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Cardiac resident nestin⁽⁺⁾ cells exhibit a neural stem cell phenotype and participate in the reparative fibrotic response of the ischemically damaged heart

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Scar formation in the ischemically damaged heart is denoted as reparative fibrosis and represents an essential physiological response to heal the damaged myocardium. During the reparative fibrotic response, a previously unidentified population of nestin⁽⁺⁾ cells was detected in the infarct region. These nestin⁽⁺⁾ cells represent a resident cardiac population, are neural crest-derived, and migrate to the ischemic region. Employing a nestin-GFP transgenic mouse in which the GFP cDNA was placed between the nestin promoter (5.8 kb of the flanking region) and the nestin enhancer (1.8 kb) of the second intron, a GFP signal was detected in cardiac nestin⁽⁺⁾ cells. These cardiac resident nestin⁽⁺⁾ cells grow as spheres in the presence of bFGF/EGF and differentiate to a neuronal phenotype when cultured in the appropriate induction medium. The injection of cardiac nestin⁽⁺⁾ cells into the infarcted rat heart revealed that a subpopulation was capable of differentiating to a vascular cell leading to *de novo* blood vessel formation in the scar. Furthermore, a subpopulation of cardiac nestin⁽⁺⁾ cells was capable of differentiating to a neuronal-like phenotype in the ischemically damaged rat heart, characterized by the synthesis of neurofilament-M⁽⁺⁾ fibres. Lastly, nestin⁽⁺⁾ cells were detected in the viable myocardium and scar of the infarcted human heart and morphologically resembled neural crest-derived cells identified in the rodent heart. These data demonstrate that the adult heart contains a resident population of nestin⁽⁺⁾ cells that exhibit a neural stem cell phenotype and directly participate in the angiogenic and neurogenic responses of reparative fibrosis following an ischemic insult.

Biography

Angelino Calderone completed his Ph.D in 1992 at the Université de Montréal and continued his post-doctoral studies at the Brigham & Women's Hospital under the tutelage of Dr. Wilson Colucci. Dr. Calderone is presently a Professor in the department of Physiology at the Université de Montréal, affiliated with the Montreal Heart Institute and Chercheur-Boursier National of the FRSQ (Fonds de recherche en santé du Québec). During his career, Dr. Calderone has published 71 papers in the cardiovascular field examining ventricular function and remodelling in cardiac disease states.