Short fractions of β -1,3 glucans act as a shield for pathogenic yeasts and modulate the activation of platelets

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Abstract

The yeast *Candida albicans* is a pathobiont causing life threatening invasive infections. Its cell wall contains β -1,3 glucans that are known to trigger a wide range of host cell activities and to circulate during infection. We studied the effect of β -1,3 glucan fractions (BGFs) consisting of diglucosides (Glc2), tetraglucosides (Glc4), and pentaglucosides (Glc5) on human platelets, their action mechanisms and their possible impact on host defenses. The effect of BGFs on the coagulation process was determined by measuring thrombin generation. Platelets pretreated with BGFs were analyzed in terms of activation, receptor expression, aggregation and adhesion to neutrophils and to *C. albicans*. The results show that BGFs affected the endogenous thrombin potential in a concentration dependent manner. For the platelet activation, BGFs at a low concentration (2 μ mol/L) reduced ATP release and prevented the phosphorylation of protein kinase C. BGFs diminished the expression of P-selectin and the activation of α IIb β 3. BGFs decreased platelet aggregation and the interaction between thrombin-stimulated platelets and neutrophils, fibrinogen, and *C. albicans*. Glc5 decreased ATP release and TGF- β 1 production in response to TLR4 upregulation in thrombin-stimulated platelets, but TLR4 blockage abolished BGFs effects on platelets. This study provides evidence that the fungal pentaglucosides modulate platelet activity mediated via TLR4 stimulation and reduce platelet-neutrophil interaction.

Background

Platelets are capable of binding, aggregating, and internalizing microorganisms, enhancing the clearance of pathogens from the blood. Platelets interact with the yeast form and hyphae of the opportunistic pathogen *Candida albicans*. Clinical and experimental studies have shown that *C. albicans* infection decreases the number of platelets in the blood. Recently, we demonstrated that oral administration of soluble β -1,3 glucans from *C. albicans* reduced leukocyte infiltration into the gut mucosa and enhanced mouse survival in a chemically-induced colitis model.

Objective

The aim of the study was to assess the effect of β -glucan fractions (BGFs) derived from *C. albicans* on the coagulation process and platelet activation.