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Abstract

Colonic Fermentation of Coffee Melanoidins and Resulting Cardioprotective Metabolites †

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Abstract: Worldwide, noncommunicable diseases accounted for 7 out of 10 deaths in 2019 (WHO), being ischemic heart disease one of the major contributors. Coffee has been implicated with several health benefits, namely the hypocholesterolemic potential, attributed to its high molecular weight compounds (e.g., polysaccharides and melanoidins) ability to affect cholesterol bioaccessibility. However, the pathways through which the nitrogen-containing brown-colored melanoidins (prevalent in many thermally processed foods) can affect cholesterol metabolism are partially unknown. In order to access coffee melanoidin's cardioprotective potential, its colonic fermentability was simulated in vitro using human feces, employing simgi®(Dynamic Gastrointestinal Simulator). The fermentation degree was evaluated by the analysis of total carbohydrates and ammonium. The cardioprotective effect of the ferments was estimated by measuring short-chain fatty acids (SCFA) and primary and secondary bile salts (BS) after 48h of fermentation. Melanoidin total sugar content decreased due to polysaccharides fermentation, used as the primary source of energy, while ammonium production increased, owing to the degradation of the melanoidin's proteins. SCFA production increased, as well as secondary BS, due to the microbiota activity. The conversion of primary to secondary BS (more hydrophobic) was significantly lower in the presence of melanoidins than in its absence (control). This decrease promoted by melanoidins may lower BS enterohepatic circulation, which in turn can lower cholesterol bioaccessibility and bioavailability, configuring a hypocholesterolemic effect. The in vitro colonic fermentation of coffee melanoidins, using human microbiota, yielded cardioprotective metabolites (SCFA) and decreased secondary BS, suggesting that they may regulate cholesterol homeostasis.

Keywords: coffee; melanoidins; fermentation; bile salt; cholesterol; microbiota; short-chain fatty acids; cardioprotective

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Data Availability Statement: The data presented in this study are available on request from the corresponding author.

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