MicroRNA expression profiles in liver and colon of sexually immature gilts after exposure to Fusarium mycotoxins

P. Brzuzan¹, M. Woźny¹, L. Wolińska-Nizioł¹, A. Piasecka¹, M. Florczyk¹, E. Jakimiuk², M. Góra³, M.K. Łuczyński⁴, M. Gajęcki²

¹ Department of Environmental Biotechnology, Faculty of Environmental Sciences, University of Warmia and Mazury in Olsztyn, Słoneczna 45G, 10-709 Olsztyn, Poland
² Department of Veterinary Prevention and Feed Hygiene, Faculty of Veterinary Medicine, University of Warmia and Mazury in Olsztyn, Oczapowskiego 13, 10-950 Olsztyn, Poland
³ Department of Organic Chemistry, Faculty of Chemistry, Jagiellonian University, Ingardena 3, 30-060 Cracow, Poland
⁴ Department of Chemistry, Faculty of Environmental Management and Agriculture, University of Warmia and Mazury in Olsztyn, Pl. Łódzki 4, 10-957 Olsztyn, Poland

Abstract

To improve our knowledge of the role of microRNAs (miRs) in responses of the porcine digestive system to two Fusarium mycotoxins, zearalenone (ZEN) and deoxynivalenol (DON), we examined the expression of 7 miRs (miR-9, miR-15a, miR-21, miR-34a, miR-122, miR-125b, and miR-192), previously found to be deregulated in diseased liver and colon cells. In this study, immature gilts were exposed to NOEL doses of ZEN (40 μg/kg/d), DON (12 μg/kg/d), ZEN+DON (40+12 μg/kg/d), and placebo (negative control group) for 7, 14, 21, 28, 35, and 42 days. Before the treatment, expression levels of the selected miRs were measured in the liver, the duodenum, the jejunum, and the ascending and the descending colon of the gilts. Hierarchical clustering of the tissues by their miR expression profiles was consistent with what would be expected based on the anatomical locations and the physiological functions of the organs, suggesting that functions of the miRs are related to the specificities of the tissues in which they are expressed. A subset of 2 pairs of miRs (miR-21+miR-192 and miR-15a+miR-34a), which were assigned to two distinct clusters based on their tissue abundance, was then evaluated in the liver and the ascending and the descending colon during the treatment. The most meaningful results were obtained from the ascending colon, where a significant effect of the treatment was observed, suggesting that during the exposure to mycotoxins, the pathways involved in cell proliferation and survival were disordered. Changes in miR expression in the liver and the descending colon of the treated gilts were smaller, and were associated more with treatment duration than the exposure to ZEN, DON, or ZEN+DON. Further research should focus on identification of genes whose expression is regulated by these aberrantly expressed miRs. This should facilitate understanding of the miRNA-regulated biological effects of mycotoxins.

Key words: deoxynivalenol, domestic pig, miRNA expression, zearalenone

Correspondence to: P. Brzuzan, e-mail: brzuzan@uwm.edu.pl, tel.: +48 89 523 41 87