Proceedings of the Nutrition Society (2009), **68 (OCE)**, E96 doi:10.1017/S0029665109990498

Scottish Section of The Nutrition Society, 7–8 April 2009

Changes in stress levels and the immuno-modulatory effects of Echinaforce®

V. Wong[1], A. Ravishankar[2], A. Gilmour[3], S. E. E. Gates[4], J. McNulty[5], A. Pritchard[5], H. Cargill[6], R. Schoop[7], S. Ramnarine[7] and M. R. Ritchie[5,6]

[1]*University of Aberdeen, Aberdeen AB24 3FX, UK,* [2]*University of London, London WC2R 2LS, UK,* [3]*University of Manchester, Manchester M13 9PL, UK,* [4]*Cambridge University, Cambridge CB2 1TN, UK,* [5]*Arbroath High School, Arbroath DD11 3BN, UK,* [6]*Napier University, Edinburgh EH14 1DJ, UK and* [7]*University of Edinburgh, Edinburgh EH8 9YL, UK*

Stress, which is a huge occupational health problem in the UK, can weaken the immune system, leaving individuals more susceptible to various infections[(1)]. Several studies have shown *Echinacea purpurea* (a medicinal plant) to be beneficial in treating and preventing influenza-type infections and the common cold[(2,3)]. However, to date little is known about the effects of *Echinacea purpurea* on the immune response in individuals whose stress levels change. Using an *ex vivo* stimulation model the present study aimed to investigate the immuno-modulatory effects of repeated Echinaforce® (extract of *Echinacea purpurea*; Bioforce AG, Roggwil, Switzerland) dosing in a heterogenous group of healthy subjects during and after a period of stress.

Thirty healthy subjects (age range 18–57 years, mean 20.6 years) with high perceived stress levels (measured using a perceived stress score-10 (PSS-10) questionnaire[4]) enrolled in phase I of the study. Daily blood samples collected throughout the 10 d study period were analysed for the anti-inflammatory mediator IFN-γ after *ex vivo* stimulation by lipopolysaccharide (LPS; variant O55:B5 from *Escherichia coli*; 100 ng/ml) and super-antigen staphylococcal enterotoxin B (SEB; 25 ng/ml). After 2 d of baseline measurements treatment was started with 4 × 1 ml Echinaforce®/d (low dose) for 5 d and subsequently increased to 10 × 1 ml/d (high dose) for 4 d. After 5 weeks all subjects completed another PSS-10 questionnaire. Eight subjects whose perceived stress level had dropped by more than five scores completed phase II, in which the procedures used in phase I were repeated.

Concentrations of IFN-γ showed a marked increase during 'low-dose' Echinaforce® treatment in phase I (stress period; mean PSS-10 score 19.1; SD 7.6) and remained higher than baseline production throughout the treatment period. Volunteers also experienced a significant transient increase in IFN-γ (>25 %) with peak induction of 50 % ($P<0.05$) on the first day of 'high-dose' treatment and a subsequent fall to baseline at the last day of treatment. This effect may have resulted in a reduction in volunteers' susceptibility to colds as a result of the antiviral property of IFN-γ. Interestingly, this effect was not observed in the same subjects whose perceived stress dropped by more than five scores in phase II (non-stress period; mean PSS-10 score 12.0; SD 5.0).

The results demonstrate a very specific adapted immune-modulatory activity of Echinaforce®. As advantageous effects were only seen when volunteers were perceived to be stressed, it can be hypothesised that Echinaforce® treatment may have a protective effect against infections during periods of stress. Although the volunteers who participated in both phases act as their own control, a placebo controlled study will be beneficial in further confirming the findings.

This study was funded by Bioforce AG, Roggwil, Switzerland.

1. Schedlowski M & Schmidt RE (1996) *Naturwissenschaften* **83**, 214–220.
2. Blumenthal M, Milot B & Oliff HS (2007) *HerbalGram* **74**, 28–31.
3. Woelkart K, Linde K & Bauer R (2008) *Planta Med* **74**, 633–637.
4. Cohen S, Kamarck T & Mermelstein R (1983) *J Health Soc Behav* **24**, 385–396.