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Weitao Chen* (weitaoc@ucr.edu). *Coupled Mechanochemical Multiscale Model to Study the Tissue Development*. Preliminary report.

Growth regulation is one of the main problems in developmental biology. During the growth, cells stop proliferation precisely when the intended size of the tissue or organ is achieved. Meanwhile, differential cell shapes in space are integrated to give rise to well-organized overall structure. Uncontrolled growth of the cells in tissues or organs will lead to abnormal development or fatal diseases such as cancer. Therefore, developing an extensible predictive mathematical model for exploring the mechanisms involved in the tissue development is significant for understanding the fundamental principles in developmental biology, with a broad range of applications from tissue engineering to biomanufacturing and biotech industry. Experimental data suggests that mechanical properties of cells and chemical signals in both intracellular and extracellular domains play critical roles in size control and shape formation. Here we develop a multiscale, mechanochemical coupled model of tissue growth with subcellular details. This model is applied to test competing hypotheses in the field to resolve the highly debated question of how tissues reach their final size, as well as how the tissue shape is determined simultaneously. (Received February 29, 2020)