

Carry-over of ochratoxin A to plasma, serum, milk, urine and faeces in lactating cows fed with concentrate-rich diets

Felipe Penagos-Tabares^{1,2,3*}, Siska Aditya^{4,5}, Barbara Streit⁶, Johannes Faas⁶, Emmanuela Gabara^{2,7}, Atif Rana^{2,7}, Mubarak Mahmood⁸, Marlene Schmidt^{2,7}, Claudia Lang^{2,7}, Raul Rivera-Chacon^{2,7}, Ratchaneewan Khiaosa-Ard⁷, Barbara Metzler-Zebeli^{1,2}, Shreenath Prasad⁶, Qendrim Zebeli^{2,7}

¹ Unit Nutritional Physiology, Institute of Physiology, Pathophysiology and Biophysics, Department of Biomedical Sciences, University of Veterinary Medicine Vienna, Veterinärplatz 1, 1210 Vienna, Austria

² Christian-Doppler-Laboratory for Innovative Gut Health Concepts in Livestock (CDL-LiveGUT), Department for Farm Animals and Veterinary Public Health, University of Veterinary Medicine, Veterinärplatz 1, Vienna, 1210, Austria

³ FFoQSI GmbH – Austrian Competence Centre for Feed and Food Quality, Safety and Innovation, Technopark 1C 3430 Tulln, Austria

⁴ Faculty of Veterinary Medicine, Brawijaya University, Puncak Dieng Eksklusif, Kalisongo, Kec. Dau, Kab. Malang 65151, Indonesia

⁵ Research Group of Feed and Food Safety, Research Center for Food Technology Processing, The National Agency for Research and Innovation of The Republic of Indonesia, Jl. Jogja-Wonosari, Yogyakarta, Indonesia

⁶ DSM-BIOMIN Research Center, Technopark 1, Tulln a.d. Donau, 3430, Austria

⁷ Institute of Animal Nutrition and Functional Plant Compounds, Department for Farm Animals and Veterinary Public Health, University of Veterinary Medicine Vienna, Veterinärplatz 1, Vienna 1210, Austria

⁸ Department of Animal Sciences, University of Veterinary and Animal Sciences, Lahore, Subcampus Jhang, 12 km Chiniot Road, Jhang 35200, Pakistan

*Corresponding author: Felipe Penagos-Tabares (Felipe.penagostabares@vetmeduni.ac.at)

Ochratoxin (OT) A is a toxin produced by several species of fungi, including *Aspergillus* and *Penicillium*, and can contaminate various food and feedstuffs. Its hepatotoxic, nephrotoxic, and teratogenic effects in animals are well documented. Ruminants possess physiological (i.e., microbial) systems for detoxifying mycotoxins. This experiment investigated the transmission of OTA and its main metabolite OT α into plasma, serum, milk, urine and faeces in lactating Simmental cows. The animals were fed with OTA-containing concentrate-rich diets composed of grass silage, corn silage and concentrate at 37.1%, 12.5% and 50.4% on dry matter basis, respectively. Twelve cows were randomly assigned to two equal groups (OTA-Low/OTA-High), which received 250 and 2500 $\mu\text{g}/\text{kg}$ DM diet for seven days, respectively. The concentrations of OTA and OT α in the mentioned biological matrices were measured via high-performance liquid chromatography coupled to mass spectrometry (HPLC-MS/MS). In addition, daily feed intake, chewing behaviour, milk production and clinical parameters were evaluated daily. Milk composition, haematological parameters and hepatic enzymes were evaluated on days 0 and 7 of the experiment. Using three cows per group, the analytical method was validated by determining the following limit of quantification (LOQs) for OTA and OT α : In plasma, serum, and milk 0.5 ng/mL, urine diluted to 10 mM creatinine 5 ppb and in dried faeces 50 ng/g. All stated LOQs are applicable for both analytes. On day 7, the average (\pm SD) concentrations of OTA in plasma, serum, milk (ng/mL), urine (ppb diluted to 10 mM creatinine) and faeces (ng/g DM) in the group OTA-High were 8.1(\pm 0.9), 7.0(\pm 1.1), 0.0(\pm 0.0), 9.9(\pm 3.2), 222(\pm 94.3), respectively, and for OT α , 18.3(\pm 1.5), 24.8(\pm 5.0), 4.8(\pm 1.4), 1271(\pm 609), 1523(\pm 314), respectively. Taken together, ingesting concentrate-rich diets containing up to 2500 μg OTA/kg DM diet for seven days did not affect feed intake, milk production and composition, chewing behaviour, clinical and haematological parameters, or hepatic function of cows. Because most OTA was microbially metabolized, low concentrations were detected in plasma/serum, and carry-over into milk was not detected. The excretion was mainly as OT α in urine and faeces.