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Modeling heat transfer in tungiasis inflammation of the skin

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Abstract: Thermographic imaging is an alternative method that is emerging in the diagnosis of several diseases including tungiasis. Tungiasis also known as jigger infestation, is a tropical disease that disproportionately affect the poor and is caused by sand fleas burrowing into the skin of the host. Tunga penetrans manifests as a small swollen lesion, with a black dot at the center and can grow to the size of a pea. Jigger infestation can also lead to bacterial infection of the skin region and subsequently to other serious conditions such as the formation of abscesses, tissue death and gangrene. This paper presents a mathematical model of heat transfer in tungiasis-associated inflammation of the skin by considering tungiasis as a growing lesion. The model which is governed by the Pennes equation uses the steady state temperature at the skin surface to study the underlying lesion. Numerical simulations that investigate the presence of tungiasis, as well as bacterial coinfection at the skin site are presented.