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Influence of cobalt chloride on mouse peripheral blood cells

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Cobalt chloride is shown to stimulate erythropoiesis. Our results show no visible changes in the erythrocyte morphology. On the other hand, granulocyte nuclear hypersegmentation in the peripheral blood smears of mice treated with low and/or high dose of cobalt chloride is observed when compared to the control samples. Thrombocyte aggregation can be also seen in the samples of cobalt chloride-treated mice.

Key words: cobalt chloride, mice, peripheral blood cells, morphological characteristics.

Introduction

Cobalt chloride ($CoCl_2$) is a water soluble compound used for treatment of anemia. Topashka-Ancheva et al. [4] determine that consuming food containing industrial dust with cobalt induces changes in hemoglobin, hematocrit, in red and white blood cells counts. Data show that $CoCl_2$ is used by athletes for stimulating erythropoietin production [1]. Treatment of rats and mice with $CoCl_2$ protects heart and kidneys from ischemic disturbancies [2].

The *aim* of the present study is to investigate the influence of cobalt chloride on the morphological characteristics of peripheral blood cells in mice.

Material and Methods

Adult balb/c mice were subjected to cobalt chloride treatment at daily doses of 75 mg/kg and/or 125 mg/kg. $CoCl_2$ was obtained from drinking water. After 20 days treatment mice were sacrificed, blood smears were prepared from the peripheral blood, fixed and stained with May-Grünwald-Giemsa. The morphological characteristics of the blood cells were observed on light microscope Opton.

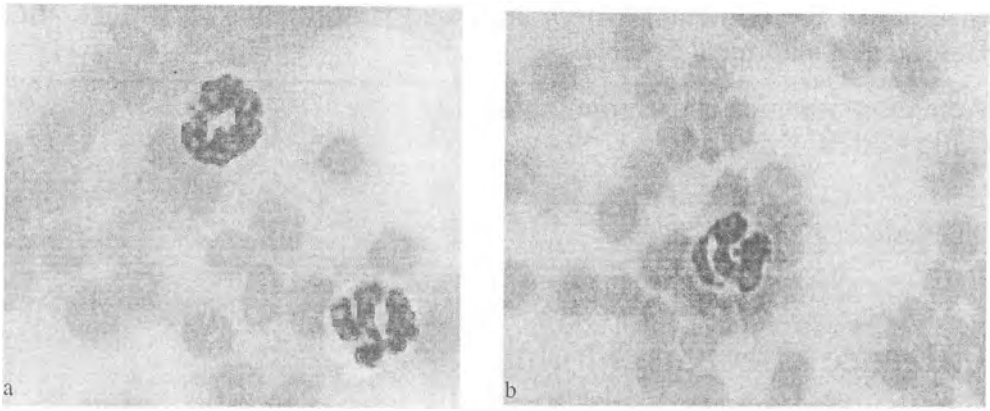

Fig. 1. Granulocyte in a peripheral blood smear – a) in a control smear and b) with nuclear hypersegmentation in smears of mice treated with 75 mg/kg and/or 125 mg/kg cobalt chloride. May-Grunwald-Giemsa staining, × 630

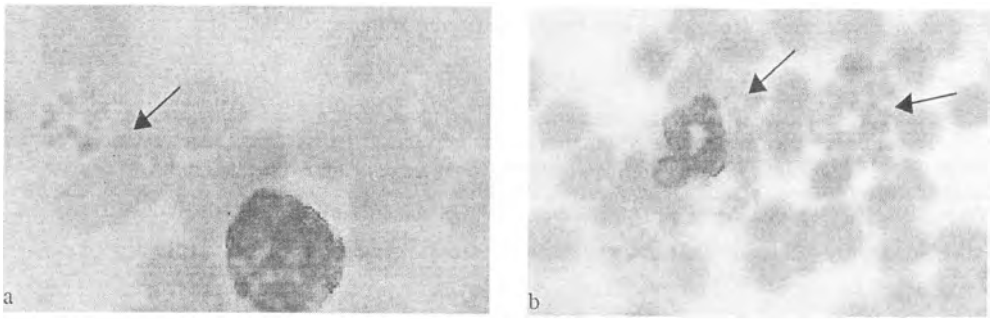

Fig. 2. Thrombocyte aggregation – a) rarely observed in control smears (see arrow) and b) large thrombocyte aggregates (arrows) in smears of mice treated with 75 mg/kg and/or 125 mg/kg cobalt chloride. May-Grunwald-Giemsa staining, × 630

Results and Discussion

The light microscope studies show no visible changes in erythrocyte morphology of blood smears obtained from cobalt-treated mice compared to the controls. Anisocytosis is rarely observed. On the other hand, nuclear hypersegmentation of neutrophils is determined when mice are treated with low and/or high dose $CoCl_2$ (Fig.1 a, b). The nuclei seem pyknotic with compact chromatin. In smears of $CoCl_2$-treated animals thrombocyte aggregation is observed compared to the controls where there are mainly individual platelets (Fig. 2 a, b).

Although nuclear hypersegmentation is a normal phenomenon in animals [5], our studies need further investigations to determine whether the nuclei are apoptotic or with increased activity. Nuclear hypersegmentation of neutrophils is observed in cases of hyperthyroidism in humans. We have no data for the influence of $CoCl_2$ on the thyroid gland in our studies, therefore such possible affect cannot be excluded. Our results are in agreement with those of S m i t h et al. [3] showing that cobalt chloride stimulates thrombocyte aggregation.

Conclusion

Cobalt chloride induces changes in granulocyte (neutrophil) morphology. Further studies for the ultrastructural changes are required to elucidate whether the observed nuclear hypersegmentation is a sign of apoptosis or cell activation. Quantitative analysis will be performed as well to determine the changes in red and white blood cell counts of the treated mice.

References

1. Lippi, G., M. Franchini, G. C. Guidi. Cobalt chloride administration in athletes: a new perspective in blood doping? – Br. J. Sports Med., **39**, 2005, No 11, 872-873.
2. Shrivastava, K, M. S. Ram, A. Bansal, S. S. Singh, G. Ilavazhagan. Cobalt supplementation promotes hypoxic tolerance and facilitates acclimatization to hypobaric hypoxia in rat brain. – High Alt. Med. Biol., **9**, 2008, No 1, 63-75.
3. Smith, A.G., A. N. Smith. Effect of cobaltous chloride on aggregation of platelets from normal and afibrinogenaemic human blood. – Toxicol. Lett., **23**, 1984, No 3, 349-352.
4. Topashka-Ancheva, M., E. Trakiiska, Zv. Pramatarova. Cytogenetical and haematological alterations in laboratory white mice ICR, caused by effects of polymetal industrial dust. – Acta zool. bulg., **55**, 2003, No 1, 61-71.
5. Илков, Н. Бели кръвни клетки. Цитология, реактивност, диагностично значение. – С., Българска академия на науките, 1977, 5–259.