P03-356

A REVIEW OF THE MECHANISMS OF STEM CELL REGENERATIVE PROPERTIES

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The regenerative ability of stem cell after transplantation into ischemic and necrotic tissues is not fully understood. We therefore examined various literature data on the effect of stem cell transplantation, to help better understand the process by which cell regenerates. Literature data on the effect of stem cell transplantation were critically analyzed. Our analysis reveals that stem cells posses multiple action sites with multiple mechanisms of action. The extraordinary regenerative ability of stem cells might largely be due to the auto-paracrine effects exacerbated in the surrounding tissues after transplantation. The autocrine/paracrine effects result from dimeric, oxidation-reduction reactions involving autophosphorylation and dephosphorylation of surface proteins, leading to activation of several downstream signaling pathways, signal transducers and activators of transcription (e.g. cAMP response binding protein). The resultant effect is the stimulation of the inhibition of apoptosis, proliferation and differentiation, which are the net result of several protein kinases cascade reactions. The paracrine effects are evident in the mechanical stimulation of ischemic and necrotic tissues by transplanted stem cells. Molecules like sulphonyl hydrazone and CD34 used in transplantation upregulate and trigger auto-paracrine factors like VEGF, IGF, angiotensin II, atrial natriuretic polypeptide, resulting from Ca+ related trafficking of nucleotides and the activation of sodium transport system, which in turn determines the amount of energy available in the transplantant-host cell medium. The end result of transplantation effect is not only dependent on the stimulation of these molecules, but also degree of the internal homeostatic regulation.

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