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| Sommario/riassunto | Tissue engineering is an innovative, multidisciplinary approach which combines (bio)materials, cells and growth factors with the aim to obtain neo-organogenesis to repair or replenish damaged tissues and organs. The generation of engineered tissues and organs (e. g. skin and bladder) has entered into the clinical practice in response to the chronic lack of organ donors. In particular, for the skeletal and cardiac muscles the translational potential of tissue engineering approaches has clearly been shown, even though the construction of this tissue lags behind others given the hierarchical, highly organized architecture of striated muscles. Cardiovascular disease is the leading cause of death in the developed world, where the yearly incidence of Acute MI (AMI) is approx 2 million cases in Europe. Recovery from AMI and reperfusion is still less than ideal. Stem cell therapy may represent a valid treatment. However, delivery of stem cells alone to infarcted myocardium provides no structural support while the myocardium heals, and the injected stem cells do not properly integrate into the myocardium because they are not subjected to the mechanical forces that are known to drive myocardial cellular physiology. On the other hand, there are many clinical cases where the loss of skeletal muscle due to a traumatic injury, an aggressive tumour or prolonged denervation may be cured by the regeneration of this tissue. In vivo, stem or progenitor cells are sheltered in a specialized microenvironment (niche), which regulates their survival, proliferation and differentiation. The goal of this research |

topic is to highlight the available knowledge on biomaterials and bioactive molecules or a combination of them, which can be used successfully to differentiate stem or progenitor cells into beating cardiomyocytes or organized skeletal muscle in vivo. Innovations compared to the on-going trials may be: 1) the successful delivery of stem cells using sutural scaffolds instead of intracoronary or intramuscular injections; 2) protocols to use a limited number of autologous or allogeneic stem cells; 3) methods to drive their differentiation by modifying the chemical-physical properties of scaffolds or biomaterials, incorporating small molecules (i.e. miRNA) or growth factors; 4) methods to tailor the scaffolds to the elastic properties of the muscle; 5) studies which suggest how to realize scaffolds that optimize tissue functional integration, through the combination of the most up-to-date manufacturing technologies and use of bio-polymers with customized degradation properties.