

Uncovering DNA binding properties of the cardiac transcription factors HAND1, HAND2 and MESP1

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Transcription factors are sequence-specific DNA binding proteins responsible for cellular differentiation and development. HAND 1/2 and MESP1 transcription factors, which belong to the basic helix-loop-helix (bHLH) family, are critical for normal cardiac development. Mutations in this transcription factors have been associated with congenital heart defects, which represent the most common form of birth defect. The gene HAND1 is selectively expressed in ventricles, predominantly in the right ventricle, whereas HAND2 is expressed both in atria and ventricles. The candidate genes under the control of these transcription factors are not well studied, but it is known that these transcription factors act as co-activators along with other cardiac transcription factors to synergistically activate cardiac genes. Expression of MESP1 induces cardiovascular progenitor specification and differentiation by directly promoting the expression of key transcription factors that control cardiovascular cell fate. Currently, there are major gaps in understanding the interdependence between cardiac transcription factors and their downstream effector genes that mediate cardiac myogenesis and function. This study aims to uncover the intrinsic DNA binding preferences of HAND1, HAND2 and MESP1. The findings of this study will help understand the spatial and temporal gene regulation rules involved in heart development.