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Predictive modeling of the fusion of uneven multi-cellular aggregates using Cellular Particle Dynamics simulations[1] MATTHEW MCCUNE, ASHKAN SHAFIEE, GABOR FORGACS, IOAN KOSZTIN, University of Missouri
— Cellular Particle Dynamics (CPD) is an effective computational method for describing and predicting the time evolution of passive biomechanical relaxation processes of multi-cellular aggregates. A typical such relaxation process is the fusion of spheroidal bioink particles during post bioprinting structure formation. In CPD cells are modeled as an ensemble of cellular particles (CPs) that interact via short-range contact interactions, characterized by an attractive (adhesive interaction) and a repulsive (excluded volume interaction) component. The time evolution of the spatial conformation of the multicellular system is determined by following the trajectories of all CPs through integration of their equations of motion. CPD was successfully applied to describe and predict the fusion of 3D tissue construct involving identical spherical aggregates. Here, we demonstrate that CPD can also predict tissue formation involving uneven spherical aggregates whose volumes decreases during the fusion process.

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Matthew McCune
University of Missouri

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