# 大蒜中有機硫化合物成份硫化二丙烯對麩胱甘肽硫轉移酵素的誘導

# Enhancement of Glutathione S-Transferase Using Diallyl Sulfide from Garlic in Hepa-1c1c7 Cells

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## 摘要

研究指出大蒜及其中所富含的有機硫化合物成份（organosulfur compounds）具有預防癌症的作用，這可能和其改變生物體內解毒酵素（xenobiotic metabolizing enzymes）的活性有關，例如麩胱甘肽硫轉移酵素（glutathione S-transferase, GST）。動物實驗顯示，大蒜萃取物可增加老鼠體內 GST 酵素活性，但有關的詳細機轉尚未被確認。所以，本研究乃利用對外來物質敏感之小老鼠肝腫瘤細胞（Hepa-1c17）來探討大蒜中的硫化二丙烯（diallyl sulfide, DAS）成份對 GST 酵素的影響，並進一步去探討其對此酵素的調節機轉。結果顯示，在 5mM DAS 處理之 Hepa-1c1c7 細胞的 GST 酵素，於 16、24 和 48 小時活性有顯著性增加的現象。而細胞以不同濃度 DAS 培養 24 小時後，0.5、1 和 5mM DAS 組的 GST 酵素活性和對照組比較有顯著增加情形。同時 GST 的三種酵素異構物（isoenzymes），GST-$\alpha$ 、GST-$\mu$和 GST-$\pi$的蛋白質含量，亦有隨 DAS 濃度增加而增加的趨勢。由此可知，DAS 這種大蒜有機硫化合物成份，在 Hepa-1c1c7 細胞中可能會增加 GST 三種酵素異構物的蛋白質含量並增加 GST 酵素活性，推論可能進一步增強生物體的解毒功能，達到抑制癌症的發生。

## Abstract

Modification of the expression of xenobiotic metabolizing enzymes, such as glutathione S-transferase (GST), is thought to be one of the mechanisms of the anticarcinogenic effect of garlic. To obtain further insight into the induction of the GST enzyme and on the anticarcinogenic action of garlic, we examined the effect of daillyl sulfide (DAS), an organosulfur compound derived from garlic, on the induction of GST in the murine hepatoma cells (Hepa-1c1c7), which is sensitive to the xenobiotics. We observed that the GST enzyme activity was enhanced after treatment with 5 mM DAS for 16, 24 and 48 hours. Dose-response experiments demonstrated that the GST enzyme activity increased with increasing concentrations of DAS. Furthermore, Western blotting analysis revealed that three GST isoenzyme proteins, GST-α, GST-μ and GST-π, tended to increase with increasing DAS concentrations. In summary, the results suggest that GST enzyme activity can be enhanced by DAS in Hepa-1c1c7 cells, and the increased expression of the GST isoenzyme proteins contributed to the augmentation of the corresponding enzyme activity. The increased GST activity may explain, at lease in

part, the anticarcinogenic effect of garlic.