**Almeida, Luís**; **Bagnerini, Patrizia**; **Habbal, Abderrahmane**; **Noselli, Stéphane**; **Serman, Fanny**

**Tissue repair modeling.** (English) Zbl 1190.35218

Novaga, Matteo (ed.) et al., Singularities in nonlinear evolution phenomena and applications. Proceedings of the workshop, Pisa, Italy, May 2008. Pisa: Edizioni della Normale (ISBN 978-88-7642-343-7/pbk). Centro di Ricerca Matematica Ennio De Giorgi (CRM) Series (Nuova Serie) 9, 27-46 (2009).

The authors study embryonic epidermal wound healing using the fruit fly *Drosophila Melanogaster* as a biological prototype. They present a simple mathematical model for epithelial sweeping in wild type fly embryos. Preliminary validation of the model is done on the basis of the movies of a laser wound healing of stage 14/15 fly embryos and of a dorsal closure. Similar laser wounds, as well as mechanical wounds, have been studied earlier by *Wood* et al. [Nat. Cell Biol. 4, 907-912 (2002)] from a biochemical point of view.

The cytoskeleton and membrane of the cells of the epidermis are globally viewed as a mechanical continuum, which can bear traction and compression loads but neither bending nor torsion. Assuming a linear elastic response of this medium considered as a plane surface, one observes planar elastic deformations. From the mathematical point of view, this leads to a simple continuum membrane model governed by a Poisson equation with suitable boundary conditions.

In the paper under review, the authors concentrate on modeling of the second phase of wound healing, that is, the closing of the wound. The main closing mechanism is actin cable contraction; the cable formation restrains filopodial and lamellipodial number and activity. Furthermore, there is no evidence of the formation of a contractile connective tissue. Consequently, the authors optimize parameters in the model by describing only the first two forces - epidermal tension and actine cable contraction. However, the third force is of interest for the cases where the cable formation is inhibited or for adult wound healing where lamellipodial crawling is important. It is also used in the study of the dorsal closure. Although the authors project the confocal images to obtain 2D data which are simpler to treat, all forces described in the model can be also considered in 3D.

For the entire collection see [Zbl 1166.37001].

Reviewer: Svitlana P. Rogovchenko (Umeå)

**MSC:**

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|---|---|---|
| 35Q92 | PDEs in connection with biology, chemistry and other natural sciences | Cited in **3** Documents |
| 37N25 | Dynamical systems in biology | |
| 92C37 | Cell biology | |
| 92C40 | Biochemistry, molecular biology | |

**Keywords:**

wound healing; mathematical model; Poisson equation