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OXIDOREDUCTASE IN RATS INTOXICATED WITH CADMIUM

ABSTRACT: There are a lot of literature data concerning the toxicity of cadmium on liver and kidney. The present work is concerning with the investigation of the effect of two plant extracts: Alloe and Allium sativum and an alcoholic Propolis extract on the behavior of the antioxidant systems. There were studied especially the activity of three enzymes: catalase, methaemoglobin reductase and superoxid dismutase consecutive an installed oxidative stress after cadmium administration in single doze.

The changes which appear in the protection enzyme’s activity are different in the red blood cells and in liver. The natural extracts had a different influence on the enzymes activity. The alcoholic propolis extract was more efficient on catalase and superoxid dismutase activities in comparison with the Allium sativum extract. The last one had an important role in the activity of superoxid dismutase.

KEY WORDS: rat, oxidative stress, catalase, superoxid dismutase, methaemoglobin reductase

INTRODUCTION

It is well known the toxicity of cadmium on kidney and liver (Cenușe et al., 1998). By the inhibition of the glutathion peroxidase activity, the lipid peroxidation was induced by the toxicity of cadmium (Chow, 1979; Cenușe et al., 1998).

The antioxidant systems formed by glutathione peroxidase, glutathione reductase, catalase, glucose 6 phosphat dehydrogenase had a major role in removing the lipid peroxides formed under cadmium influence (Cenușe et al., 1998).

The present work is concerning with the investigation of the effect of some plant extracts on the behavior of the antioxidant systems consecutive an installed oxidative stress after cadmium treatment in single dose.
MATERIALS AND METHODS

The experiment was carried on 30 Wistar, one year old male rats having a body weight of 280—300 g divided in 5 batches. The first batch (L1) was the control and was daily administrated with 0.5 ml of physiologic serum per os. A single dose of 20 mg of cadmium was administered to the second batch (L2) and from the second day only physiologic serum. The third batch (L3) was administered with 20 mg of cadmium in single dose and from the second day of the experiment was treated daily with 0.5 ml of an *Alloe* aqueous extract for three weeks. The fourth batch (L4) was administered with 20 mg cadmium in single dose and from the second day of the experiment was treated daily with 0.5 ml of a Propolis alcoholic extract till the end of the experiment. The fifth batch (L5) was administered with 20 mg cadmium in single dose and from the second day till the end of the experiment was treated with an aqueous extract of *Allium sativum*. At the end of the experiment the rats were anesthetized with chloroform and the blood was prelevated by heart puncture. There were also prelevated liver and kidney. There were determined the blood and liver catalase activity by Sinha method (Iordachescu, 1988), methaemoglobin reductase activity (Manța et al., 1976) and the blood and liver superoxide dismutase activity by the method with Nitroblue tetrazolium (NTB) (Iordachescu, 1988) by colorimetric methods (Chișu, 2000).

Data processing was done using the multiple interval test (Duncan), and testing was done for the level of significance of \( p = 0.05 \).

RESULTS AND DISCUSSION

As a consequence of the administration of the natural extracts there were revealed important changes in the activity of the protection enzymes (Table 1, Fig. 1).

<table>
<thead>
<tr>
<th>Batch</th>
<th>Catalase blood (UI)</th>
<th>Catalase liver (UI)</th>
<th>SOD blood (UI)</th>
<th>SOD liver (UI)</th>
<th>MethHb-red % MHb</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>70.5±2.44a</td>
<td>74.6±10.2a</td>
<td>4.55±0.12a</td>
<td>5.92±0.16c</td>
<td>17.5±2.56a</td>
</tr>
<tr>
<td>L2</td>
<td>53.5±3.6d</td>
<td>54.6±9.2b</td>
<td>1.86±0.15c</td>
<td>7.42±0.48b</td>
<td>13.97±1.02ab</td>
</tr>
<tr>
<td>L3</td>
<td>59.3±1.70c</td>
<td>67.5±4.25a</td>
<td>1.76±0.11c</td>
<td>3.37±0.17e</td>
<td>14.8±3.5ab</td>
</tr>
<tr>
<td>L4</td>
<td>64.6±3.70b</td>
<td>68.0±3.4a</td>
<td>3.30±0.12b</td>
<td>5.35±0.31d</td>
<td>11.97±0.67b</td>
</tr>
<tr>
<td>L5</td>
<td>58.5±2.75c</td>
<td>43.3±10.4c</td>
<td>4.55±0.37a</td>
<td>8.82±0.49a</td>
<td>13.7±0.45ab</td>
</tr>
</tbody>
</table>

