 ROLE OF OXIDATIVE STRESS AND ANTIOXIDANT SYSTEMS IN PREECLAMPSIA

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INTRODUCTION

Oxidative stress (OS), defined as an imbalance between prooxidants (mainly reactive oxygen species) and antioxidants (1). A specific and common form of OS, uncontrolled lipid peroxidation (LPX) is considered to play an important role in pathogenesis of various complications during pathological pregnancy or perinatal period (2). One of them is preeclampsia (PE) which is a major cause of maternal and fetal mortality and morbidity (3). PE is defined by hypertension and proteinuria but these are only the key and most common symptoms of the condition among many others (4). Although the pathogenesis of PE is not clear, this pathological process starts with abnormal placentation in the first trimester of pregnancy and could result in various maternal diseases with varying degrees of fetal disease usually marked by intrauterine growth restriction (5). Activation of LPX by OS in the placenta, endothelial cells of the umbilical, maternal and fetal vessels, leads to damage of these tissues with releasing of LPX products in maternal and fetal circulation (6). Moreover, it has been found that antioxidant capacity is also decreased in preeclampsia (2) (Figure 1).

Figure 1 Relationship between oxidative stress and expected pathogenesis of preeclampsia
MATERIAL AND METHODS

Aims of the study were to

- determine of LPX products in umbilical cord plasma and maternal plasma (0-A),
- investigate of LPX products formation in vitro in both plasma during 3 experimental situations: 1) in plasma with added LPX activator (L-ascorbic acid and Fe$^{2+}$) (0+A), 2) in incubated plasma (30 min, 37 °C) without added LPX activator (30-A), 3) in incubated plasma with added LPX activator (30+A),
- determine activities of antioxidant enzymes glutathione peroxidase (GPx) and superoxide dismutase (SOD) in blood of pregnant women,
- assessing the relationship among of the enzyme activities and values of selected risk factors for PE (age, gestational age, body mass index, blood pressure) and levels of biochemical parameters suggesting to pathology in pregnancy (glucose, hemoglobin, platelets).

The LPX products were determined as thiobarbituric acid reacting substances (TBARS) (7) in plasma from venous pre-delivery and post-delivery blood of healthy mothers giving birth with no complications and in plasma from mixed umbilical cord blood of term well-adapted newborns. The activities of GPx, SOD and biochemical parameters were determined in blood of healthy pregnant women and women with preeclampsia (PE), gestational diabetes mellitus (GDM) and anemia.

RESULTS

No differences were observed in TBARS levels determined in cord plasma and maternal pre-delivery and post-delivery plasma. TBARS formation in umbilical cord plasma was higher in all experimental situations in comparison with both maternal plasma (Table 1).

Activities of antioxidant enzymes SOD and GPx in blood of examined women were in normal range and we did not find any differences in the enzyme activities between healthy pregnant women and women with pathological course of pregnancy (PE, GDM and anemia).

<table>
<thead>
<tr>
<th>Experimental situation</th>
<th>Umbilical cord plasma</th>
<th>Maternal plasma</th>
<th>Pre-delivery</th>
<th>Post-delivery</th>
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<tr>
<td></td>
<td></td>
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<td>(nmol TBARS/ml of plasma)</td>
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<tr>
<td>0-A</td>
<td>3,51 ± 0,493♠</td>
<td>3,45 ± 0,530</td>
<td>2,71 ± 0,602♣</td>
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<tr>
<td>30–A</td>
<td>7,29 ± 2,170</td>
<td>4,07 ± 1,090</td>
<td>5,44 ± 1,350♣</td>
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</tr>
<tr>
<td>0+A</td>
<td>7,38 ± 1,980♣</td>
<td>2,70 ± 1,240</td>
<td>2,69 ± 1,890</td>
<td></td>
</tr>
<tr>
<td>30+A</td>
<td>8,57 ± 2,200♣</td>
<td>3,14 ± 1,190♣</td>
<td>4,67 ± 1,260</td>
<td></td>
</tr>
</tbody>
</table>

Values are given as means ± SEM, (♠,♣,♣) denote significant differences (p = 0.05)
CONCLUSION

Our results suggest that intensity of lipid peroxidation in plasma of newborns might be activated on contrary to maternal plasma. TBARS could be suitable parameters for evaluation of extent of lipid peroxidation in plasma. In future, it is necessary to pay attention to the determination of antioxidant enzymes activities during physiological and pathological pregnancy, but the measurement should be realized only by validated accurate and reliable methods.

REFERENCES


