

Effects of pH and Temperature on Microstructure and Morphology of Hydroxyapatite/Collagen Complex Synthesized in vitro

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ABSTRACT

Collagen is the main structural protein in connective tissue of animal. Hydroxyapatite (HAp.) is a natural inorganic substance of hard tissue in vertebrate, which has excellent biological compatibility. This research mainly was divided into two parts. The first part, collagen was extracted from pork skin using salting out method, and then analyzed its yield, purity, sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) analysis and scanning electron microscope (SEM) observation. The second part, collagen and hydroxyapatite were coprecipitated by proper ratio under different temperature and pH conditions for several hours to form HAp./collagen complex. The SDS-PAGE behavior, fourier transform infrared spectrophotometer (FTIR) spectra, X-ray diffraction (XRD) spectra and SEM microstructure of the complex were analyzed. The results were found as the follows : The yield and purity of collagen extracted from pork skin were 11.38% and 31.42%, respectively. The SDS-PAGE patterns and SEM micrographs were observed, collagen prepared by our lab was similar with the products purchased from Sigma Co. and National Chung Hsing University (NCHU). The SDS-PAGE pattern of the HAp./collagen complex was found that alpha 2 chain disappeared as compared with collagen itself. In alkaline condition, alpha 2 chain disappeared slowly. The phenomenon indicated that the synthesis reaction proceeded. In acid condition, it happened synthesis reaction obviously after precipitating for 36 hours. The FTIR spectra showed the complex arose a new bond of HAp./collagen, but it had confused absorbed peak at pH 5. The X-ray diffraction spectra, HAp. had crystal reaction. But at pH 5, it produced much confused crystal. The SEM micrographs for the HAp./collagen complexes were found leaf-like structure when the synthesis pH value was lower. When the synthesis pH value was higher, the complex showed a compact coral-like shape.

Keywords : collagen ; hydroxyapatite ; pH and temperature ; synthesis

Table of Contents

目錄	1
1. 緒言	2
2. 文獻回顧	3
2.1 膠原蛋白	3
2.1.1 膠原蛋白簡介	3
2.1.2 膠原蛋白之結構和纖維構造	3
2.1.3 膠原蛋白抗原免疫特性之去除	6
2.1.4 膠原蛋白的分類、結構與組織分佈	9
2.1.4.1 第一型膠原蛋白	9
2.1.4.2 第二型膠原蛋白	10
2.1.4.3 第三型膠原蛋白	10
2.1.4.4 第四型膠原蛋白	11
2.1.4.5 第五型膠原蛋白	12
2.1.4.6 第六型膠原蛋白	12
2.1.4.7 第七型膠原蛋白	12
2.1.4.8 第八型膠原蛋白	13
2.1.4.9 第九型膠原蛋白	13
2.1.4.10 第十型膠原蛋白	14
2.1.4.11 第十一型膠原蛋白	14
2.1.5 膠原蛋白之應用	18
2.1.5.1 生醫材料方面	18
2.1.5.2 食品加工方面	20
2.1.5.3 化妝品方面	20
2.2 羧基磷灰石	22
2.2.1 羧基磷灰石簡介	22
2.2.2 羧基磷灰石應用於骨骼的特性	22
2.2.3 羧基磷灰石的合成方法	27
2.2.4 骨骼基質與膠原蛋白之關係	29
3. 材料與方法	31
3.1 實驗藥品與儀器	31
3.1.1 材料	31
3.1.2 藥品	31
3.1.3 儀器	32
3.2 實驗方法	32
3.2.1 膠原蛋白的製備	32
3.2.2 膠原蛋白的產率	33
3.2.3 膠原蛋白的含量(純度之測定)	33
3.2.3.1 試劑製備	34
3.2.3.2 步驟	34
3.2.4 SDS-PAGE電泳行為分析	35
3.2.4.1 試劑製備	35
3.2.4.2 蛋白質變性處理	37
3.2.4.3 電泳之操作	37
3.2.4.3.1 膠片的製備	37
3.2.4.3.2 電器泳動之操作	38
3.2.5 掃描式電子顯微鏡的觀察	39
3.2.6 羧基磷灰石-膠原蛋白複合物的合成	39
3.2.7 傅立葉轉換紅外線光譜儀分析	40
3.2.8 X光結晶繞射分析	41
3.2.9 繪圖軟體	41
4. 結果與討論	42
4.1 膠原蛋白之測定	42
4.1.1 膠原蛋白外觀、產率及純度之測定	42
4.1.2 膠原蛋白之SDS-PAGE分析	45
4.1.3 膠原蛋白掃描式電子顯微構造之觀察	47
4.2 羧基磷灰石-膠原蛋白複合物之測定	49
4.2.1 羧基磷灰石-膠原蛋白複合物之外觀	49
4.2.2 羧基磷灰石-膠原蛋白複合物之SDS-PAGE分析	51
4.2.3 羧基磷灰石-膠原蛋白複合物之傅立葉轉換紅外線光譜儀測定	59
4.2.4 X光結晶繞射分析	67
4.2.5 羧基磷灰石-膠原蛋白複合物掃描式電子顯微結構之觀察	73
5. 結論	79
參考文獻	81
圖目錄	
圖2.1 膠原蛋白的三螺旋結構	4
圖2.2 膠原蛋白微纖維之微細結構	5
圖2.3 膠原蛋白分子結構示意圖	7
圖3.1 羧基磷灰石-膠原蛋白合成複合物之裝置圖	40
圖4.1 豬皮萃取之膠原蛋白外觀	43
圖4.2 Hydroxyproline標準曲線圖	44
圖4.3 自製膠原蛋白和購自Sigma膠原蛋白之電泳圖	46
圖4.4 自製萃取膠原蛋白和中興大學提供膠原蛋白之掃描式電子顯微構造圖(10000倍)	48
圖4.5 羧基磷灰石-膠原蛋白複合物之外觀	50
圖4.6 羧基磷灰石-膠原蛋白複合物之電泳圖	53
圖4.7 不同沉澱時間羧基磷灰石-膠原蛋白複合物之電泳圖(pH=9)	54
圖4.8 不同沉澱時間羧基磷灰石-膠原蛋白複合物之電泳圖(pH=8)	55
圖4.9 不同沉澱時間羧基磷灰石-膠原蛋白複合物之電泳圖(pH=7)	56
圖4.10 不同沉澱時間羧基磷灰石-膠原蛋白複合物之電泳圖(pH=6)	57
圖4.11 不同沉澱時間羧基磷灰石-膠原蛋白複合物之電泳圖(pH=5)	58
圖4.12 羧基磷灰石-膠原蛋白複合物之傅立葉轉換紅外線光譜圖	61
圖4.13 不同條件下合成羧基磷灰石-膠原蛋白複合物之傅立葉轉換紅外線光譜圖(37 , pH=9 ; 37 , pH=8)	62
圖4.14 不同條件下合成羧基磷灰石-膠原蛋白複合物之傅立葉轉換紅外線光譜圖(37 , pH=7 ; 37	

