Oxysterols and TLR-mediated intestinal inflammation: protective effect of cocoa bean shells. a smart way for waste valorisation

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Dietary oxysterols' ability to induce intestinal inflammation is widely known. Considering the important role of Toll-like receptors (TLRs) in mediating immune and inflammatory responses, we verified if a mixture of oxysterols widely present in cholesterol-rich foods could require TLR2 and TLR4 activation to promote intestinal inflammation. Furthermore, the protective effects of cocoa bean shell (CBS) extracts with high polyphenolic content were also investigated. Differentiated CaCo-2 enterocyte-like cells were treated with a dietary oxysterol mixture and TLR2/4 gene expression and activation were analyzed. Inflammation was evaluated by quantifying IL-8, IFNβ and TNFα cell release. Honduras CBS polyphenolic fractions (HFs) were characterized by HPLC-DAD-MS/MS. The HF anti-inflammatory effects were evaluated in cells under oxysterol mixture treatment. We observed that TLR2 and TLR4 activation is required to mediate oxysterol pro-inflammatory effects. HF pre-treatments fully prevented the oxysterol-dependent cytokine induction, as well as TLR2/4 over-expression. These effects may be due to the high (-)-epicatechin and tannin quantities present in specific HFs. In conclusion, TLR2 and TLR4 can definitely contribute to mediate oxysterol pro-inflammatory action on intestinal cells. CBS fractions could be employed as anti-inflammatory food supplements, thus representing an important industrial design for recycling.