

Travelling Waves in a Model of Skin Pattern Formation

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According to the Cruywagen-Murray (1992) model, the skin consists of two layers, epidermis and dermis, separated by a basal lamina. The epidermis is modelled as a two-dimensional visco-elastic continuous medium. The Reynolds number of the motion of the epidermis is assumed to be low. The body force balances the elastic force, the viscous force, and the cell traction generated within the epidermis by a morphogen produced in the dermis. In this model the motion of the dermal layer is described by a reaction-diffusion equation containing chemotaxis like term. The aim of this paper is a rigorous mathematical analysis of travelling wave solutions of the described equations, under a simplifying assumption that the force exerted by the basal lamina is much larger than the other forces acting on the epithelium. Using the Implicit Function Theorem the existence of travelling waves with positive dermis cell density is proved, and a discussion of the minimal wave-speed problem is carried out.

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