

# Effect of the 70% ethanol extract of *Tetragonia tetragonoides* on Immunoreactivity in ovariectomized mouse model

Jin Ah Ryuk<sup>1</sup>, Jae Seon So<sup>2</sup>, Hye Jin Kim<sup>1</sup>, Byoung Seob Ko<sup>1\*</sup>

<sup>1</sup>Korea Institute of Oriental Medicine, Daejeon, 34054, Korea

<sup>2</sup>Dongguk university of department of medical biotechnology, Republic of Korea.

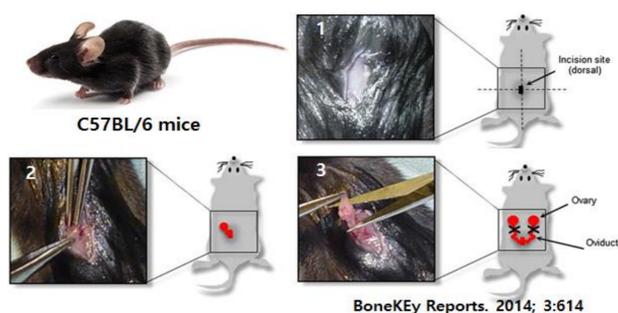
Corresponding author, [bsko@kiom.re.kr](mailto:bsko@kiom.re.kr)

## Introduction

Women who have experienced menopause are at greater risk for immune imbalance including hormone problem. Estrogens are involved in immune response at least of the humoral immunity and androgens and progesterone. However, hormone replacement therapy has limitations of breast cancer incidence, Herbal medicines, which have less adverse effects, have received attention to compensate for the problems related to hormone replacement therapy. The purpose of this study is to demonstrated the immunological efficacy of *T. tetragonoides* (TT) using ovariectomized animal models.

## Material and Methods

### Experimental design model of the study



### A. Establishment of Menopause model by Ovariectomy

1. Control	Normal mice - Water	4. B ; Dangguijakyaksan	Ovariectomy - 500 mg/kg
2. Negative Control	Ovariectomy - Water	5. C ; Kyejitang	Ovariectomy - 500 mg/kg
3. A ; Tetragonia tetragonoides	Ovariectomy - 500 mg/kg	6. D ; Kyejibokryoungwan	Ovariectomy - 500 mg/kg

### B. Experimental scheme for evaluating the oriental-or/and herbal medicine

## Result I

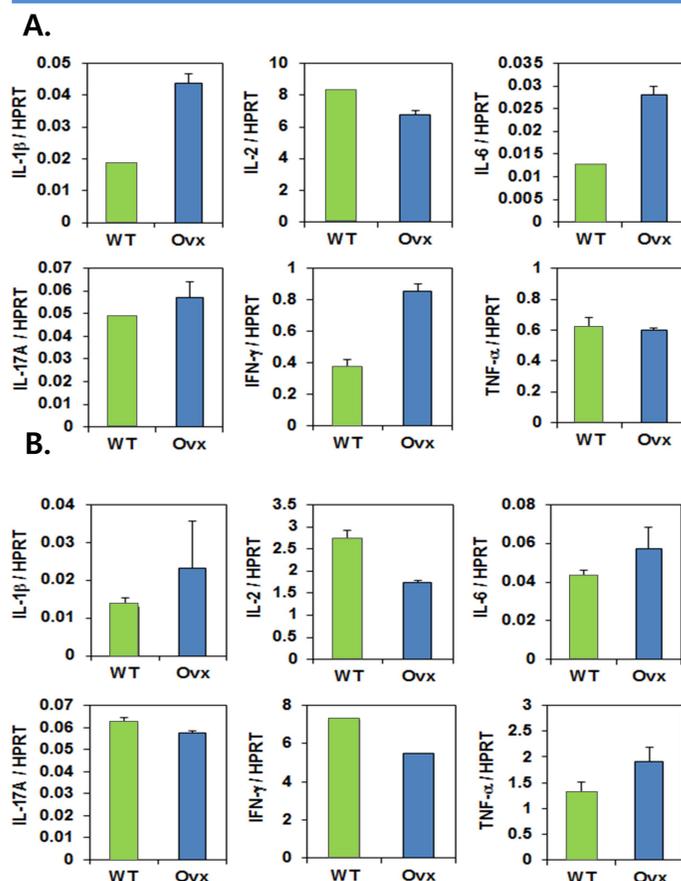


Figure 1. Analysis of immune response in ovariectomized mice. Mice were ovariectomized or sham-operated, and were sacrificed after 4 weeks surgery. CD4+ T cells isolated from spleen of ovariectomized mice. Immune response was evaluated by mRNA expression of inflammatory cytokines in CD4+ T cells and mesenteric lymph. A, The mRNA expression of inflammatory cytokines in CD4+ T cell. B, The mRNA expression of inflammatory cytokines in mesenteric lymph.

