Bioactive Properties of Mushroom *Coriolus versicolor*

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The growing consumer concern for health issues has led to an increased interest in functional foods. Besides the nutritional properties, mushrooms have attracted market attention because they are a potential source of bioactive compounds able to perform several positive functions on the health of the consumer. *Coriolus versicolor (CV)*, also known in the literature by *Tramates versicolor* or *Polyporus versicolor,* belongs to the genus *Coriolus,* family *Polyporaceae*, order *Polyporales* and division *Basidiomycotina* (Chen, J., Jin, X., Zhang, L. & Yang, L.).

This mushroom rises up from lignocellulosic wastes and has a fan-shaped wavy margin and may exist in nature in several different colours. Polysaccharides of *C. versicolor* are physiologically active: polysaccharopeptide (PSP) and polysaccharopeptide Krestin (PSK) were isolated and used during the last years as a supplement to support cancer treatments due to its immunostimulatory properties (Sakamoto et al., 2006; Jiménez-Medina et al., 2008).

Furthermore, it seems that these polysaccharides may also act as prebiotics by stimulating the growth and/or activity of probiotic bacteria in the colon (Yu, Liu, Muckherjee & Newburg, 2013). Since most studies have focused on the PSP and the PSK from *C. versicolor* the objective of the present work was to evaluate bioactive properties of mushroom biomass, namely the prebiotic activity.

To evaluate this activity, a sample of MRL-CV (a nutrient adjuvant which contains biomass of the fungus *C. versicolor*) was submitted to the conditions of the gastrointestinal tract (GIT) from the mouth to the intestine.

Species	Growth with 1 % of sample*	Growth with 1 % of sample after GI tract*	Growth with 1% of FOS*
Lactobacillus acidophilus L10	-	-	-
Lactobacillus casei L26	++	+	+
Bifidobacterium longum BG6	_____	+	-
Bifidobacterium animalis B0	++	++	_____

*Bacterial growth after the 48th hour of incubation at 37°C. Growth was measured by enumeration of viable microorganisms (CFUmL). ++, same level of growth compared to glucose; +, weaker growth compared to glucose; - no growth.

Table 1. Summary of the bacterial growth of the species tested

The experimental data showed a potential strain-dependent prebiotic effect with higher activity on the *B. animalis Bo*. Fermentation of *C. versicolor* biomass by *L. paracasei* L26 increased the concentrations of organic acids particularly acetic acid.

Prebiotic agents can have an indirect inhibitory effect on pathogenic bacteria through its selective fermentation by the probiotic bacteria in the colon. However antiadhesive components are another potential strategy to inhibit undesirable bacteria (Rhoades, Gibson, Formentin, Beer, & Rastall, 2006). The adhesion of pathogens can be inhibited through two processes: receptor analogs, which are usually carbohydrates that can mimic the epithelial receptor sites and bind to the bacterial adhesin receptors preventing the bacteria from adhering to the host cells, and adhesin analogs that bind to the host cells surface receptors blocking the pathogens (Gibson & Roberfroid, 2008). Mushrooms may constitute a new source of bioactive molecules with the ability inhibit pathogen infection.

The adhesion of undesirable bacteria to host tissue is the first step in pathogenesis. The effect of the *C. versicolor* biomass upon *Salmonella enterica* (ATCC 13076), *Staphylococcus aureus* (ATCC 6538) and *Escherichia coli* (ATCC CRM 8739) adhesion to mucin was evaluated *in vitro* using mucin (Type II Sigma-Aldrich) as a model of the intestinal mucus. The results showed a potential inhibitory effect of the substrate, especially in the case of *Salmonella enterica*. However, additional studies are needed in mixed cultures and faecal samples in order to assess the bioactivity in an environment involving complex intestinal microbiota.

References

[1] Sakamoto, J., Morita, S., Oba, K. et al. 2006. Cancer Immunology, Immunotherapy 55(4): 404-411.

[2] Jiménez-Medina, E., Berruguilla, E., Romero, I. et al. 2008. BMC Cancer 8 (m1): 78.

[3] Yu, Z. T., Liu, B., Mukherjee, P., Newburg, D. S. 2013. Plant Foods for Human Nutrition 68 (2): 107-112.

[4] Rhoades, J., Gibson, G., Formentin, K., Beer, M. and Rastall, R. 2006. Carbohydrate Polymers 64: 57-59;

[5] Gibson, G. R., & Roberfroid, M. B. 2008. Handbook of Prebiotics. CRC Press Taylor & Francis Group, USA, pp. 1-92.

[6] Chen, J., Jin, X., Zhang, L. and Yang, L. 2013. African Journal of Traditional, Complementary, and Alternative Medicines: AJTCAM/African Networks on Ethnomedicines 10 (6): 481–484.

Note: The *Coriolus versicolor* was supplied by Mycology Research Laboratories Ltd.-United Kingdom. (www.mycologyresearch.com)

Editors Note:

Prebiotics are substances that induce the growth or activity of microorganisms (e.g., bacteria and fungi) that contribute to the well-being of their host. In diet, **prebiotics** are typically non-digestible fibre and mineral compounds that pass undigested through the upper part of the gastrointestinal tract and stimulate the growth or activity of advantageous bacteria that colonize the large bowel by acting as substrate for them.

Probiotics are preparations of or a product containing viable mono- or mixed microbial culture in sufficient numbers, which applied to animal or man, beneficially affects a compartment of the host nutrition and health by improving the properties of the indigenous microflora. The term **Synbiotic** is used when a product contains both probiotics and prebiotics. This term should be reserved for products in which the prebiotic compound selectively favours the probiotic compound.

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