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Abstract

Viscosity of blood and its relation with the biomechanical properties of red blood cells

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Abstract:

The rheological properties of blood depend highly on the properties of its red blood cells: concentration, membrane elasticity and aggregation. These properties affect the viscosity of blood, as well as its shear thinning behaviour. Moreover, it has been demonstrated that, in some cases, these properties are related to diseases, such as hemolyticanemias. By mean of the experimental analysis of the front advancement of blood in micro channels, we determine the viscosity of different samples of blood. We present a method that successfully scales the viscosity of blood, according to the concentration of erythrocytes and their biomechanical properties, bending elasticity and aggregation.

Biography:

Amir Reza Aref is a Leader/Scientist at the Belfer Center of Applied Cancer Science, within the Dana-Farber Cancer Institute at Harvard Medical School. He made the important discovery in that it is possible to culture primary tumors in a novel 3D microfluidic system, by digesting them with collagenase and capturing spheroids that are composed of a mixture of tumor and immune cells. In addition, he has demonstrated the ability to treat these tumor spheroids with small molecule inhibitors and measure cytokine responses by collecting conditioned media from the device. This innovative technology is a major advance upon traditional 2D cell line culture and even organoid systems, which require time to establish and lack the immune microenvironment. Furthermore, it enables tumor cytokine profiling in a way not previously possible.

Recent Publications:

1.Trejo-Soto, C., Costa-Miracle, E., Rodríguez-Villarreal, I., Cid, J., Alarcon, T., & Hernández-Machado, A. (2016). Capillary filling at the microscale: Control of fluid front using geometry. PLoS One, 11(4), e0153559.

2. Trejo-Soto, C., Costa-Miracle, E., Rodríguez-Villarreal, I., Cid, J., Castro, M., Alarcon, T., & Hernandez-Machado, A. (2017). Front microrheology of the non-Newtonian behaviour of blood: scaling theory of erythrocyte aggregation by aging. Soft matter, 13(16), 3042-3047.

3. Lázaro, G. R., Hernández-Machado, A., & Pagonabarraga, I. (2014). Rheology of red blood cells under flow in highly confined microchannels: I. effect of elasticity. Soft Matter, 10(37), 7195- 7206. 4. Lázaro, G. R., Hernández-Machado, A., & Pagonabarraga, I. (2014). Rheology of red blood cells under flow in highly confined microchannels. II. Effect of focusing and confinement. Soft matter, 10(37), 7207-7217.

5. Tomaiuolo, G. (2014). Biomechanical properties of red blood cells in health and disease towards microfluidics. Biomicrofluidics, 8(5), 051501.

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