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APPLICATION OF FRACTIONAL PARTIAL DIFFERENTIAL EQUATIONS TO WOUND HEALING MODELLING

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Wound healing is an intricate process that involves orchestrated cell migration and proliferation. During wound healing, cell evolution is controlled by both biochemical and mechanical cues. Traditionally, continuous convection-diffusion-reaction models are used to study different aspects of the healing process, such as wound closure [1], wound contraction [2] and angiogenesis [3]. In all these models, cell random migration and chemical diffusion of growth factors are modelled with Fick's second law. Despite providing valuable results, this law is suited only for homogeneous media. However, skin, as any other biological tissue, is highly heterogeneous which may cause that cell migration exhibits different behaviours through the different layers of the skin. Fractional partial differential equations are known to cope with heterogeneities in a natural way, as well as to be able to tune in memory aspects [4] or variable speed travelling waves [5].

In this work, we consider a simple wound healing model that accounts for the interaction between fibroblasts and a generic growth factor. In this model, we replace the diffusion terms by fractional partial differential equations. On a first stage, we will address the migration pattern of fibroblasts and the wound healing rate. After that, the role of the nonhomogeneous migration of fibroblasts will be further analysed in a wound contraction environment.

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