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肝素化胶原/丝素共混膜的制备及其抗凝血性能*★

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［HTML全文］［PDF］［投稿］

Preparation and anticoagulant activity of heparinized collagen/silk fibroin blend film Cheng*★

Abstract

AIM：To prepare a new type heparinized collagen/silk fibroin blend film and investigate its anticoagulant activity.

METHODS： The experiment was conducted at the Research Center of Material Science, Beijing Institute of Technology from December 2003 to April 2005. ①50 mg collagen was dissolved in 5 mL acetic acid solution (0.2 g/L), and 0.5 mL heparin solution (10 g/L) was added and stirred for 10 minutes to prepare the heparinized collagen. The structural characteristics were examined through a infrared spectrometer (EQINOX55). ②Glutaraldehyde as a coupling agent was added into the aqueous solution of heparinized collagen and silk fibroin (mass ratio of 1:4), which was cast into a polystyrene plate. The blend film was formed after the plate dried for 72 hours. The standard curve, and the effect of glutaraldehyde at different doses on the combination rate of heparin and mechanical performance of film were measured. ③The blood anticoagulant activity of the blend film was assessed by in vitro coagulation time test including activated partial thromboplastin time (APTT), thrombin time (TT) and activated thromboplastin time (PT) measurement, which were performed by a photo-optical clot detection instrument COAG-A-MATE-XM (Organon Tekinika Company, U.S.).

RESULT: ①Heparinized collagen showed absorption bands at 850 cm－1. ②The combination rate of the blend film approached to 56% and the rupture strength was 45 MPa as 0.1mL glutaraldehyde (5 g/L) was added. ③APTT, TT, and PT of the blend film was over 150, 200 and 50 seconds, respectively.

CONCLUSION:The heparin in heparinized collagen/silk fibroin blend film still possesses good anticoagulant activity; it may be a new biomaterial with excellent performance.

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摘要

目的：制备一种新型肝素化胶原/丝素共混膜，观察其抗凝血性能。
方法：实验于2003－12/2005－04在北京理工大学材料中心实验室完成。①将50 mg胶原溶于0.2 g/L醋酸溶液5 mL中，然后滴加10 g/L肝素溶液0.5 mL，均匀搅拌10 min,得到肝素化胶原。采用EQINOX55型红外光谱仪（美国NICOLET公司）进行结构表征。②将肝素化胶原与丝素溶液共混（质量比为1∶4），加入戊二醛溶液作交联剂，注入聚乙烯模具内干燥72 h得肝素化胶原/丝素膜。测定肝素的标准曲线以及不同戊二醛用量对肝素的结合率和膜的力学性能的影响。③采用体外凝血时间试验评价材料的抗凝血性，包括活化部分凝血活酶时间、凝血酶时间、凝血活酶时间 3种凝血时间测定,在COAG-A-MATE-XM型半自动四通道凝血仪（美国Organon Tekinika公司）中进行。
结果：①肝素化胶原红外光谱在 850 cm－1处出现新峰。②当加入5 g/L戊二醛溶液0.1 mL时，所得共混膜中肝素的结合率为56%，共混膜的断裂强度为45 MPa。③共混膜的活化部分凝血活酶时间、凝血酶时间 、凝血活酶时间分别超过150，200，50 s。
结论：肝素化胶原与丝素共混膜中的肝素仍保持良好的抗凝血性。从而得到一种性能优良的新型生物材料。
关键词：胶原；丝素；肝素化；抗凝血性

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课题背景：课题是由河北省科学技术研究与发展指导项目(05215512)资助，课题负责人曾参加了国家重点基础研究计划项目“ 抗凝血材料 ”的研究，在此方面的研究中积累了一定经验。基于心血管疾病是国人死亡的最主要疾病，近半个世纪来，治疗心血管疾病的药物迅速发展，抗凝血材料的研究也成为生物材料研究的中心和重点。目前国内外研究主要集中在材料的筛选、抗凝血剂接枝或共混等方面。本课题组在采用天然材料为固定化材料方面取得了一些成果。

热点资讯：世界范围内，生物材料及其Devices的研究、生产和应用已成为一个新兴的高科技产业。抗凝血材料可以部分用于生物体，对生命科学的发展十分重要；可以制成新型载药体系，是现代医学以及生物工程学等进一步发展的重要物质支柱。抗凝血材料一旦在抗凝血性和生物功能上得到圆满的解决，其庞大的市场是毋庸置疑的，其应用前景十分看好。

同行评价：文章报道了肝素化胶原 / 丝素蛋白共混膜的制备、交联剂戊二醛用量对所得共混膜中肝素结合率、膜断裂强度的影响以及共混物的体外抗凝血性能，这在一定程度上为该类共混膜开发为性能优良的抗凝血材料提供了实验依据。

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