C-phycocyanin, a very potent and novel platelet aggregation inhibitor from Spirulina platensis

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摘要

Abstract

The aim of this study was to systematically examine the inhibitory mechanisms of C-phycocyanin (C-PC), one of the major phycobiliproteins of Spirulina platensis (a blue-green alga), in platelet activation. In this study, C-PC concentration-dependently (0.5−10 nM) inhibited platelet aggregation stimulated by agonists. C-PC (4 and 8 nM) inhibited intracellular Ca2+ mobilization and thromboxane A2 formation but not phosphoinositide breakdown stimulated by collagen (1 μg/mL) in human platelets. In addition, C-PC (4 and 8 nM) markedly increased levels of cyclic GMP and cyclic GMP-induced vasodilator-stimulated phosphoprotein (VASP) Ser157 phosphorylation. Rapid phosphorylation of a platelet protein of Mw 47 000 (P47), a marker of protein kinase C activation, was triggered by phorbol-12,13-dibutyrate (150 nM). This phosphorylation was markedly inhibited by C-PC (4 and 8 nM). In addition, C-PC (4 and 8 nM) markedly reduced the electron spin resonance (ESR) signal intensity of hydroxyl radicals in collagen (1 μg/mL)-activated platelets. The present study reports on a novel and very potent (in nanomolar concentrations) antiplatelet agent, C-PC, which is involved in the following inhibitory pathways: (1) C-phycocyanin increases cyclic GMP/VASP Ser157 phosphorylation and subsequently inhibits protein kinase C activity, resulting in inhibition of both P47 phosphorylation and intracellular Ca2+ mobilization, and (2) C-PC may inhibit free radicals (such as hydroxyl radicals) released from activated platelets, which ultimately inhibits platelet aggregation. These results strongly indicate that C-PC appears to represent a novel and potential antiplatelet agent for treatment of arterial thromboembolism.