

A Three Layer Porous Media Model of Cutaneous Circulation with Application to Mechanical Skin Irritation

Daniela Bauer⁽¹⁾, Reinhard Grebe⁽¹⁾, Alain Ehrlicher⁽²⁾

(1) *Université de Technologie de Compiègne, Compiègne, France*

(2) *LAMI, École Nationale des Ponts et Chaussées, Marne La Vallée, France*

Mechanical skin irritation induces vasodilatation on the line of stroke due to histamine release from mast cells and vasodilatation in the neighboring areas induced by pain receptor stimulation. Cutaneous vascular network has been described by a model consisting of three layers. First and last layer presenting irrigation and drainage of the system, are described as horizontal two-dimensional porous media. Intermediate layer, described by means of lumped parameter model, does not allow horizontal fluxes. This assumption is done in order to describe best cutaneous microcirculation. Capillaries in skin show, in contrary to muscle circulation, only very few connections between themselves. All vessels are compliant. Permeability depends on volume. Skin irritation is modeled by changing compliance. The model gives insight in changes in pressure and volume due to irritation. It also shows spatial flow fields before and after irritation.

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