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Characterizing the mechanical behavior of the zebrafish germ layers DAVID KEALHOFER, FRIEDHELM SERWANE, ALESSANDRO MONGERA, PAYAM ROWGHANIAN, ADAM LUCIO, OTGER CAMPÀS, University of California, Santa Barbara — Organ morphogenesis and the development of the animal body plan involve complex spatial and temporal control of tissue- and cell-level mechanics. A prime example is the generation of stresses by individual cells to reorganize the tissue. These processes have remained poorly understood due to a lack of techniques to characterize the local constitutive law of the material, which relates local cellular forces to the resulting tissue flows. We have developed a method for quantitative, local in vivo study of material properties in living tissue using magnetic droplet probes. We use this technique to study the material properties of the different zebrafish germ layers using aggregates of zebrafish mesendodermal and ectodermal cells as a model system. These aggregates are ideal for controlled studies of the mechanics of individual germ layers because of the homogeneity of the cell type and the simple spherical geometry. Furthermore, the numerous molecular tools and transgenic lines already developed for this model organism can be applied to these aggregates, allowing us to characterize the contributions of cell cortex tension and cell adhesion to the mechanical properties of the zebrafish germ layers.

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