Cardiogenic Regeneration Via Stem Cells

Heart diseases arising out of abnormalities in cardiac muscles and vessels are surpassing any other cause of death throughout the globe. Almost half of the CVD crop up in Asia. Consequently, Asian countries have higher death rate from stroke as compared to western world. Although, ischemic heart disease has less prevalence in Eastern Asia but the Central Asia has pronounced death toll from both the stroke and ischemic heart diseases (Ohira & Iso, 2013). Despite the fact that small infarcts in cardiac vasculature are managed by the internal defense system of the body with the help of resident or circulating stem cells and also by re-directing the cardiac myocytes into developmental phases, or cellular hypertrophy, enlarged infarcts cannot be repaired by endogenous mechanisms resulting in irreversible damage to cardiac muscles, smooth muscles and endothelial cells present nearby. The endogenous repair process leads to the substitution of working cardiac musculature by the fibrous tissue which does not possess the ability to contract (Sutton Martin & Sharpe, 2000).

The patients with heart ischemia, cardiac failure, arrhythmias, or those whom results show higher risk, the management via invasive procedures are considered. Alternatively, coronary angiography or coronary revascularization might be suggested for recurrent asymptomatic events. However, these management approaches have no proven. Lastly, medicines like aspirin, lipid-lowering medication, a beta blocker and an angiotensin-converting enzyme inhibitor, sounds logical as they have found to improve survival after myocardial infarction (Sheifer, Manolio, & Gersh, 2001).

Therefore, the prevailing treatment options available for myocardial infarction are only limited to symptomatic control leaving the root cause unaddressed.

The Regenerative medicine is the study of methods to repair damage cells, tissue or organ via tissue engineering by using scaffold, therapeutic stem cells, active molecules alone or in combination for the construction of artificial organs.

The repair and regeneration of many tissues and organs such as, liver, skin, kidney, cardiac and some congenital faults were effectively mended using the tools of regenerative medicine (Tang et al., 2016). Therefore, many diseases are treated using regenerative medicine as therapy (K. Dzobo et al., 2018). The source of cells required for the tissue engineering and regeneration can be autologous (from patient) or allogeneic (from different person). The cells from animals (xenogenic) can also be used in tissue engineering. Although, the commonly used cells reported so far are, mesenchymal stem cells, keratinocytes, fibroblasts and chondrocytes (Kraeutler, Belk, Purcell, & McCarty, 2018; Mistry et al., 2017). The use of allogenic cell source has the potential to evoke an immune reaction, that can be prevented by the immunosuppressants drugs given to the patients. In some circumstances, body's natural curing process can be accelerated by regenerative medicine procedures (Guex et al., 2012; Mao & Mooney, 2015).

The acceleration of healing process involves the use of biological factors and different materials that manipulate the tissue environment. The extracellular martrix, that mimics the biological systems, palyed an important role in this regard, besides providing the physical strength (Alves

da Silva et al., 2017; Gonçalves, Rodrigues, & Gomes, 2017; Pina et al., 2017). These extracellular matrix accelerate the regeneration and promote the growth of cells alone or in combination with different growth factors or other molecules (Drowley et al., 2016; Gonçalves et al., 2017; Guan et al., 2017; Mistry et al., 2017; Pina et al., 2017). Primarily, scaffold was supposed to be just essential for the physical support of the tissue, but it has myriad role in providing the bilogical signals to promote the cellular regeneration and physiology (Kevin Dzobo et al., 2016; Evans et al., 2010; Sadtler et al., 2016). Different tissues and organs have different regeneration capacity, therefore, some requires no cells and only the biomaterial and/or the biomolecules, whereas, others needed cells, biomaterials, as well as biomolecules for their regeneration (Atala, 2008, 2012; Kotton & Morrisey, 2014).