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(University of Sydney)**

and

**THE WORLD'S POULTRY SCIENCE ASSOCIATION
(Australian Branch)**

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EFFECT OF SELECTED YEAST FRACTION ON THE GROWTH OF *CLOSTRIDIUM PERFRINGENS*: QUANTITATIVE DETERMINATION OF GROWTH INHIBITION AND ADSORPTION CAPACITY

E. SANTOVITO¹, D. GRECO¹, V. MARQUIS², R. RASPOET², V. D'ASCANIO¹ and G. AVANTAGGIATO¹

Yeast cell wall (YCW) fractions have proven effective in reducing the incidence of necrotic enteritis induced by *Clostridium perfringens*. Dietary supplementation with YCWs stimulates the systemic innate immune responses of broiler chickens, suggesting the role of these products in regulating immune homeostasis (Alizadeh et al., 2016). In a proposed mode of action of YCW on bacteria, the branched lateral chains of the mannan-oligosaccharides (MOS) in the YCW structure bind the bacteria and provide alternative sites for the adhesion of pathogens. The ingestion of YCW products might supply competitive attachment sites for the host receptors, thus reducing the risk of pathogenic bacteria colonising the intestinal tract. Bacteria bound to MOS in the intestinal tract can pass through the gut, instead of attaching to host epithelial cells (Caipang and Lazado, 2015). This inhibition mechanism seems to be limited to some specific Gram-negative enteropathogens (*Salmonella* and *E. coli*), although several *in vivo* studies report their effect also on Gram positive pathogens like clostridia (Santovito et al., 2018).

To provide *in vitro* evidence on the antimicrobial effect of YCW on *C. perfringens*, the effectiveness of YCW fractions in inhibiting the growth of several *C. perfringens* strains was quantitatively determined. The bacterium was grown in the presence of different YCW fractions at different concentration levels. The effect of YCW fractions on growth parameters was analysed. One product out of four materials was selected as the best candidate for *C. perfringens* inhibition. The selected product, at an optimal dosage of 1.25 mg/mL, increased the lag phase duration, and reduced the maximum growth rate and the final cell count in a significant manner with respect to the control. The adsorption of the pathogen to YCW was studied using the isotherm adsorption approach. The effect of YCW dosage, incubation time, and bacterial concentration on the adsorption was evaluated. The study proved that the product adsorbed *C. perfringens* cells in a dose and time dependent manner. Equilibrium isotherms showed that the cell adsorption onto the product was fast, stable over the time, and occurred with high affinity and capacity. The selected product sequestered up to ca. 10⁴ cells of *C. perfringens* per mg. To the best of our knowledge, this is the first report showing the *in vitro* efficacy of yeast fraction products in inhibiting the growth of *C. perfringens* and reducing the culturable cells by an adsorption process. The *in vitro* approach proposed herein is a powerful tool for studying the adsorption of aerobic or anaerobic pathogens by eubiotics.

Alizadeh M, Rodriguez-Lecompte JC, Yitbarek A, Sharif S, Crow G & Slominski BA (2016) *Poult. Sci.* **95**: 2266-2273.

Caipang CMA & Lazado CC (2015) *Mucosal Health Aquacult.* 211-272.

Santovito E, Greco D, Logrieco AF & Avantaggiato G (2018) *Foodborne Path. Dis.* **15**: 531-537.

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