



Original contribution

Blood glutathione redox status in gestational hypertension

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Abstract

Gestational hypertension during the third trimester reflects an exaggerated maternal inflammatory response to pregnancy. We hypothesized that oxidative stress present even in normal pregnancy becomes uncompensated in hypertensive patients. A glucose-6-phosphate dehydrogenase (G6PD) activity sufficient to meet the increased reductive equivalent need of the cells is indispensable for defense against oxidative stress. The erythrocyte glutathione redox system was studied, where G6PD is the only NADPH source. The glutathione (GSH) redox status was measured both in vivo and after an in vitro oxidative challenge in pregnant women with gestational hypertension ($n = 19$) vs. normotensive pregnant subjects ($n = 18$) and controls ($n = 20$). An erythrocyte GSH depletion with an increase in the oxidized form (GSSG) resulted in an elevated ratio GSSG/GSH (0.305 ± 0.057 ; mean \pm SD) in hypertensive pregnant women vs. normotensive pregnant or control subjects (0.154 ± 0.025 ; 0.168 ± 0.073 ; $p < .001$). In hypertensive pregnant patients, a “GSH stability” decrease after an in vitro oxidative challenge suggested a reduced GSH recycling capacity resulting from an insufficient NADPH supply. The erythrocyte GSSG/GSH ratio may serve as an early and sensitive parameter of the oxidative imbalance and a relevant target for future clinical trials to control the effects of antioxidant treatment in women at increased risk of the pre-eclampsia syndrome.



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Keywords

Oxidized/reduced glutathione; Hemoglobin; Glutathione recycling; Glucose-6-phosphate dehydrogenase; Free radicals

Abbreviations

APH, acetylphenylhydrazine; CO, carbon monoxide; G6PD, glucose-6-phosphate dehydrogenase; GSH, reduced glutathione; GSSG, oxidized glutathione; GSSG/GSH, glutathione redox ratio; Hb, hemoglobin; HMP, hexose-monophosphate shunt; NO, nitric oxide; RBCs, red blood cells

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...This ratio was shown to significantly decrease in RBCs of patients affected by end stage renal disease undergoing to haemodialysis. These values are in agreement with the levels measured by some other research groups using NEM to protect GSH from oxidation [46,64,75,76], whereas other research groups measured even higher GSH/GSSG values [45,63]. In some cases, a significant alteration of the GSH/GSSG ratio between controls and diseased people was observed....

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GSH feedback inhibition (Németh et al., 2001). Animal and human studies demonstrate that adequate protein nutrition is crucial for the maintenance of GSH homeostasis (Rizvi and Maurya, 2008; Kumar and Maurya, 2013)....

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...In our study, GR activity is significantly increased in D subgroup in comparison with normotensive pregnant women, as well as compared to C subgroup. This increased activity of the enzyme known to have an important role in peroxide removal may be an indicator of increased oxidized form of glutathione GSSG generated during lipid peroxidation of placental tissue cells (Nemeth et al., 2001). In the D subgroup we have obtained a correlation between blood Cd concentrations and GR activity....

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