

行政院國家科學委員會專題研究計畫 成果報告

運動訓練對樹突狀細胞抗腫瘤能力之影響

計畫類別：個別型計畫

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計畫主持人：江界山

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行政院國家科學委員會補助專題研究計畫成果 報告

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The effect of exercise training on differentiation and
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一、中文摘要

本研究先前的實驗表明運動訓可增進樹突狀細胞的抗腫瘤免疫力。樹突狀細胞 (dendritic cells) 是有效的抗原呈現細胞，當接觸到腫瘤抗原時，樹突狀細胞可以刺激提升機體的免疫功能，本後續實驗的目的在探討運動訓練對於腫瘤患者的樹突狀細胞之影響，以人工植入腫瘤的 BALB/c 小白鼠為實驗對象，分為運動組與不運動組，觀察運動訓練對於樹突狀細胞的數量、型態學以及抗腫瘤能力。本研究預期可以提供運動訓練對腫瘤患者有利的證據。

關鍵詞：樹突狀細胞 運動訓練 腫瘤免疫力

Abstract

Our previous study reveals that exercise training facilitates the immune functions of dendritic cells. Dendritic cells (DCs) are potent antigen-presenting cells and can promote anti-tumor immunity *in vivo* when pulsed with tumor antigen. This following study aims to define roles of exercise training

in differentiation/maturation of DCs and their anti-tumor activity both *in vitro* and *in vivo*. DCs generated from BALB/c mice with or without exercise training are analyzed morphologically, phenotypically, and functionally and are tested for their ability to promote prophylactic and/or therapeutic anti-tumor immunity. This study may provide evidences for possible target of the immunopotentiating effect of exercise on tumor-bearing host.

Keywords: dendritic cells, exercise, tumor immunity.

二、緣由與目的

運動已成為先進國家的主流預防醫學範疇之一，而運動免疫科學也由於遺傳免疫分子科技的快速進展，已然成為運動科學中備受矚目的新領域與新學科。運動免疫研究者經由運動控制，利用生體外 (*in vitro*) 與活體內 (*in vivo*) 的綜合研究，以探討運動對血液中各種免疫生化值的變化與細胞的生長發育情形。

運動訓練之於免疫功能反應，端賴運動訓練對個體的適應與否，此一免疫適性 (immunological adaptability) 可應用於評定運動訓練負荷強度的適當性，並做為運動訓練監控的依據，藉以評定運動時，不同

的訓練負荷壓力 (stress) 加諸於細胞時的反應與適應情形。

癌症的發展，近幾年已研發出許多的治療方法，免疫療法便是一項具有潛力的治療方式，而目前最熱門的話題之一就是樹突狀細胞免疫治療(Kalady et al., 2004 ; Weise et al., 2004)。樹突狀細胞(dendritic cell) 是目前已知最有潛力之抗原呈現細胞(antigen presenting cells, APCs)。生物體內針對腫瘤細胞最有效之免疫反應為細胞毒殺性淋巴球反應 (cytotoxic T-lymphocytes, CTLs)，而要誘導專一性 CTLs 的產生必須藉由抗原呈現細胞先將特定抗原呈現給 CTLs，使 CTLs 針對帶有此特定抗原之細胞進行毒殺作用，此外，運動不只能在治療癌症時作為輔助之治療、預防或舒緩癌症之發展，另外也扮演增強免疫力的重要角色。本研究以運動訓練對樹突狀細胞抗腫瘤能力之影響探討：

一、大鼠飲食、飲水攝取量和體重的影響。

二、大鼠樹突狀細胞之數量、純度和回收百分比之差異與活化大鼠骨髓樹突狀細胞表面抗原的影響。

三、大鼠樹突狀細胞刺激淋巴球反應與 IL-12 細胞激素分泌的影響。

四、漸進式負荷訓練後對大鼠血液乳酸值的變化。

五、大鼠肝功能 (Glutamic-pyruvic transaminase, GPT) 與腎臟 (Creatinine, Cr)是否產生毒性的影響。

三、結果與討論

設計規律漸進式負荷訓練模式，不僅能讓選手達成高運動表現，進而促進個體免疫機能。動態恢復為運動後給予運動者較輕程度之負荷，非靜態休息，如此能夠有效率且加速乳酸於血液中的清除並減緩

因運動訓練課程中所造成之過度訓練與運動傷害(Stone, 1990)

大多數研究肯定以長期且適度之運動型態有助於提升人體的免疫功能，而負荷式訓練可能造成免疫功能上的不適而產生變化。因此透過五週漸進式負荷訓練運動模式，探討對大鼠飲食、食水與體重變化；骨髓樹突狀細胞數量、純度、回收百分比、表面抗原的影響；樹突狀細胞分泌 IL-12、混合淋巴球反應；漸進式負荷訓練對肝功能(GPT)、腎功能(Cr)的影響。

一、漸進式負荷訓練配合餵有效控制大鼠飲食、飲水的攝取量和體重的增加量。

二、漸進式負荷訓練會提高大鼠骨髓樹突狀細胞數量與回收百分比。

三、漸進式負荷訓練對大鼠骨髓樹突狀細胞表面抗原(CD80 和 CD86)無顯著表現，運動組與控制組會提高 CD11c 與 MHC class II(IA)的活性表現，且達顯著性差異($p < 0.05$)。

四、漸進式負荷訓練對活化大鼠骨髓樹突細胞混合淋巴球反應有促進的效果。

五、漸進式負荷訓練對大鼠肝功能與腎功能指數無顯著差異。

四、計畫成果自評

此研究內容與原計畫相符程度高，預期目標情況已達成。

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