P31 - Adsorbing agents: can we select them to detoxify more than mycotoxins?

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Adsorbing agents, such as aluminosilicates, are currently considered among the most cost-effective strategies to counteract the effects of mycotoxins in the livestock industry. These products are added in the feed and reduce animal exposure to mycotoxins by decreasing their bioavailability and their absorption in the systemic circulation of the animals. Over the last years, there has been an increasing knowledge on mycotoxins importance (co-contamination, impact on animal health and productivity, interaction in gut). In the meantime, a multitude of products have entered the market. Therefore, it appears essential when developing or selecting a new product to have a global approach and consider multiple aspects of the intestinal environment. More recently, concern has arisen over animal exposure to other biotoxins such as bacterial toxins, which can be involved in various disease, such as colibacilosis, necrotic enteritis in poultry, neonatal porcine diarrhoea in porcine, etc. It is known that the efficacy of binding agents (i) is sometimes limited to a few mycotoxins (aflatoxins) and (ii) vary greatly according to the type of compounds, due to the wide structure and function diversity from one source to another. However, few data are available on the bacterial toxin properties of these binding agents. This study aims to compare the adsorption capacity of the main clays used in animal feed, as well as some products of the market, toward biotoxins from moulds and bacteria. Eleven binding agents, including different types of bentonite (tri and di-octahedral smectites), sepiolite, zeolite and yeast-cell wall have been investigated *in vitro* for their binding properties towards different biotoxins using single concentration methodologies. Adsorption properties of the binding agents were evaluated toward mycotoxins (zearalenone, aflatoxin B1, ochratoxin, fumonisin B1, T2-toxins and deoxynivalenol), endotoxins (lipopolysaccharides) and exotoxins (toxins from *Clostridium perfringens*, Labile toxins and Shiga-like toxins from *E. coli* and staphylococcal enterotoxins). Results demonstrated than biotoxins adsorption rate vary greatly according to the category of binding agents, even in the same category of compounds. This difference has been linked to their structural configuration. The most efficient compounds for biotoxins detoxification were trioctahedral bentonites, which showed the highest adsorption rate and the largest spectra of adsorption. These compounds have shown more than 90% of adsorption toward bacterial toxins for most of the toxins tested. This study highlighted interesting functionalities of some specific binding agents, which may contribute to help animals to counteract negative impact of bacterial toxins on animal health, in addition to their mycotoxins detoxification potential.

P32 - Multifunctional poly(ethylene-co-vinyl alcohol)-based membranes for selective patulin removal

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Many food commodities are prone to fungal infection and to mycotoxin contamination. Fungi can infect crops in the field and maintain their activity during storage. Some of these fungi produce mycotoxins, that may resist food processing and persist in food products. Existing decontamination strategies are still very inefficient, and that is why research in this area is continuously evolving. Recent advances in the study and use of nanoscale materials allow the development of novel electrospun nanofibrous affinity membranes with tailored and stable selectivities, combining high separation performance and capacity to remove selected food contaminants from fluid food commodities, involving simple filtration steps and avoiding loss of nutritive and/or organoleptic attributes. As proof of concept, novel membranes were evaluated for the selective removal of patulin from juices. Patulin is a mycotoxin produced by several fungi, being *Penicillium expansum* one of the most common causes of patulin contamination in apples, cherries, pears and other fruits. Besides some acute symptoms caused in humans such as gastritis and nausea, patulin also has diverse toxic effects, including neurotoxicity, immunosuppression and genotoxicity. Major issues for food safety are related to the occurrence of patulin in unfermented apple juice and apple-derived baby foods. Many countries, including the European Union, have established maximum tolerable levels of patulin contamination for fruit-derived products. Novel nano-/microfibrous membranes with a poly(ethylene-co-vinyl alcohol) backbone as a support to other bioactive polymers, cell components or whole cells were prepared. These membranes were tested for their mechanical and physical properties, and for

their behaviour regarding patulin adsorption. The most common adsorption models were adjusted to the experimental data for the chemical characterisation of membranes behaviour. The future application of these membranes for the selective removal of patulin from juices is discussed.

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P33 - *In vitro* lipo-oligosaccharide adsorption by bentonite at different biological pH levels

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Lipo-oligosaccharides (LPS), also known as endotoxins, are key component of outer membrane of gram-negative bacteria such as *Escherichia coli* (*E. coli*). Symptoms associated with the LPS presence in animal production include reduced feed intake, increased intestinal permeability, hepatic necrosis and increased morbidity. Animals with endotoxemia may reduce the rate of mycotoxin elimination and therefore lengthen the exposure to mycotoxins. In the present study, the adsorption efficacy of smectite-based bentonite was measured *in vitro* using lyophilised amoebocyte lysate (LAL) assay. 50 ng/mL *E. coli* LPS with four different bentonite concentrations (0.05, 0.1, 0.2 and 0.4%; w/v) were performed at two pH levels (3.0 and 7.0; pH 3.0 to simulate stomach where main digestion occurs, while pH 7.0 to simulate small intestine where main absorption occurs) in three replicates per group. The unbound LPS were measured and expressed as a percentage relative to the negative control (without bentonite). At pH 3.0, the unbound LPS were 58.5, 28.2, 14.0 and 9.2%, respectively, where results (14.0 and 9.2%) of 0.2% (w/v) and 0.4% (w/v) bentonite groups were significantly lower ($P<0.05$) than others. At pH 7.0, the unbound LPS were 8.6, 21.7, 28.5 and 19.6%, respectively, where results of all groups were not significantly different. Moreover, results (28.2 vs. 21.7%, 14.0 vs. 28.5%, 9.2 vs. 19.6%) of 0.1, 0.2 and 0.4% bentonite groups were not significantly different between two pH levels, indicating that the bound LPS at low pH (3.0) is not expected to desorb at high pH (7.0). In conclusion, smectite-based bentonite showed promising results in the adsorption efficacy on 50 ng/ml *E. coli* LPS at pH 3.0 and 7.0. Further studies should be conducted to confirm the *in vivo* implications of the described results.

P34 - Characterisation of *Aspergillus flavus* for biocontrol of aflatoxins in cotton in Pakistan

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Cottonseed cake is the major protein source in dairy rations in Pakistan. The oilseed cake is commonly contaminated with aflatoxin producing *Aspergillus flavus* and has been linked with high aflatoxin residues in milk of the animals consuming it. The present study was carried out to characterise *A. flavus* from cotton fields and to isolate atoxigenic strains for their potential use as biocontrol agents on cotton. Forty-five samples of cottonseed were collected from farms and ginners located in three cotton zones (Multan, Rahimyar Khan, and Nawabshah) of the country. The samples were inoculated on a clean-up agar for initial screening and isolation of *A. flavus*. The 212 isolates thus obtained were examined morphologically and subjected to qualitative aspergillic acid and quantitative aflatoxin production tests. Around 98% of the isolates were found to be of *Aspergillus* spp. based on morphological characteristics, while 97% were positive for aspergillic acid production. To further confirm these results,

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