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研究论文

细胞在单壁碳纳米管无纺膜支架上的生长行为

孟洁[1], 宋礼[3], 孟洁[2], 孔桦[2], 王朝英[3], 朱广瑾[1], 徐樑华[4], 解思深[3], 许海燕[2]

1. 中国医学科学院基础医学研究所, 中国协和医科大学病理生理系,
2. 生物医学工程系, 北京100005;
3. 中国科学院物理研究所, 北京100080;
4. 北京化工大学材料科学与工程学院, 北京 100029

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摘要 以具有纳米拓扑结构特征的单壁碳纳米管无纺膜材料为支架, 选择在促进组织修复和再生中起重要作用的成纤维细胞株作为实验细胞, 研究了该材料对细胞生长行为的影响. 通过X射线光电子能谱分析, 表征其在细胞培养液中浸泡后的表面化学组成; 通过细胞粘附、增殖实验以及细胞骨架发育观察, 探讨了材料的微观纳米拓扑结构对细胞的作用, 以及与碳纤维、聚氨酯浇铸膜和空白培养板材料对细胞作用的差异和可能的机理; 并采用双层细胞培养装置, 研究了该材料通过细胞通讯途径对在其它材料上生长的细胞增殖的影响. 实验结果表明, 单壁碳纳米管无纺膜材料为细胞提供了十分接近天然细胞外基质的人造微环境, 具有显著促进细胞粘附和长时间增殖的功能, 而且生长在该支架上的细胞可能通过旁分泌方式将某些化学介质分泌到细胞外液中, 经局部扩散作用于在其它材料上生长的细胞, 促进它们的增殖.

关键词 碳纳米管 细胞生长 成纤维细胞 组织再生与修复 细胞间通讯

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Growing Behavior of Cells on Single-walled Carbon Nanotubes Nonwoven Films

MENG Jie[1], SONG Li[2], MENG Jie[3], KONG Hua[3], WANG Chao-Ying[2], ZHU Guang-Jin[1], XU Liang-Hua[4], XIE Si-Shen[2], XU Hai-Yan[3]

1. Department of Pathophysiology,
2. Department of Biomedical Engineering, Institute of Basic Medicine, Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing 100005, China;
3. Institute of Physics, Chinese Academy of Sciences, Beijing 100080, China;
4. College of Materials Science and Engineering, Beijing University of Chemical Technology, Beijing 100029, China

Abstract Carbon nanotubes have attracted intensive interests in biomedical research in recent years. In this paper, a novel type of carbon nanotubes material so called nonwoven single walled carbon nanotubes(nonwoven SWNT) with nanotopographic structure and macroscopic volume was used as cell growing scaffold. The morphology and surface chemistry of nonwoven SWNT were observed and characterized by scanning electron microscopy(SEM) and X-ray photoelectron spectroscopy(XPS) respectively. The cells were cultivated in nonwoven SWNT and in other types of substrate as the control. The cells growth behavior including adhesion, proliferation and cytoskeletal development was investigated by using cell viability assay and confocal observation. The experimental results indicate that nonwoven SWNT exhibited a significant enhancement to the cells adhesion and proliferation in at least 3 weeks. Numerous and well organized cytoskeletal structures were observed when the cells were cultured in nonwoven SWNT. Additionally, an obvious promotional influence of the cells cultivated in nonwoven SWNT sca

ffold upon the proliferation of those growing in the other kind of substrate through cell-cell co mmunication were found. The results obtained in this work are of significance to *in vitro* cell a mplification in a large scale, tissue regeneration or guided repair, as well as biomedical device application.

Key words Carbon nanotubes Cells growth fibroblast Tissue regeneration and repair Cell-cell com munication

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通讯作者 许海燕 xuhy@pumc.edu.cn