

## Anti-inflammatory, analgesic and acute toxicity effects of fermented soybean

### ABSTRACT

**Background:** Tempeh is a widely known fermented soybean that contains elevated level of bioactive contents. Our previous study has shown that anaerobic fermented Nutrient Enriched Soybean Tempeh (NESTE) with increase amino acid and antioxidant levels possessed better hepatoprotective effect than raw soybean.

**Methods:** In this study, the anti-inflammatory effect of the NESTE aqueous extract and raw soybean aqueous extract (SBE) were evaluated by quantifying the inhibition of IL-1 $\beta$ , TNF- $\alpha$  and nitric oxide (NO) secretion in LPS treated RAW 264.7 cell in vitro. On the other hand, in vivo oral acute toxicity effect of the extract was tested on mice at the dose of 5000 mg/kg body weight. In vivo oral analgesic effect of both aqueous extracts at 200 and 1000 mg/kg body weight was evaluated by the hot plate test.

**Results:** In the in vitro anti-inflammatory study, 5 mg/mL NESTE was able to inhibit  $25.50 \pm 2.20\%$ ,  $35.88 \pm 3.20\%$  and  $28.50 \pm 3.50\%$  of NO, IL-1 $\beta$  and TNF- $\alpha$  production in LPS treated RAW 264.7 cells without inducing cytotoxic effect on the cells. However, this effect was lower than 4  $\mu$ g/mL of curcumin, which inhibited NO, IL-1 $\beta$  and TNF- $\alpha$  production by  $89.50 \pm 5.00\%$ ,  $78.80 \pm 6.20\%$  and  $87.30 \pm 4.00\%$ , respectively. In addition, 1.5 to 2.5-fold increase of latency period up to 120 min for mice in the hot plate test was achieved by 1000 mg/kg NESTE. The analgesic effect of NESTE was better than 400 mg/kg of acetyl salicylic acid, which only increased  $\sim 1.7$ -fold of latency period up to 90 min. Moreover, NESTE did not show acute toxicity (no LD50) up to 5000 mg/kg body weight.

**Conclusion:** NESTE is a nutritious food ingredient with potential anti-inflammatory and analgesic effects.

**Keyword:** Fermented; Soybean; Anti-inflammation