# To investigate the effects of carvacrol on helper T cell subtypes and asthma-related symptoms

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## Outline

- Introduction
- T helper cells subtypes and their cytokine gene expression affected by carvacrol in sensitized mice administered during sensitization period
- Potential anti-inflammatory and immunomodulatory effects of carvacrol against ovalbumin-induced asthma in rats
- Conclusion

## Abstract

Asthma is a chronic inflammatory disorder of the airways with chronic airway inflammation and airway remodeling. Progression of asthma is accompanied by activation of T helper cells which are considered the key driver of the inflammatory response in asthma. Naïve T cells will differentiate into Th1 (Helper T cell type 1), Th2, Th17 and Treg cells according to the purpose. $CD4^+$ T cells play an important role in lung inflammation in asthma by releasing cytokines and start a cascade of inflammatory mediators to initiate and perpetuate the inflammatory response. In addition, it was found that the expression of reactive oxygen species (ROS) and reactive nitrogen (RNS) increased in asthma patients. These substances induce oxidative stress and inflammatory processes contributing to allergic asthma. Carvacrol has antioxidative, anti-inflammatory, antimicrobial, antitussive, anti-tumor, neuroprotective and smooth muscle relaxant pharmacological effects. In this report, the effects of carvacrol on improving the balance of Th cells in asthmatic mouse models and its anti-inflammatory properties on asthma-related symptoms will be investigated. Kianmehr *et al*. showed that carvacrol potentiated Th1 and Treg cells but reduced Th2 and Th17 cells leading to improvement of Th1/Th2 imbalance. Furthermore, carvacrol reduced the activities of proinflammatory cytokines as well as relevant cell subtypes, finally alleviating asthma-related symptoms. Ezz-Eldin *et al*. showed that carvacrol attenuated histopathologic changes and inflammatory cell infiltration in the lung, and decreased the levels of Th2 cytokines in asthmatic mice. In addition, carvacrol reduced the inflammatory response by reducing the oxidative stress produced by ROS and RNS. In conclusion, carvacrol can inhibit pro-inflammatory cytokines and oxidative stress to ameliorates asthma-related symptoms. In conclusion, carvacrol ameliorates asthma-related symptoms by regulating helper T cell subtypes and inhibiting pro-inflammatory cytokines and oxidative stress.

# 參考資料


Annunziato, F., Cosmi, L., Liotta, F., Maggi, E., & Romagnani, S. (2008). The phenotype of human Th17 cells and their precursors, the cytokines that mediate their differentiation and the role of Th17 cells in inflammation. *International immunology*, *20*(11), 1361-1368.

Arunasree, K. M. (2010). Anti-proliferative effects of carvacrol on a human metastatic breast cancer cell line, MDA-MB 231. *Phytomedicine*, *17*(8-9), 581-588.

Boskabady, M. H., & Jandaghi, P. (2003). Relaxant effects of carvacrol on guinea pig tracheal chains and its possible mechanisms. *Die Pharmazie-An International Journal of Pharmaceutical Sciences*, *58*(9), 661-663.

Braman, S. S. (2006). The global burden of asthma. *Chest*, *130*(1), 4S-12S.

Chatila, T. A. (2005). Role of regulatory T cells in human diseases. *Journal of allergy and clinical immunology*, *116*(5), 949-959.

Comhair, S. A., & Erzurum, S. C. (2010). Redox control of asthma: molecular mechanisms and therapeutic opportunities. *Antioxidants & redox signaling*, *12*(1), 93-124.

Deo, S. S., Mistry, K. J., Kakade, A. M., & Niphadkar, P. V. (2010). Role played by Th2 type cytokines in IgE mediated allergy and asthma. *Lung India: Official Organ of Indian Chest Society*, *27*(2), 66.

**Ezz-Eldin, Y. M., Aboseif, A. A., & Khalaf, M. M. (2020). Potential anti-inflammatory and immunomodulatory effects of carvacrol against ovalbumin-induced asthma in rats. *Life Sciences*, *242*, 117222.**

**Kianmehr, M., Rezaee, A., Mahmoudi, M., Ghorani, V., & Boskabady, M. H. (2019). T helper cells subtypes and their cytokine gene expression affected by carvacrol in sensitized mice administered during sensitization period. *Journal of cellular biochemistry*, *120*(4), 5343-5354.**

Kirkham, P., & Rahman, I. (2006). Oxidative stress in asthma and COPD: antioxidants as a therapeutic strategy. *Pharmacology & therapeutics*, *111*(2), 476-494.

Li, Z., Hua, C., Pan, X., Fu, X., & Wu, W. (2016). Carvacrol exerts neuroprotective effects via suppression of the inflammatory response in middle cerebral artery occlusion rats. *Inflammation*, *39*(4), 1566-1572.

Saleh, D., Ernst, P., Lim, S., Barnes, P. J., & Giaid, A. (1998). Increased formation of the potent oxidant peroxynitrite in the airways of asthmatic patients is associated with induction of nitric oxide synthase: effect of inhaled glucocorticoid. *The FASEB journal*, *12*(11), 929-937.

Samarghandian, S., Farkhondeh, T., Samini, F., & Borji, A. (2016). Protective effects of carvacrol against oxidative stress induced by chronic stress in rat's brain, liver, and kidney. *Biochemistry research international*, *2016*.

Shi, Y. H., Shi, G. C., Wan, H. Y., Jiang, L. H., Ai, X. Y., Zhu, H. X., ... & Zhang, B. Y. (2011). Coexistence of Th1/Th2 and Th17/Treg imbalances in patients with allergic asthma. *Chinese medical journal*, *124*(13), 1951-1956.