ERYTHRON RESPONE TO PCB INTOXICACION

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Introduction

Dioxins are a class of highly toxic and broadly dispersed environmental contaminants. Dioxins include 75 dibenzodioxins, 135 dibenzofurans and 20 biphenils. According to their chemical structure polychlorinated biphenyls (PCB) belong to a class of polyhalogeneralized cyclic hydrocarbons. PCB are widely used in agriculture and family life as dielectric liquid in transformers and condensers. PCB can enter the human body through the skin and gastrointestinal tract (V.N.Maistrenko,1998).

PCB are lipophiled; they are easily absorbed in a lipid tissue and a liver. Sometimes more toxic metabolites can appear. The intensity of peroxic lipid oxydation processes is increased, antioxydant activity of blood and cells is decreased; it leads to the erythrocytes membrane destruction during affected by PCB (A.F.Kaioumova,1996). An increased erythrocytes hemolysis brings about tissue hypoxia, immunological distress, free radicals formation and peroxide lipid oxydation activation.

Methods and Materials

The aim of this investigation is to analyse of the variable character in the erythron central chain when exposed to PCB in 0,1 and 0,05 LD_{50} dose. 100 white non pedigree male rats (150-200 gr.) were at different doses of PCB. 0,1 LD_{50} dose of PCB was introduced into the stomach during 28 days (in the form of olive oil) in group 1. The group 2 of animals was also subjected to PCB by the probe during the same time and the total dose was 0,05LD_{50}. The control group consumed the equivalent ammount of olive oil. All the animals were killed on the 1-st and 28-th day of an observation. Peripheral blood findings examination was carried out by means of common methods after 24 hours of the beginning of toxicants infusing and on the 28-th day. Distribution calculacion and classification of erythroblastic islands (EI) into 5 classes was done according to Y. M. Zakharov (1990). Class 1 contains 2-8 erythroid cells in the “crown” since CFUe differentiation into proerythroblast and the subsequent devision have been performed. Class 2 - from 9 to 16 cells; class 3 – more than 16 nuclear erythroid cells. Normoblasts and reticulocytes, unable to be fissioned, are concentrated in “crown” in involution class. A class of EI reconstruction possesses a devision capable cells (pro- and basophile erytroblasts) and undividable cells. CFUe involvement estimation into the process of proerythroblasts differentiation, a chance of reinvolvement of central macrophag (CMPh) into a new walve of erythropoiesis were carried out according to Yu. M. Zakharov and L.V.Vorgova (1990).

Results and Discussion.

A statistical descrease of erythrocytes, hemoglobine and hematocrit was noted when exposed PCB. Erythrocyte ammount in group 1 was $3,76 \pm 0,19 \times 10^{12}$/l ($p < 0,001$) by the end of the first day, group 2 - $4,24 \pm 0,56 \times 10^{12}$/l ($p<0,01$), while the control parametre was $5,48 \pm 0,6 \times 10^{12}$ /l. Group hemoglobine content decreased up to $132,0 \pm 8,0$ gr/l ($p < 0,001$), group 2 – $140 \pm 8,04$ gr/l ($p < 0,001$),

while the control data was 175 ± 9,09 gr/l. Hematocrit was also under chance: it was a tendency to be decreased up to 41 % in group 1 and 45 % in group 2, while the control index was 49 % ($p < 0,01$).

Erythrocytes destruction changing values being exposed to the inserted preparations and their peripheral blood metabolits during 24 hours PCB injection can be explained by the fact, that erythrocytes are being heavily destroyed under the influence of the injected preparations and their metabolites.

According to A. Kaioumova (1996), toxicants and metabolites have both direct and inderect influence on erythrocytes membrane. Their impact concerns the erythrocyte membrane phospholipids peroxidation increasing. The fact is that the lipid oxydation products are accumulated in the body (when being intoxicated), antioxydant activity of tissue and blood decreases, erythrocyte life is decreased, and the time of their distruction increases.

On day 28 we could observe the restoration of the peripheral blood indices in both groups. Peripheral blood analysis has confirmed this fact. Erythrocytes ammount in group 1 was 6,18 ± 0,36 ´ 10^{12}/l. The second group: 5,5 ± 0,66 ´ 10^{12}/l ($p < 0,05$); hemoglobin respectively – 150 ± 12,0 gr/l and 151 ± 12,21 gr/l ($p < 0,05$).

The obtained indeces can be explained by the adaption of an erythrone to hemolytic action of PCB and their metabolites, marrow erytrocytes reproduction increase which is stable to hemolytics action. The accelerated process of erythrocytes, destruction is accompanied with their marrow reproduction disfunction when affected by PCB. This fact is confirmed by the following data: EI/femur bone absolute index is decreased; an impeded CFUe differentiation into proerythroblasts, according to the EI first class and newly reconstructed EI; impeding of the amplification wave and erythroblasts maturing in the proliferative EI classes. EI erythropoiesis impeded reconstruction was combined with marrow erythropoietinactive MF functional activity impediment: their impediment to a repeated complexity with CFUe and their lysosomalaminar complex. The above mentioned changings were evidently shown in group 1 (Table 1,2).

Ecotoxicant effect espressed in erythrocyte supression in EI possibly reflects their property to suppess intracellular interaction mechanisms. Increasing activity of proteolytic enzymes free radical oxydation and lipid peroxids damaging the formation of EI erythropoiesis in likely to be the underlying cause intracellular interaction damage in EI exposed to PCB.

References

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Table 1. Distribution of erythroblastic islands of different bone marrow maturity class (%) in different groups of rats (M±m, p)

Groups of Rats	El ×10³/ femur	Distribution of erytroblastic islands (%) EI1	EI2	EI3	EIrec	EIinv
Control	120±42.1	4±2.84	12±3.17	25±0.89	15±2.39	44±3.39
Group 1	95±16.4 p < 0,05	6.4±1.6 p < 0,05	20.4±5.8 p < 0,05	18.4±4.3 p < 0,05	24.4±1.02 p < 0,05	30.4±5.4 p < 0,05
Group 2	124±22.1 p < 0,05	0	0	50.6±5.7 p < 0,001	6.4±1.11 p < 0,01	42.6±3.11 p < 0,05

Note: p is calculated with regard to control indexes at each period of study

Table 2. Functional indexes of erythropoiesis in EI in rats in different groups (M ±m).

Index / Group of rats	Total CFU-E number involved in EI differentiotion $EI_1 + EI_2 + EI_3$ + EIinv +2EIrec × 10³/femur	CFUe involvment amound in erythroid differention $EI1_1$ + EIrec (×10³/femur)	Index of repeated EI CM in Volvment in erythropoiesis: EIrec/Eiinv
Control	138,2 ± 2,86	23,1 ± 0,86	0,36 ± 0,06
Group1	123,9 ± 2,5 p<0,05	35,6 ± 0,4 p<0,05	1,7 ± 0,05 p<0,05
Group2	131,94 ± 1,16 p<0,001	7,94 ± 1,16 p<0,001	0,18 ± 0,05 p<0,001

Note: p is calculated with regard to the control indexes at each period of study.