* Values with the same letter do not differ significantly at \( p = 0.05 \)

There was observed a decreasing of both the blood and the liver catalase consecutive the administration of a single dose of 20 ppm Cadmium at the second batch (intoxicated and untreated with natural extracts). The same observations were made to the batches (L3—L5) which were treated with the natural extracts.

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After the treatment of the natural extracts there was observed an increasing of the blood catalase activity at the L3, L4 and L5 batches. The same observation could be made at the L3 and L4 in relation with the liver catalase activity but not at the 5th batch (L5) treated with Allium sativum aqueous extract, where there were registered lower values of the enzyme activity. This response of the blood catalase was a consequence at the induced oxidative stress (SO), observation which was confirmed by former literature data (Ghergariu, 1997).

Between the administrated natural extracts, the most efficient one, on the blood catalase activity was the alcoholic propolis extract; the aloe and the Allium sativum extract had similar effect on the blood catalase activity.

The liver catalase had a different behavior at the treatment with different natural extracts. So, the aloe and the propolis extract have both the same effect (an increasing with 10% in comparison with the control) but at the treatment with the Allium sativum extract was registered a semnificative decreasing in both the blood and the liver catalase activity (—17% as the values registered at the control).

The superoxide dismutase activity (SOD) registered a decreasing at the treated batches in comparison with the control but were semnificative different between the treated batches. So, at the aloe treated batch (L3) the blood SOD activity registered a decreasing with 6% as the intoxicated and untreated batch (L2) but an increasing of the enzyme activity with 70—144% was registered at the propolis (L4) and Allium sativum (L5) treated batches. The liver SOD activity decreased at the aloe and propolis treated batches and increased at the Allium sativum treated one but registered similar values with the control.

As a consequence of the installation of the oxidative stress, the methae-moglobin reductase (metHb-red) activity decrease at the batches treated with...
aloe and propolis, but not at the batch treated with Allium sativum aqueous extract, where there was registered a decreasing of the methaemoglobin reductase activity.

CONCLUSION

The changes which appear in the protection enzyme’s activity are different in blood and in liver. After the oxidative stress was installed both the red blood cells enzymes and the liver enzymes registered a decreasing of their activity.

The natural extracts had a different influence on the enzymes activity. So, the alcoholic propolis extract was more efficient on the catalase and superoxid dismutase activities in comparison with the Allium sativum extract. The last one had an important role in the activity of superoxid dismutase.

REFERENCES


ОКСИДОРЕДУКТАЗА КОД ПАЦОВА ТРЕТИРАНИХ КАДМИЈУМОМ

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Резиме

Познато је да кадмијум утиче токсично на бубреге и јетру, као и да оксидоредуктазе могу утицати на токсичност кадмијума у организму. У раду су испитани ефекти неких бијених екстраката на понашање антиоксидативних система после стреса кадмијумом. Промене које су се појавиле као последица заштитне улоге ензима су различите у првеним крвним зрницима и јетри мада им је заједничко смањење инхибиторног дејства кадмијума. Природни екстракти имају различит утицај на ензимску активност. Тако је алкохолни прополис екстракт више утицао на каталазну и супероксидисмутазну активност у поређењу са екстрактом из лука — *Allium sativum*.