In Vitro study of the growth and interfacial behavior of Vero and HeLa cells cultures.

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The growth of linear and radial cell colonies is investigated by performing In Vitro cultures. The interfacial properties of the colonies are rationalized in terms of the dynamics scaling theory and the analysis of the fractal behaviour. Two different cell lines where studied: Verlo and HeLa cells. Experiments show that the front of Vero cell colonies moves forward with an average constant velocity of $v = 0.22 \pm 0.02$ mm/min, while for HeLa cell colonies such a velocity is slower, namely $v = 0.9 \pm 0.05$ mm/min. The dynamic scaling analysis of both, cultured Vero and HeLa cell colonies, shows that log-log plots of the width of the interface (w) versus the time (t) collapse in a single curve with a growth exponent $\beta = 0.33 \pm 0.02$. From the analysis of the structure factor a global roughness exponent $\alpha = 0.50 \pm 0.05$ is obtained, so that the dynamic exponent is $z = 1.5 \pm 0.2$. On the other hand, the analysis of numerical simulations of a minimal discrete model for cell cultures in-vitro, aimed to describe the experimental setup, yields $\beta = 0.32 \pm 0.02$, $\alpha = 0.49 \pm 0.05$, and $z = 1.49 \pm 0.2$. Summing up, we conclude that there is an excellent agreement between the experimental and the numerical results. Furthermore, the set of evaluated exponents fulfils the Family-Vicsek relationship and it is consistent with the predictions of the one-dimensional continuous Kardar-Parisi-Zhang (KPZ) equation ($\beta = 1/3$, $\alpha = 1/2$, and $z = 3/2$), so that the growing interface of the studied systems can safely been placed within the KPZ universality class.

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