

Effect of multi-functional polyhydroxylated polyhedral oligomeric silsesquioxane (POSS) nanoparticles on the angiogenesis and exosome biogenesis in human umbilical vein endothelial cells (HUVECs).

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Streszczenie

Angiogenesis, the growth of new vessels, is a vital process for tissue regeneration. Exosomes are nano-sized vesicles releasing from cells that are recognized as important soluble angiogenic factors. Although there are a lot of reports about biomedical applications of polyhedral oligomeric silsesquioxane nanoparticles (POSS NPs), the effect and mechanism of POSS NPs in angiogenesis and wound healing have not been studied until now. In this research, we have synthesized water-soluble multifunctional polyhydroxylated POSS (POH-POSS) and characterized using FT-IR, TEM, ^1H NMR and ^{29}Si NMR. We hypothesize that incubation of human endothelial cells (HUVECs) with POH-POSS NPs could contribute to the modulation of angiogenesis and exosome biogenesis. As compared to the control group, the survival rate of cells incubated with 300 ppm POH-POSS significantly increased ($P < 0.05$). Wound healing and migration rate of cells increased in POH-POSS treated cells ($P < 0.05$). Expression of genes involved in angiogenesis (VEGFR-2, Ang-1, Ang-2) and exosomes biogenesis (Alix, CD63, Rab27a, Rab27b) concurrent with miRNA-21 and miRNA-155 expression up-regulated in treated cells ($P < 0.05$). Our findings suggested that up-regulated angiogenesis in POH-POSS treated HUVECs is coincided with an increased exosomal secretory pathway, proposing the key role of exosomes in angiogenesis and possible biomedical application of POH-POSS.

Słowa kluczowe

POSS nanoparticles, Angiogenesis, HUVECs, Nanomedicine, Exosome, Wound healing

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