

## 研究论文

### 分子影像监测血管内皮细胞生长因子预处理促进体外和体内脂肪间充质干细胞存活与增殖的研究

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#### 摘要:

干细胞疗法为缺血性心血管病的组织再生带来希望, 然而体内移植后干细胞的不良转归严重制约了其治疗效果。研究表明, 血管内皮细胞生长因子 (vascular endothelial growth factor, VEGF) 或可对干细胞产生保护作用; 同时, 分子影像可作为干细胞研究的有力手段, 实现体内外干细胞生物学过程的可视化与实时定量监测。该研究首先培养了稳定表达萤火虫荧光素酶报告基因的脂肪间充质干细胞, 然后运用报告基因光学成像等分子影像学方法, 对体外及体内移植后脂肪间充质干细胞的存活与增殖进行示踪和定量分析, 并观察VEGF预处理对细胞活性的影响。光学成像和定量分析结果提示, VEGF可以显著改善体外缺氧损伤后脂肪间充质干细胞的生存与增殖, 并延长其体内移植后的生存时间。由此证实, 分子影像可以对间充质干细胞的体外与体内生物学过程进行无创、直观、高通量监测, 并能有效评价保护性因子VEGF对细胞的作用。

**关键词:** 分子影像 间充质干细胞 血管内皮细胞生长因子

### Molecular Imaging for Monitoring Survival and Proliferation of Adipose Derived Mesenchymal Stem Cells *in vitro* and *in vivo* after Pretreatment with VEGF

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#### Abstract:

Although stem cell therapy holds promise for the regenerative treatment of ischemic heart disease, the tragic fate of engrafted stem cells is still a hurdle for the therapeutic effect. Previous studies showed that molecular imaging could be a realtime and quantitative effective approach to visualize and monitor stem cells, while vasoactive factors such as vascular endothelial growth factor (VEGF) may have protective effect on the stem cell. In this study, adipose tissue derived mesenchymal stem cells (ADMSCs), which stably expressed firefly luciferase gene, were cultured at the first step. Then bioluminescence imaging and other methods were used to visualize and quantify the ADMSCs' survival and proliferation, and confirmed whether VEGF pretreatment could affect the cells' viability. The results from bioluminescence imaging and quantitative analysis implied that VEGF pretreatment significantly enhanced the survival and proliferation of ADMSCs after hypoxia/reoxygenation injury *in vitro*, and prolonged ADMSCs' lifetime *in vivo*. Eventually, it concluded that reporter gene molecular imaging could be a direct, efficient and noninvasive strategy for monitoring the MSCs' biological process *in vitro* and *in vivo*, while it could well evaluate the effect of protective factors, such as VEGF, on MSCs with high efficacy.

**Keywords:** Molecular imaging Mesenchymal stem cells VEGF

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