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THE BIOCHEMICAL MODIFICATIONS OF SOME IRON PARAMETERS IN PROPOLIS TREATED AND CADMIUM INTOXICATED RATS

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Summary

A propolis extract effect on sideremia, total iron binding capacity, haemoglobinemia, methaemoglobinemia, and methaemoglobin reductase activity was studied on Wistar male rats. The rats were pretreated with a hydroalcoholic propolis extract, intoxicated in single doze with CdCl2 (20ppm/kg b.w) and treated with the same extract 2 weeks more.

There was observed that the propolis extract protect the hemoglobin from oxidative reactions and stimulates the iron absorption and the activity of methaemoglobin reductase.

Key words: cadmium, propolis, sideremia, haemoglobinemia, total iron binding capacity, rats

Propolis is a complex mixture of substances. The composition depends on the season and location. The different propolis types have similar components such as: flavonoides, volatile oils, aromatic acids, unsaturated fatty acids, trace elements, proteins, cerides and even antibiotics (6,7,8). It is well known that flavonoides give antioxidant properties to the propolis extract. They can diminish the lipid peroxidation (9), but in the same time can accelerate the oxidative lesions of other unlipidc biomolecules by the reductive reactions of iron and copper. The obtained metallic ions can participate to the oxygen free radicals production by Haber-Weiss and Fenton reactions (2). An antioxidant in a system must not be antioxidant in all systems.

Cadmium intoxication can induce anemia, the decreasing of haemoglobinemia, sideremia, of the haematocrit, etc. (5)

In the present work we studied the effect of a propolis extract administrated to mammalian organism, related with the propolis antioxidant properties and the oxidoreductive iron reactions. Sideremia (Fe), haemoglobinemia (Hb), methaemoglobinemia (MHb), total iron binding capacity (TIBC), methaemoglobin reductase (MHbred) activities were determined in rats with oxidative stress induced by Cd intoxication, both in prevention and treatment.

Materials and methods

The experiment was carried out on 35 adult Wistar male rats, with a body weight of 220-240 g, one year old, maintained in good physiological conditions.

The experiment took place during four weeks and was carried out in two major stages. In the first stage (the preventive one), rats were divided in three groups. Each group included 15 rats and were treated after the following protocol:

L1- control, received 0.5 ml hydro alcoholic solution (the same concentration as those used for the propolis extract); L2 – received 0.5 ml hydro alcoholic propolis extract by gastric tubing; L 3- received 0.5 ml distilled water by gastric tubing.

After two weeks 20 ppm Cd / kg b.w. in single doze was administrated by gastric tubing in the rats from L2 and L3, as CdCl2. After 24 hours from the intoxication, 5 rats from each group, were sacrificed. Blood and tissue samples were collected.

In the second stage the same protocol was followed for the L1 and L3 groups and the L2 group was split in another two subgroups: L2a, which received 0.5 ml hydro alcoholic propolis extract till the end of the experiment (the treated group) and L2b which received 0.5 ml distilled water (the untreated group). After two weeks under general narcosis, blood was collected on heparin, by cardiac punction and than sacrificed and tissues were collected.

Sideremia (Fe), haemoglobinemia (Hb), methaemoglobinemia (MHb), total iron binding capacity (TIBC), methaemoglobin reductase (MHbred) activity were determined by colorimetric methods (4).

The data are presented as means ± S.D. values. TTest was used to analyze mean differences between experimental groups for each parameter separately and between groups.

Results and discussions

The results are presented in table 1 and 2 and figure 1-3.

Table 1

MDA, Hb, MHb, Fe and TIBC average values and MHbred activities in the first stage of the experiment in Cd intoxicated and propolis preventive treated rats

Group	MDA µ mol/g	Hb g %	MHb g %	MHbred %/h	Fe µg %	TIBC µg Fe%
L1	30.36 ± 1.14	8.24±0. 12	0.36 ± 0.012	14.42 ±2.04	172.14± 11.17	355.5 ± 27.14
L2	27.47 ± 0.98	8.96 ±0.11	0.64 ± 0.02	13.31 ±3.16	155.84 ± 14.37	318.46 ±19.87
L3	40.83 ± 2.32	7.03± 0.18	1.14 ±0.023	6.34 ±1.07	141.72 ±9.54	288.85 ±13.24

L1- control group, L2- propolis extract preventive administration and Cd intoxicated group, L3 - distilled water and Cd intoxicated

Table 2

MDA, Hb, MHb, Fe and TIBC average values and MHbred activities in the second stage of the experiment in Cd intoxicated and propolis preventive treated rats

