Public Abstract
First Name:Brooke
Middle Name:James
Last Name:Damon
Adviser's First Name:Gabor
Adviser's Last Name:Forgacs
Co-Adviser's First Name:
Co-Adviser's Last Name:
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Title:THE INTERPLAY OF PHYSICAL AND MOLECULAR DETERMINANTS IN LIMB AND CARDIAC CUSHION MORPHOGENESIS

In an effort to investigate the interplay between molecular determinants and biomechanical properties during early embryonic development we have investigated two separate but similar morphogenetic processes: limb morphogenesis and cardiac cushion morphogenesis. It has previously been suggested that embryonic tissues may be described as liquids and that the biomechanical properties of individual tissue masses/populations contribute to the forces necessary for shape changes during early organogenesis. In order to quantitatively investigate the interplay between physical and molecular determinants during early vertebrate embryonic development we proposed that intact living fragments of embryonic mesenchymal tissue behave as liquids and that the biomechanical properties of living spherical explants of mesenchyme may be quantitatively measured using novel techniques and standard liquid theory. Formation of the limbs in avian embryos occurs by changes in the properties of the somatopleural mesoderm in the limb fields whereby the limb buds are caused to bulge outwardly from the body. Signaling by FGF8 produced by the newly formed apical ectodermal ridge (AER) initiates this morphogenetic process. Formation of the atrio ventricular (AV) cushion mesenchyme during early embryonic heart development occurs by changes in the properties of the endocardium (signaled by TGF3) whereby the cushions are caused to swell and protrude inwardly from the myocardium. Employing formal similarities between embryonic tissues and immiscible liquids we have measured the apparent surface tensions of embryonic chicken wing and leg bud mesenchymal tissue, and adjacent flank mesoderm. Additionally we measured the biomechanical properties of explants of AV cushion tissue, in particular surface tension and viscosity.