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Universal timescales in the rheology of spheroid cell aggregates MIAO YU, Rutgers University, Department of Mechanical and Aerospace Engineering, ARIA MAHTABFAR, PAUL BELEEN, RAMSEY FOTY, Rutgers Robert Wood Johnson Medical School, JEFFREY ZAHN, DAVID SHREIBER, Rutgers University, Department of Biomedical Engineering, LIPING LIU, HAO LIN, Rutgers University, Department of Mechanical and Aerospace Engineering — The rheological properties of tissue play important roles in key biological processes including embryogenesis, cancer metastasis, and wound healing. Spheroid cell aggregate is a particularly interesting model system for the study of these phenomena. In the long time, they behave like drops with a surface tension. In the short, viscoelasticity also needs to be considered. In this work, we discover two coupled and universal timescales for spheroid aggregates. A total of 12 aggregate types (total aggregate number n=290) derived from L and GBM (glioblastoma multiforme) cells are studied with microtensiometer to obtain their surface tension. They are also allowed to relax upon release of the compression forces. The two timescales are observed during the relaxation process; their values do not depend on compression time nor the degree of deformation, and are consistent among all 12 types. Following prior work (Yu et al., Phys. Rev. Lett., 115:128303; Liu et al., J. Mech. Phys. Solids, 98:309-329) we use a rigorous mathematical theory to interpret the results, which reveals intriguing properties of the aggregates on both tissue and cellular levels. The mechanics of multicellular organization reflects both complexity and regularity due to strong active regulation.

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