利用獸疫鏈球菌生產透明質酸之研究

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摘 要

本研究主要是研究Streptococcus zooepidemicus BCRC 15414在批次發酵下，探討不同培養條件對生產hyaluronic acid (HA)之分子量及特性影響。這些不同培養條件包含不同葡萄糖濃度 (0-40 g/L)、攪拌速度 (50 and 150 rpm)、曝氣速率 (0.5 and 2 Lmin-1)、絕對厭氧及添加不同NaCl濃度 (0-5%, w/v)。實驗結果顯示出在pH為9.0的條件下，當攪拌速率為150 rpm且葡萄糖濃度為20 g/L時，HA產量可達最大值(1.79 g/L)且分子量為1.76×106 Da；當曝氣速率為2.0 Lmin-1時，HA產量可達2.05 g/L且分子量為1.97×106 Da。因此，攪拌速度和曝氣速率對於細胞生長和HA生產是很重要的影響。另外，在利用固定化S. zooepidemicus PVA (polyvinyl alcohol)顆粒進行批次發酵生產HA方面，實驗結果顯示出利用固定化S. zooepidemicus PVA顆粒進行批次發酵生產，最好的HA產量約為1.0 g/L。除此之外，本實驗將純化後的HA樣品以NMR (nuclear magnetic resonance)、GPC (gel permeation chromatography)及EA (elemental analyzer)進行分析，確定產物之結構及分子量範圍，結果顯示此產物確實為 HA。 在HA發酵過程中，由於HA累積而使發酵液黏度增加。因此，氧氣質傳速率會明顯地減少。在培養期間，氧氣質傳係數是扮演 重要角色。所以，本研究主要探討攪拌速度、曝氣速率及HA溶液黏度對kLa值(oxygen mass transfer coefficient)的影響。實驗結果顯示出攪拌速度和曝氣速率增加時，kLa值也會隨之增加。當攪拌速度為300 rpm，kLa值為最大，其值約為0.3787 min-1；當曝氣速率為2.0 Lmin-1，kLa值為最大，其值約為0.1328 min-1。 此外，本研究亦探討在批次發酵系統下，用S. zooepidemicus生產胞外多醣HA之發酵動力學。本實驗所用simple model是以Logistic equation模擬菌體生長、Luedeking-Piret equation來模擬HA生產、而葡萄糖和氧氣消耗則是利用Luedeking- Piret- like equation模擬得知。

關鍵詞 : 獸疫鏈球菌 ; 透明質酸 ; 固定化 ; 氧氣質傳係數

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