Original article

Zearalenone induces apoptosis and inhibits proliferation in porcine ileal Peyer’s patch lymphocytes

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Abstract

Zearalenone (ZEN) is one of the most active natural estrogenic compounds that induces apoptosis. This study has been prompted by the widespread occurrence of ZEN in food and feed and limited knowledge about the effects of exposure to low doses of ZEN on the immune system. The aim of the study was to verify the hypothesis that low doses of ZEN contribute to induction of apoptosis and inhibition of proliferation in lymphocytes of the germinal centers (GC) of ileal Peyer’s patches (IPP) in pigs. The experiment was performed on 30 female Polish Large White pigs, aged 2 months, with body weight of 15-18 kg, divided into two groups: control (C, n=15) and experimental (Z, n=15). On days 14, 28 and 42 of exposure to ZEN (100 μg kg⁻¹ feed day⁻¹), apoptosis in IPP GC was evaluated histologically in HE-stained specimens, immunohistochemically by active caspase-3 staining and in mononucleosome and oligonucleosome detection-based ELISA. Proliferation was evaluated histologically by mitosis detection in HE-stained specimens, immunohistochemically by PCNA staining and in the MTT tetrazolium salt colorimetric assay detecting mitogenic responses of B cells to LPS. Exposure to low doses of ZEN for several weeks intensified apoptosis and weakened proliferation in IPP lymphocytes. ZEN influences gut-associated lymphoid tissue (GALT) by decreasing the expression of CD21+ on B cells and by increasing the percentage of B₁ cell populations.

Key words: zearalenone, lymphocytes, proliferation, apoptosis, germinal center, pigs

Introduction

The global spread of mycotoxins poses a serious health risk for humans and animals. Mycotoxins’ adverse effects on the immune system (Murata et al. 2003, Obremski 2013) have been demonstrated by both in vivo (Bondy and Pestka 2000) and in vitro (Berek et al. 2001) studies, even at doses below the no observable adverse effect level (NOAEL) (Oswald et al. 2005). Zearalenone (ZEN) is one of the most active natural estrogenic compounds (Nikov et al. 2000) produced by various species of the genus Fusarium (Bennett and Klich 2003, Obremski et al. 2003a). Fusarium colonizes maize, wheat and barley