, pH=6)63 圖4.15 不同條件下合成羥基磷灰石-膠原蛋白複合物之傅立葉轉換紅外線光譜圖(37 , pH=5 ; 40 , pH=9)64 圖4.16 不同條件下合成羥基磷灰石-膠原蛋白複合物之傅立葉轉換紅外線光譜圖(40 , pH=8 ; 40 , pH=7)65 圖4.17 不同條件下合成羥基磷灰石-膠原蛋白複合物之傅立葉轉換紅外線光譜圖(40 , pH=6 ; 40 , pH=5)66 圖4.18 不同條件下合成羥基磷灰石-膠原蛋白複合物之X光結晶繞射圖譜(37 , pH=9 ; 40 , pH=9)68 圖4.19 不同條件下合成羥基磷灰石-膠原蛋白複合物之X光結晶繞射圖譜(37 , pH=8 ; 40 , pH=8)69 圖4.20 不同條件下合成羥基磷灰石-膠原蛋白複合物之X光結晶繞射圖譜(37 , pH=7 ; 40 , pH=7)70 圖4.21 不同條件下合成羥基磷灰石-膠原蛋白複合物之X光結晶繞射圖譜(37 , pH=6 ; 40 , pH=6)71 圖4.22 不同條件下合成羥基磷灰石-膠原蛋白複合物之X光結晶繞射圖譜(37 , pH=5 ; 40 , pH=5)72 圖4.23 不同條件下合成羥基磷灰石-膠原蛋白複合物之掃描式電子顯微鏡圖 (pH=9) 74 圖4.24 不同條件下合成羥基磷灰石-膠原蛋白複合物之掃描式電子顯微鏡圖 (pH=8) 75 圖4.25 不同條件下合成羥基磷灰石-膠原蛋白複合物之掃描式電子顯微鏡圖 (pH=7) 76 圖4.26 不同條件下合成羥基磷灰石-膠原蛋白複合物之掃描式電子顯微鏡圖 (pH=6) 77 圖4.27 不同條件下合成羥基磷灰石-膠原蛋白複合物之掃描式電子顯微鏡圖 (pH=5) 78 表目錄 表2.1 在酸性及中性環境中膠原蛋白沉澱所需之鹽濃度8 表2.2 膠原蛋白種類、基因位置及分佈組織16 表2.3 羥基磷灰石之物理和化學性質24 表2.4 常用之生醫骨材料的種類25 表2.5 各種生醫材料物理性質26 表2.6 羥基磷灰石的合成方法28 表4.1 豬皮萃取之膠原蛋白產率及純度44

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