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Cell affinity chromatography: Experimental study of specific capture mechanisms and implications for industrial development

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A long with the development of cell therapy, cell sorting technology becomes more and more important. Cell specific adhesion is a key phenomenon in affinity cell sorting. We introduce a novel experiment to study the influence of cell velocity on kinetics of specific adhesion of cells. We use a model system: A suspension of biotinylated red blood cells flowing in packed glass beads functionalized with streptavidin (Figure 1). As red blood cell are captured, beads turn red and we can measure cell adhesion kinetics using image analysis of the column (Figure 1) and we determine capture efficacy as a function of cell velocity. We can distinguish two regimes: below 7 mm/s the capture efficacy is greater than 1%, and beyond 7 mm/s capture efficacy greatly decreases to around 0.1%. This study reveals essential results that allow us to design an optimal column and protocol for cell affinity chromatography for cell therapy.

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Parametric electrical modelling of human forearm simulation response using multi-frequency electrical bioimpedance

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This work presents a parametric electrical modelling of the electrical response of human forearm tissues through a simulation of Multi-frequency Electrical Bioimpedance analysis (MF-EBIA). The objective is to estimate the resistance and capacitance values of the three tissue domains in the forearm – the fat, muscle and artery, through parametric analysis. Following up from a simulation analysis of the human forearm model using Ansys® High Frequency Structure Simulator (HFSS), this work assumes an electrical analogy of the human forearm section for every tissue and calculates the electrical parameters. The tissue model was considered to be isotropic with regards to the dielectric properties and the consideration of blood flow was realised by taking three instances of radial artery diameter. The obtained values of resistance and capacitance for every tissue domain provide an insight into their significant contribution to the overall electrical response, which can be important while analysing their individual electrical behaviour and also helpful in various pre-experimental studies related to dielectric characterization of living tissues.

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