

论文

磷酸三钙涂层镁合金材料的细胞相容性研究

付玉平¹, 郭磊¹, 管俊林¹, 赵杰¹, 赵延刚¹, 谭丽丽², 杨柯²

1. 中国医科大学附属第一医院 沈阳 110001;

2. 中国科学院金属研究所 沈阳 110016

摘要:

目的: 制备磷酸三钙(β -TCP)涂层镁合金材料, 评价材料表面的特性及体外的细胞生物适应性。方法 电化学法制备 β -TCP涂层镁合金材料(β -TCP-Mg-Al-Zn), 观测金属材料表面微观结构特性和能谱分析, 小鼠颅骨源成骨细胞与材料直接接触培养, 荧光染色观察材料表面细胞生长状况, 检测成骨细胞增殖和碱性磷酸酶(ALP)活性。结果 β -TCP涂层Mg-Al-Zn材料表面呈多孔状, 材料表面含有镁、钙和磷等元素; 成骨细胞与材料直接接触培养24 h及48 h后, 材料表面有大量的成骨细胞粘附、伸展、汇合; 与Mg-Al-Zn材料比较, β -TCP-Mg-Al-Zn材料明显地促进细胞增殖、显著地增加成骨细胞中ALP活性 ($P<0.05$)。结论 β -TCP涂层改善了Mg-Al-Zn镁合金材料表面特性及体外的细胞相容性, 有望成为新一代可降解医用金属材料。

关键词: 镁合金 磷酸三钙 涂层 成骨细胞 细胞相容性

Study on Cell Compatibility of Magnesium Alloy Covered with Tricalcium Phosphate

FU Yu-ping¹, GUO Lei¹, GUAN Jun-lin¹, ZHAO Jie¹, ZHAO Yan-gang¹, TAN Li-li², YANG Ke²

1. Department of Orthopedic Surgery, the First Affiliated Hospital, China Medical University, Shenyang 110001, China;

2. Institute of Metal Research, Chinese Academy of Sciences, Shenyang 110016, China

Abstract:

The magnesium alloy (Mg-Al-Zn) covered with tricalcium phosphate (β -TCP) was electrosynthesized and evaluated its surface characteristics and biocompatibility. The β -TCP-Mg-Al-Zn has been prepared by electrochemistry, whereas the surface structure and spectrum analysis of material were measured. The osteoblasts from mice skull were cultured with magnesium alloys *in vitro*, and the cell proliferation and alkaline phosphatase(ALP) were detected with methyl thiazolyl tetrazolium and fluorescein isothiocyanate. The results show that the β -TCP-Mg-Al-Zn surface was porosity and high content of magnesium, calcium and phosphorus elements. The cell proliferation and the activity of osteoblasts were increased after cultured 24 h or 48 h with the β -TCP-Mg-Al-Zn ($P<0.05$). Therefore, covering with β -TCP has improved surface properties and cell compatibility *in vitro*. The magnesium alloy covered with β -TCP would be a new biomedical material.

Keywords: Magnesium alloy Tricalcium phosphate Covering Osteoblast Cellular compatibility

收稿日期 2011-10-18 修回日期 2011-12-22 网络版发布日期

分类号:

Q819

基金项目:

国家自然科学基金(30872724; 81071460)、辽宁省科技攻关层次计划(2008225009; 2009225010-3)资助项目

通讯作者: 郭磊 通讯作者E_mail: G572@sina.com

扩展功能

本文信息

- Supporting info
- PDF(965KB)
- [HTML全文](KB)
- 参考文献[PDF]
- 参考文献

服务与反馈

- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- 引用本文
- Email Alert

本文关键词相关文章

- ▶ 镁合金
- ▶ 磷酸三钙
- ▶ 涂层
- ▶ 成骨细胞
- ▶ 细胞相容性

本文作者相关文章

PubMed

参考文献:

[1] Witte F, Fischer J, Nellesen J, et al. *In vitro* and *in vivo* corrosion measurements of magnesium alloys. *Biomaterials*, 2006,27(7):1013-1018.

[2] Geng F, Tan L L, Jin X X, et al. The preparation, cytocompatibility, and *in vitro* biodegradation study of pure β -TCP on magnesium. *J Mater Sci: Mater Med*, 2009,20(5): 1149-1157.

[3] Hongwei Chai, Lei Guo, Xiantao Wang, et al. *In vitro* and *in vivo* evaluations on osteogenesis and biodegradability of a beta-tricalcium phosphate coated magnesium alloy. *J Biomed Mater Res A*, 2011,99(11):81-88.

[4] Guo Lei, Liu Kui, Zhang Shiliang, et al. Cytotoxicity of AZ31B magnesium alloy covering with magnesium oxide. *Rare Metal Materials and Engineering*, 2008, 37(6): 1027-1031.

[5] Marta Monjo, Bastien F. Lamolle S, et al. *In vivo* expression of osteogenic markers and bone mineral density at the surface of fluoride-modified titanium implants. *Biomaterials*, 2008 (29): 3771-3780.

[6] Luvizuto E R, Tangl S, Zanoni G, et al. The effect of BMP-2 on the osteoconductive properties of β -tricalcium phosphate in rat calvaria defects. *Biomaterials*, 2011,32(15):3855-3861.

[7] Kondo A Ogoose, Tokunaga K. Bone formation and resorption of highly purified β -tricalcium biomed microdevices phosphate in the rat femoral condyle. *Biomaterials* 2005,26(28): 5600-5608.

[8] Leeuwenburgh S, Layrolle P, Barrere F, et al. Osteoclastic resorption of biomimetic calcium phosphate coatings *in vitro*. *Journal Biomed Mater Res*, 2001, 56(2):208-215.

[9] Xue W, Moore J L, Hosick H L, et al. Osteoprecursor cell response to strontium-containing hydroxyapatite ceramics. *Journal Biomed Mater Res A*, 2006, 79(4):804-814.

[10] John A, Varma H K, Kumari T V, et al. Surface reactivity of calcium phosphate based ceramics in a cell culture system. *Journal Biomater Appl*, 2003, 18(1):63-78.

本刊中的类似文章

1. 杨松海,林天歆,刘珊英,范新兰,苏芳,潘秋辉.重组Osx腺病毒载体的构建及其调控成骨细胞增殖与分化的作用[J]. *中国生物工程杂志*, 2008,28(3): 84-88
2. 刘魁,郭磊,黄晶晶,杨柯.AZ31B镁合金植入小鼠的生物相容性考察[J]. *中国生物工程杂志*, 2008,28(3): 59-63
3. 潘秋辉,杨松海,董群伟,孙奋勇.BMP2/7异源二聚体调控CIZ的表达与自身活性的关系[J]. *中国生物工程杂志*, 2007,27(9): 14-18
4. 丁艳, 杨隽, 司书毅, 阮力.Statin类药物促成骨细胞BMP-2表达机理[J]. *中国生物工程杂志*, 2005,25(4): 18-21
5. 屈长青, 张国华, 赵丽丽, 杨公社.猪脂肪基质细胞成骨与成脂分化潜能的研究[J]. *中国生物工程杂志*, 2005,25(11): 42-45
6. 辛娟, 林福春, 张兵兵, 向燕, 王远亮.力生长因子E肽对成骨细胞增殖及基因表达的影响[J]. *中国生物工程杂志*, 2011,31(10): 1-6