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Passive cellular microrheology in developing fruit fly embryos SARAH CREWS, XIAOYAN MA, STACEY LAWRENCE, M. SHANE HUTSON, Vanderbilt University — The development of fruit fly (*Drosophila)* embryos involves spatial and temporal regulation of cellular mechanical properties. These properties can be probed *in vivo* using laser hole drilling experiments; however, this technique only infers relative forces. Conversion to absolute forces requires measurement of cellular viscoelastic properties. Here, we use passive microrheology of fluorescently labeled cell membranes to measure the viscoelastic properties of amnioserosa cells. These dynamic epithelial cells play an important mechanical role during two developmental stages: germ band retraction and dorsal closure. Passive microrheology in this system is confounded by active contractions in the cytoskeleton. Thus, the fruit fly embryos are transiently anesthetized with CO_2, halting active cellular movements, leaving only passive Brownian motion. The power spectra of these fluctuations are well fit by a Lorentzian – as expected for Brownian motion – and allow us to extract cellular viscoelastic parameters at different developmental stages. These measured parameters inform previous hole-drilling experiments and provide inputs for quantitative computational models of fruit fly embryonic development.

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