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EDITORIAL

Highlight report: metabolism and toxicity by fumonisins

Gisela H. Degen[1]

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Recently, Wang et al. (2015) from Huazhong University in China have published a comprehensive review about metabolism and toxicity of fumonisins. Fumonisins are a group of mycotoxins that occur worldwide, mostly in corn (maize) and corn-based products, but have also been found in wheat, rice, wine, black tea, nuts and other food commodities (Logrieco et al. 2010; Marín et al. 2007; Martins et al. 2001; Zimmer et al. 2008). The most prevalent of the fumonisins, FB_1, is known to exert toxicities in liver and kidney, but also in other organs of farm and laboratory animals (Voss et al. 2007). In highly exposed human populations, fumonisins are suspected risk factors for oesophageal and liver tumours, neural tube defects and cardiovascular problems (Riley et al. 2015; Stockmann-Juvala and Savolainen 2008; Voss et al. 2007). This spectrum of toxicities necessitates a better understanding of the underlaying mechanisms, not only for an improved risk assessment, but also for developing mechanism-based approaches to counteract the toxic potential of fumonisins.

Fumonisins inhibit ceramide synthase leading to disrupted sphingolipid metabolism [references in Wang et al. (2015)]. Most recently, disruption of sphingolipid metabolism has been shown to be an apical event in FB_1-induced autophagic cell death in kidney cells (Yin et al. 2015). Moreover, fumonisins influence the immune status by increasing cytokine levels in experimental animals. In recent years, several in vitro and in vivo studies have identified oxidative stress as one of the mechanisms by which fumonisins can lead to adverse effects such as hepatotoxicity, nephrotoxicity and cardiotoxicity (Wang et al. 2015). Moreover, the IARC has classified fumonisin B_1 as possibly carcinogenic to humans (IARC 2002). Nevertheless, fumonisins have attracted relatively little attention in toxicological research. Currently, hepatotoxicity (Campos et al. 2014; Liu et al. 2014; Godoy et al. 2009, 2013, 2015; Schyschka et al. 2013; Schliess et al. 2014; Grinberg et al. 2014), nephrotoxicity (Yang et al. 2014; Yu et al. 2013; Early et al. 2013; Kitada et al. 2006; Ruíz-López et al. 2006; Bulacio and Torres 2013) and cardiotoxicity (Fujisawa et al. 2014; Maayah et al. 2014; Ferreiro et al. 2014; Rossato et al. 2013) represent cutting-edge topics in toxicology. Recently, lists of reference compounds have been recommended for establishment of in vitro systems of repeated dose toxicity (Jennings et al. 2014; Hengstler et al. 2014). Perhaps it may be advisable to include fumonisins into these sets of compounds because of their well-documented hepatotoxicity and kidney toxicity in animals, and evidence for human exposure from recent biomonitoring studies (Gerding et al. 2015; Riley et al. 2015; van der Westhuizen et al. 2013). The present review of Wang et al. (2015) represents a must-read to anyone interested in mycotoxins.

✉ Gisela H. Degen
degen@ifado.de

[1] Leibniz Research Centre for Working Environment and Human Factors, TU Dortmund, IfADo - Ardeystr. 67, 44139 Dortmund, Germany

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