

# **MEDICAL ASPECTS OF RADIATION PROTECTION IN NORMAL AND ACCIDENTAL SITUATION**

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## **ABSTRACT**

The most important radiation medicine aspects of the diagnostics of the radiation damage, problems of differential diagnosis, having in view the persons in the field of medicine and industry. The effect of decontamination in the prevention of irradiation was evaluated at persons employed on the Reactor RA in Vinča, in laboratories which produce and use radionuclides in period of time over 30 years.

A special interest was given in work to contemplation of some methods of biological indications, as well as to the haematological, biochemical, cytogenetical parameters with estimation of their relevancy for evaluation of the possible postradiation effects in normal and accidental situation and expert opinion at occupational exposition too.

## **INTRODUCTION**

Investigations are included experimental materials in the frame of decontamination of normal skin contaminated with radioiodine or radiocaesium in experimental conditions from aspects of the influence of some decontamination means on the skin permeability and the degree of internal contamination in dependence of the state of the skin, type and chemical form of radiocontaminant. In experimental conditions the efficiency of decontamination based on evaluation of the total body burden of radionuclides and residual radioactivity in the decontaminated region. In human praxis the decontamination treatment presents the most effective medico-prophylactic procedure in the prevention of local and total irradiation, although base on phenomenal evaluation.

The investigations in experimental conditions concerns also the reactivity of some radiosensitive systems at condition whole body gamma irradiation as well as effects of application of the antiradiation means on the haematopoietic tissue. At small laboratory animals were observed: lethality and surviving, clinical changes, quantitative changes of total leucocytes, erythrocytes

and platelets count, differential blood picture, change in percentual ratio between small and large lymphocytes in peripheral blood, occurrence of cytomorphological changes in white cells of peripheral blood, haemoglobine, haematocryte and other changes.

The effect of the applied drugs on the postirradiational haematologic reaction and reparatories, have been observed in dependence on ordinary time in some phases of acute radiation illness.

In epidemiological study the results of medical supervision of persons occupationally exposed to ionizing radiation, controlled in period of ten years have been presented. Observations were selected according to occupation (workers employed in metal, chemical, paper and tobacco industries and avio companies), to the sex, age, character of exposition (external and internal exposures), and dosimetric data of the received doses.

In the paper the problems of the differential diagnosis of some states and diseases according to the systems (skin, eyes, cardio-vascular system, endocrine and nervous system, haematopoietic tissue), have been discussed with special attention to focuses in the organisme, which can change numerical values in the peripheral blood or as far as their look is concerned that could be very similar to changes affected by action on of ionizing radiation.

On the basis of the existed criteria for evaluation of haematological parameters, pathological states of the skin, lenticular injury, changes in cardio-vascular system and changes in other systems too, indications and contra-indications for work with ionizing radiation have been observed. The incidence and persistence of morphological changes of lymphocytes and granulocytes in peripheral blood and anaemic states in correlation with changes, caused other harmful factors arised from working environment.

## METHODS

Methodology includes the experimental study and the analysis of epidemiological data taken from the human praxis.

**Experimental:** The experiments were performed on the white male rats, narcotized with urethane. The skin made "Fat-free" using soap before contamination. The radioactivity of the applied amount of solution  $^{131}\text{NaI}$  and  $^{137}\text{CsCl}$  was 1,85 MBq. Decontamination of the skin: five treatments were performed in duration of the minute each. Means for decontamination, saline, 1% Cetavlon, 2,5% Sterigal, 0,5% iodine tincture, 5% HMF, 0,25% DBS-TR, PAM-03.

Radiation source and exposure conditions: Irradiation was carried out using cobalt-60 gama-rays at a dose rate of 23,5 Gy/min and at a distance of 70 cm. During irradiation each animal was placed in a separate compartment of the wooden box. The integral dose to the whole body was 6 Gy what represents a sublethal dose under the given experimental conditions. The animals were isolated in a separate cage and kept under the usual conditions of feeding and care until the end of the experiment.