Group	MDA µ mol/g	Hb g %	MHb g %	MHbred %/h	Fe µg %	TIBC µg Fe%
L1	26.06 ± 1.02	8.85± 1.07	0.31 ± 0.041	15.21 ± 1.01	211.1 ± 7.23	385.16 ± 22.16
L2a	23.14 ± 0.64	9.18 ± 1.03	0.37 ± 0.022	11.24 ± 2.14	168.0 ± 11.03	339.14 ± 20.72
L2b	27.18± 2.10	8.38 ± 0.91	0.49 ± 0.031	9.37 ± 0.95	154.23 ± 14.15	315.4 ± 31.14
L3	43.11 ± 1.25	7.38 ± 0.67	0.52 ± 0.023	8.83 ± 0.88	108.37 ± 12.39	216.92 ± 30.64

L1- control group, L2a, which received 0.5 ml hydroalcoholic propolis extract, L2b which received 0.5 ml distilled water, L3 - distilled water and Cd intoxicated

The MDA values characterized the oxidative stress installation. At L2 a 1.48 times lower value as L3, was registered. This results indicated the remarkable antioxidant properties of the propolis extract. (figure 1)

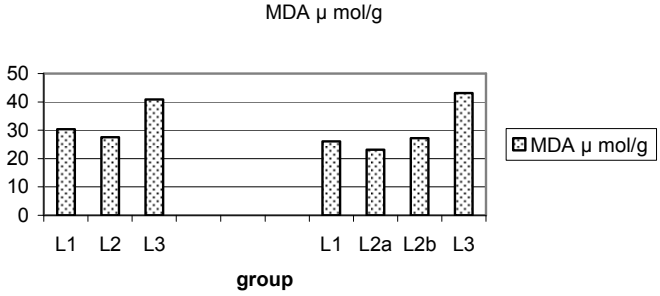

Figure 1. The MDA average values in the first and the second stage of the experiment

The Hb average values at L2 and L3 registered significant differences at the first experimental stage. The highest value was registered at the pretreated group L2 which represented an antioxidative protection of the Hb. These results were confirmed by the obtained MHb average value. A 3.64 times increasing as L1, respectively 2.27 times higher as L2 at L3 group, was registered.

The MHb red activities registered significantly decreased values at L2 and L3 groups (figure 2). The MHbred activity depends with the $NADPH+H^+$ concentration as well as with the glucose 6 phosphate dehidrogenase activity. These enzymes are very active in the glucose catabolism or in the oxidative stress when their activity are affected. An explanation of the MHbred low activity could due to an

increased substrate concentration. A similar situation was registered in CCl4 intoxication (1).

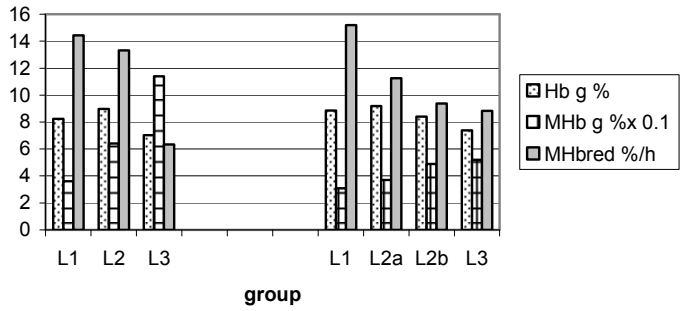

Figure 2. The Hb, MHb average values and MHb red activities values in the first and the second stage of the experiment

The sideremia average values were similar with the literature data (2,3). The sideremia registered lower values at L2 and L3 groups as the control group. (figure 3). The TIBC average values at L1 were higher as the untreated and Cd intoxicated group L2 and L3. The differences were significant.

In the second stage of the experiment the Hb and MHb average values were situated within the literature data. The propolis hydro alcoholic extract demonstrated antioxidant properties. The MHbred activities values were higher at L2a as L2b. The results were presented in figure 1 and 2.

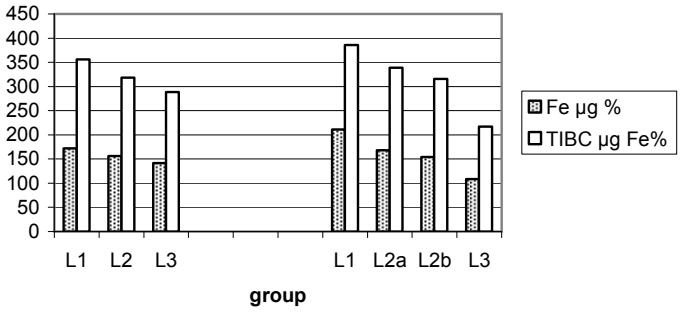

Figure 3. The Fe and TIBC average values in the first and the second stage of the experiment

The sideremia and TIBC average values were higher at L2a (treated group) as at L2b (untreated group). The differences were insignificant.

Conclusions

1. The propolis extract had an antioxidant role. It protected haemoglobin against oxidation
2. The propolis extract had a protective role in the iron absorption
3. The propolis extract was more efficient in prevention as in the treatment after Cd intoxication

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