## Result II

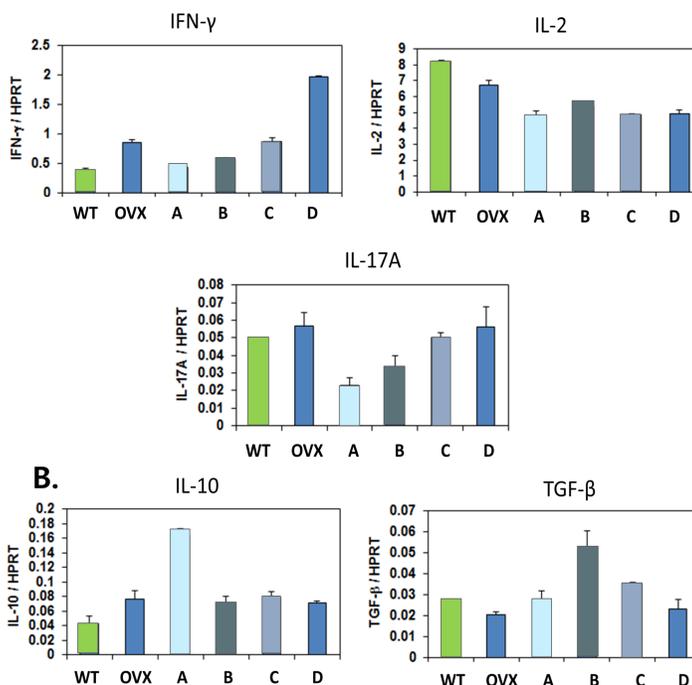
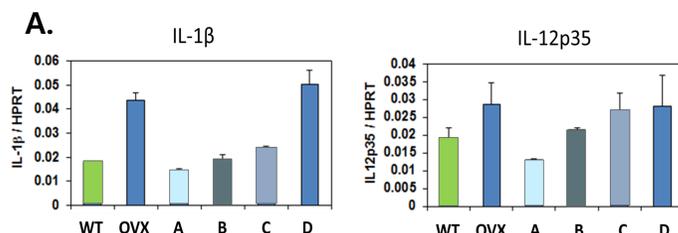


Figure 2. Analysis of immune response in CD4+ T cells of ovariectomized mice. Mice were then treated with Tetragonia tetragonoides (A), Dangguijakyaksan (B), Kyejitang (C), and Kyejibokryoungwan (D) by orally administered a day for 4weeks after surgery (OVX; ovariectomy). Immune response was evaluated by mRNA expression of inflammatory cytokines in CD4+ T cells. A, mRNA levels of inflammatory cytokines. B, mRNA levels of anti-inflammatory levels.

## Result III

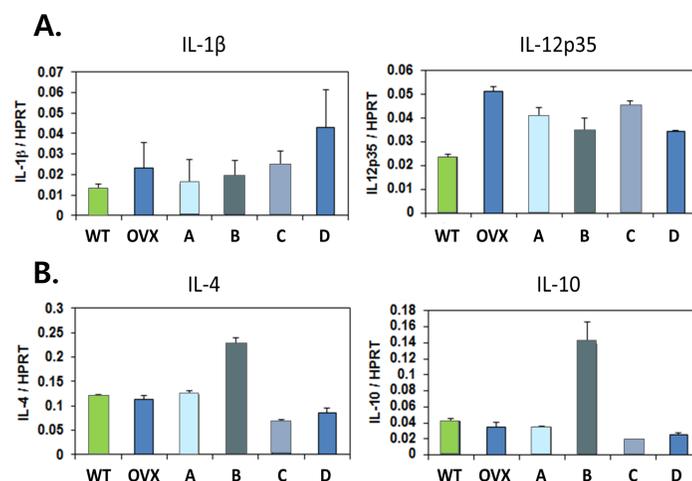


Figure 3. Analysis of immune response in mesenteric lymph of ovariectomized mice. Mice were then treated with Tetragonia tetragonoides (A), Dangguijakyaksan (B), Kyejitang (C), and Kyejibokryoungwan (D) by orally administered a day for 4weeks after surgery (OVX; ovariectomy). Immune response was evaluated by mRNA expression of inflammatory cytokines in mesenteric lymph. A, mRNA levels of inflammatory cytokines. B, mRNA levels of anti-inflammatory levels.

## Conclusion

- Immune response related cytokine influenced by menopause condition.
  - IL-1 $\beta$ , IL-2, IL-17, and IFN- $\gamma$  in CD4 + T cells were significantly reduced in ovariectomized animal model.
  - Significantly, Modulating of immune response activities including inhibition of generation of immune cell cytokine production in mesenteric lymphnodes.
- > Target the modulation of inflammatory immune responses for the treatment of menopausal symptoms And related disease.

## References

1. Straub RH. The complex role of estrogens in inflammation. *Endocr Rev.* 2007; 28: 521-74.
2. Pernis AB. Estrogen and CD4+ T cells. *Curr Opin Rheumatol.* 2007; 19: 414-20.
3. Okasha SA, et al. Evidence for estradiol-induced apoptosis and dysregulated T cell maturation in the thymus. *Toxicology.* 2001; 163: 49-62.
4. Cenci S, et al. Estrogen deficiency induces bone loss by enhancing T-cell production of TNF- $\alpha$ . *J Clin Invest.* 2000; 106: 1229-37.
5. Roggia C, et al. Role of TNF- $\alpha$  producing T-cells in bone loss induced by estrogen deficiency. *Minerva Med.* 2004; 95:125-32.
6. Polanczyk MJ, et al. Cutting edge : estrogen drives expansion of the CD4+CD25+ regulatory T cell compartment. *J Immunol.* 2004; 173: 2227-30.