Treatment with Plibex and pyridoxine: Plibex is given every second day in quantity of 0.1 ml per animal begining first day or tenth day after irradiation. Given content of Plibex<sup>(R)</sup> is following: thiamine-chloride 0.2 mg, riboflavin 0.02 mg, nicotinamide 0.5 mg, calcium-pantotenate 0.05 mg, pyridoxine chloride 0.04 mg and cyanocobalamine 0.02/ $\mu$ g. Pyridoxine was applied i. m. every day at a dose of 0.3 mg/animal.

## RESULTS AND DISCUSSION

### 1. Decontamination of persons at an operating nuclear plant and in laboratories of Institute "Boris Kidrič" - Vinča

- Period of observation: over 30 years
- Number of cases: 76
- Anatomical locality: fingers of handful, handfuls, forehead, hair forehead, nose, neck, face, lips, temple, ears, foot, fingers of foot, frontal bump, aye, cheek.
- Radiocontaminants:  $^{131}\text{I}$ ,  $^{198}\text{Au}$ ,  $^{239}\text{Pu}$ ,  $^{137}\text{Cs}$ ,  $^{60}\text{Co}$ ,  $^{111}\text{Ag}$ ,  $^3\text{H}$ ,  $^{24}\text{Na}$ ,  $^{109}\text{Ag}$ , Unknown composition.
- State aggregation: dust, gas, liquid.
- Decontamination: contained 4-5 procedures by use of cotton, wool and rinsing or by cleaning with solution of means for decontamination: 5% detergent, toilet soap, 3% citric acid, saline, 2% boric acid, combination 5% detergent with 2% versen, permanganate.

### **2. The observed changes, deviations and deseases of the supervised persons in dependance of working exposition is given in Table 1.**

Table 1. Number of supervised person

Working exposure (years)	N	Skin	Haematologic changes Numerical	Morphologic	Eyes
1 - 5	50	14	5	5	1
6 - 10	31	5	8	8	1
11 - 15	34	26	19	5	2
16 - 20	16	5	6	3	1
under 20	17	2	4	1	-

### 3. Haematological effects of whole body irradiation and treatment with pyridoxine

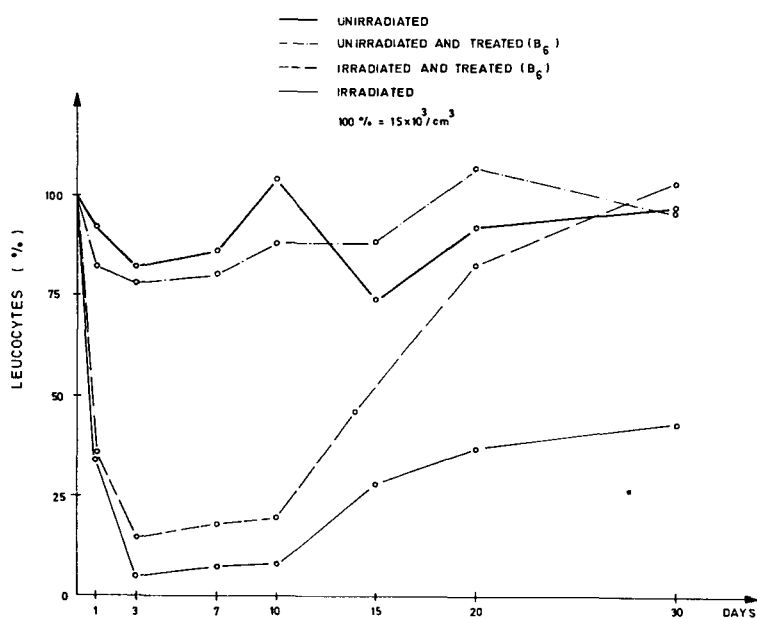


FIG. 1. Leucocytes in the peripheral blood.

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