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論文名稱(英)	Characterization the effects of 2C-T-2, a phenethylamine derivative, on the immune system of mice
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(中)	
關鍵字(英)	phenethylamine 2C-T-2 psychoactive drugs immunity
摘要(中)	2,5-二甲氧基-4-乙硫基苯乙胺（2, 5 – dimethoxy – 4 – ethylthiophenethylamine, 2C-T-2）為苯環上官能基改變之苯乙胺（phenethylamine）衍生物，為一種精神活化藥物（psychoactive drugs）；精神活化藥物服用後可影響腦部功能，造成服用者知覺、心情、認知與行為改變，長期濫用會影響多項生理功能。先前研究中，小鼠單次口服 2C-T-2 會導致小鼠脾臟細胞在活化狀況下 nitric oxide（NO）產生的下降，NO 與免疫系統的防禦力有關，但有關 2C-T-2 對免疫生理活性的影響尚無相關文獻報導。本研究的目的是以小鼠灌食模式，評估單次或多次 2C-T-2 餵食對小鼠免疫活性的影響，並進一步探討在 2C-T-2 對免疫系統的神經內分泌調控的機制。研究結果顯示，小鼠口服 2C-T-2 卅分鐘後即可在血液中被偵測，約 6 小時在血液中便達到殘餘量的最低點，2C-T-2 同時可促進血漿中皮質固酮（conrticosterone）的濃度增加。在單次餵食 2C-T-2 的結果顯示，2C-T-2 的餵食會抑制周邊血中總白血球的數目，同時也抑制白血球吞噬的活性，而 2C-T-2 也會抑制脾臟 B 與 T 淋巴球在活化狀態下細胞增生與 NO 釋放，並在餵食後 2 小時呈現最大抑制的反應；另外 2C-T-2 也顯著抑制 LPS 刺激分泌的細胞激素 IL-1β、IL-6 與 TNF-α 分泌量與 Con A 刺激分泌的細胞激素 IFN-γ、IL-4 與 IL-10 的分泌量，但 2C-T-2 顯著促進 TGF-β1 與 IL-2 分泌增加。在多次餵食實驗結果顯示，2C-T-2 不會顯著改變周邊血總白血球數目，對脾臟 B 與 T 淋巴球在活化狀態下細胞增生僅呈現些微抑制現象，而在多次餵食下 IL-1β、IL-6、TNF-α、IL-4 與 IL-2 分泌量皆會下降，但對 IFN-γ 與 IL-10 的分泌量並無影響。在探討 2C-T-2 所造成免疫活性抑制機制的結果顯示，將不同劑量的 2C-T-2 與巨噬細胞株、脾臟初代細胞與純化出 T 細胞進行體外共同培養的實驗結果顯示，2C-T-2 之免疫抑制作用並非藥物直接作用細胞所導致；接著在餵食藥物前 30 分鐘腹腔施打交感神經抑制劑（nadolol）與興奮劑（epinephrine），發現 NO 釋放的抑制現象可因為藥物的施打而減弱。綜合以上所得， 2C-T-2 攝食可造成小鼠免疫活性的抑制，而此抑制作用與神經內分泌的調控有關。
摘要(英)	2C-T-2 (2,5 – dimethoxy – 4 – ethylthio- phenethylamine), a psychoactive drug, is a ring-substituted phenethylamine derivative that exerts psychological effects including changes in mood, cognition, and behavior. It had been reported that psychoactive drugs caused the health problems if there were abused intake. The previously studies indicated that oral intake 2C-T-2 suppressed the nitric oxide production of mitogen-stiumated splenocytes in mice. However, little information is available concerning its bioactivity and immunomodulatory activity. In this study, the metabolic kinetic and immunomodulatory effects of 2C-T2 after single or repeated oral intake are examined and characterized used the mice animal model. In addition, the neuroendocrine-mediated mechanism(s) of 2C-T-2-induced immunosuppression was also examined. Results indicated that the level of 2C-T-2 in the peripheral blood was

firstly detected at 30 minutes after intake, and 6 hours later, the level of 2C-T-2 was metabolic clear and less than detectable amount. In parallel, 2C-T-2 oral intake also increased the level of corticosterone in blood plasma. The results of single intake 2C-T-2 on immune activities indicated that 2C-T-2 induced the decrease the distribution of T, B, and NK cell populations in peripheral blood. And the ability of phagocytosis in leukocytes was suppressed significantly after 2C-T-2 oral intake 6 hours. 2C-T-2 also induced the suppression of mitogen-stimulated proliferation and nitric oxide in spleen and thymus. In addition, the production of IL-1 β, IL-6, TNF- α, IFN- γ, IL-4, and IL-10 cytokines from LPS or Con A-stimulated splenocytes were significantly decreased after 2C-T-2 oral intake. However, 2C-T-2 intake significantly increased the IL-2 and TGF- β1 production. Repeated 2C-T-2 intake induced the immunosuppression on production of nitric oxide, IL-1 β, IL-6, TNF- α, IL-4, IL-10, and TGF- β1, but no change on leukocytes subpopulation number, proliferation and production of IL-2 and IFN- γ. Furthermore, in this study, we observed that in vitro exposure to 2C-T-2 did not alter LPS-stimulated nitric oxide production. This data indicate that the ability of 2C-T-2 to suppress the production of nitric oxide and cytokine production is not due to a direct action on immune cells. Interestingly, administrated nodolol, a β-adrenoceptor blockade, or epinephrine attenuated the decrease in nitric oxide production induced by 2C-T-2 oral intake. In summary, these data demonstrate that 2C-T-2 intake induce the suppression effect on immune activities of mice. However, further studies are needed to elucidate the exact mechanisms that underlie 2C-T-2 induced suppression of nitric oxide and cytokine production.

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