

## The effects of chloroform, ethyl acetate and methanolic extracts of *Brassica rapa* L. on cell-mediated immune response in mice

A. Jafarian<sup>1</sup>, B. Zolfaghari<sup>2</sup> and M. Mirdamadi<sup>1</sup>

<sup>1</sup>Department of Pharmacology and Toxicology, School of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Isfahan, I.R.Iran.

<sup>2</sup>Department of Pharmacognosy, School of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Isfahan, I.R.Iran.

**Background and Aims:** Turnips with a long history of usage, are helpful in preventing breast and prostate cancer, inflammation and body's immune system dysfunction. In this study, we investigated the effects of chloroform, ethyl acetate and methanolic extracts of *Brassica rapa* L. on cell-mediated immune response in mice.

**Methods:** Chloroform, ethyl acetate and methanolic extracts of *B. rapa* glands were prepared by maceration method. To study the effects of *B. rapa* on acquired immunity, groups of Balb/c mice (n=8) were used. Sheep red blood cell (SRBC) was injected (s.c.,  $1 \times 10^8$  cells/ml, 0.02 ml) and 5 days later, different extracts (10, 100 and 500 mg/kg), betamethasone (4 mg/kg) and Levamisol (4 mg/kg) as a positive control and normal saline as a negative control were given i.p. After 1 h SRBC was injected to footpad (s.c.,  $1 \times 10^8$  cells/ml, 0.02 ml) and footpad swelling was measured up to 72 h. To investigate the effects of *B. rapa* on innate immunity the same procedure was used, but animals only received one injection of SRBC 1 h after i.p. injection of test compounds.

**Results:** Our findings showed that SRBC induced an increase in paw swelling with maximum response at 6-8 and 2-4 h for innate and acquired immunity, respectively. Betamethasone inhibited and levamisol increased paw thickness in both models. In both innate and acquired immunity models, chloroform, ethyl acetate and methanolic extracts of *B. rapa* glands significantly and dose-dependently reduced paw thickness. Ethyl acetate extract showed better effect.

**Conclusion:** The results indicated that *B. rapa* is a good candidate for immunomodulatory effect. As glucosinolates are better extracted by ethyl acetate, it may be concluded that they are contributed in the more pronounced effects of ethyl acetate extract.

**Keywords:** *Brassica rapa*; turnip; acquired immunity; innate immunity; methanolic extract; chloroform extract; ethyl acetate extract