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The role of Periostin in regulating the biomechanical properties of cushion tissue

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During embryonic heart development the atrio-ventricular (AV) cushions swell and fuse to form the valves and septa of the adult heart. Initially, the cushions appear as swellings on the interior wall of the AV canal and eventually fuse to form the septum and valvular leaflets. The morphogenetic event that the cushions undergo during the fusion process is, in part, driven by the cohesive energy of the tissue, which can be described by the tissue's surface tension. It has been shown earlier that many properties of embryonic tissues can be interpreted by using the analogy that they behave as liquids and it is this analogy that gives rise to apparent tissue surface tension. Periostin is hypothesized to affect cushion tissue surface tension, through its possible binding of the extracellular matrix of the tissue. In this study virus containing the sense strand of Periostin DNA is introduced into hanging drops containing living explants of AV cushion tissue. Overnight the tissue explants rounded up to form spheroids allowing their surface tension to be measured and compared to the surface tension of AV cushion tissue explants exposed to a LacZ promoter control virus. The surface tension was determined using a specifically designed apparatus that measures the viscoelastic response of spherical explants due to a compressive force. It was expected that the increased production of Periostin in the cushion explants due to exposure to the virus will result in an increased surface tension compared to that of explants exposed to the control virus. The preliminary results of the experiment have displayed no significant difference of surface tension between the control virus and the Periostin virus. Since earlier research has shown a significant difference in the rate of fusion of cushions exposed to Periostin DNA virus and those exposed to the control virus, and because fusion time is characterized by the ratio of the surface tension and the viscosity of the tissue, we believe that Periostin may be affecting the viscosity of the tissue explants instead of the surface tension.