Diosgenin, a phytoestrogen inhibited LPS-activated neuroinflammation in BV2 microglia

Anwer Abudheir[1], Olumayokun Olajide[1]. [1]University of Huddersfield, Huddersfield, UK

Neuroinflammation is an important aspect in many neurodegenerative disorders. It is evident that pro-inflammatory mediators control inflammatory signalling pathways in the CNS. Diosgenin is a plant-derived steroidal saponin commonly found in fenugreek (*Trigonella foenum graecum*), roots of wide yam (*Dioscorea villosa*) and *Solanum incanum* (1). Recent studies on diosgenin showed significant anti-inflammatory effects on macrophage and on allergen-induced intestinal inflammation in a murine model (2, 3). However, little is known about the anti-neuroinflammatory effect of this compound on the brain cells. In the current study we have investigated the anti-neuroinflammatory activity of diosgenin on lipopolysaccharide (LPS)-activated BV2 microglia. Diosgenin was obtained from Sigma-Aldrich and dissolved in dimethyl sulfoxide (DMSO) to prepare a stock solution of 0.01 M. BV2 cells were pre-incubated with diosgenin (5, 10, and 20 μM) prior to stimulation with LPS (100 ng/ml) for 24 h, supernatants were evaluated for the levels of nitrite using Griess assay, interlukin-6 (IL-6) and tumour necrosis factor-α (TNF-α) using ELISA kit. MTT assay was used to determine the effect of diosgenin on BV2 cell viability. Cyclooxygenase-2 (COX-2) and inducible nitric oxide synthase (iNOS) protein expressions were evaluated in LPS-activated BV2 microglia by western blotting analysis. The total number of each experiment was three. Results showed that diosgenin produced significant reduction in the levels of nitrite and IL-6 without affecting the viability of BV2. Diosgenin (20 μM) significantly ($p < 0.001$) reduced the TNF-α production by 63.6±14.8 compared to LPS control group. Further, diosgenin significantly downregulated iNOS and COX-2 protein expressions in LPS-activated BV2 microglia in which diosgenin at 20 μM significantly ($p < 0.001$) supressed iNOS and COX-2 expressions by 26.4±8.03, 45.5±13.6, respectively compared to LPS control group. Our findings showed that diosgenin supressed LPS-induced nitrites, IL-6, TNFα mediated neuroinflammation in BV2 microglial cell. We have also demonstrated that diosgenin downregulated iNOS and COX-2 protein expressions in LPS-activated BV2 cells. These preliminary data seem to indicate that diosgenin might be a potential anti-neuroinflammatory compound.

1. Xiao L et al. (2012). Diosgenin Promotes Oligodendrocyte Progenitor Cell Differentiation Through Estrogen Receptor-Mediated ERK1/2 Activation to Accelerate Remyelination. GLIA **60**:1037-1052

2. Jung H et al. (2010). Diosgenin inhibits macrophage-derived inflammatory mediators through downregulation of CK2, JNK, NF-κB and AP-1 activation. International immunopharmacology, **10**: 1047-1054

3. Huang H et al. (2009). Diosgenin attenuates allergen-induced intestinal inflammation and IgE production in a murine model of food allergy. Planta Med, **75** ,1300-1305.