propagation of these wave fronts and spirals and compare them to clinical images of geographic tongue. Finite-element decomposition of the differential equations on spheroids and paraboloids easily generated spiral and elliptical wave fronts similar to those observed clinically. The qualitative similarity between our simulations and patient data can be achieved without assuming anisotropic diffusion on the tongue's surface. In our next steps, we will use experimental time-series to measure real GT propagation speeds and determine diffusion constants to reproduce particular subjects' GT behavior as well as investigate the effects of inert obstacles like fungiform papillae or fissures in the tongue on GT evolution.

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