

MANIFESTATIONS OF RADIATION SYNDROME IN PIGS

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ABSTRACT

Clinical and hematological changes in pigs after one-time acute radiation by high-energy-X-rays were described.

The radiation of animals was performed by using the linear accelerator of industrial type, with X-rays of 4 MeV, with semi-lethal dose (LD 50/30 = 3,20 Gy) bilaterally (50% of the dose from each side).

The radiation syndrome in pigs developed through 4 stages of the disease: the prodromal stadium (1-3 days), the latent stadium (3-7 days), the stadium of expressed clinical symptoms (7-18 days) and the stadium of recovery (after 25 days). The basic characteristic of the disease was a strong haemorrhagic diathesis with expressed blood spots on the skin and bleedings from the nose and the anus as well as a rush decrease of blood elements (leukocytes and trombocytes) already 24 hours after radiation.

INTRODUCTION

The studies on the acute radiation syndrome (ARS) in pigs is of great importance because a certain number of morphological lesions are similar to those in people in the same radiation conditions. This refers particularly to the clinical picture and pathomorphological changes on the skin and haematopoietic organs of the breeds of "white" pigs (1-3).

The aim of our investigations was to study the effects of semilethal radiation doses on the manifestation of the radiation syndrome in pigs.

MATERIAL AND METHODS

Six pigs of the "Landras" breed were used in the experiment. They were of both sexes, 4 months old and with average weight of 40 kg. The animals were irradiated with the semilethal dose of high-energy-X-rays (3,20 Gy) on a linear accelerator of industrial type. The irradiation was performed one time bilaterally (50% of the dose on each side). In the course of the 30 post-irradiation days the animals were clinically observed every day and their haematological status was followed on days 1, 3, 7, 14, 21 and 28 after irradiation.

RESULTS AND DISCUSSION

Clinical manifestations of the radiation syndrome in semilethally irradiated pigs can be divided in 4 phases: the prodromal phase, the latent phase, the phase of expressed clinical symptoms and the phase of recovery.

The prodromal phase begins immediately after irradiation and lasts to day 3. It is characterized by slight apathy, inappetence and conjunctivitis of lower degree.

The latent phase attach to the prodromal phase and lasts to day 7. It is characterized by absence of visible clinical symptoms, animals look illusory healthy and consume feed and water normally.

The phase of expressed clinical symptoms begins approximately on day 7 after irradiation and lasts the next 12-15 days. It is characterized by strong apathy, animals mostly lie, refuse feed and water, diarrhea appears, which obtains a profuse character with jelly and blood, the temperature rises and also bronchopneumonia with expressive cough attacks appears. Between days 7 and 10 after irradiation, a strong erythema and hyperaemia occur on the skin of animals, which, in the later phase, transform into dermatitis that has sometimes a pustulous character. Dermatitis is mostly expressed on ears, on the back, on the inside of extremities as well as on the stomach. About day 15, bloody spots and diffused bleedings appear, the skin aches when touched and breaks easily. In their further development, skin lesions convert into bloody stained dark crusts that give a "sooty" appearance to the whole change. In this phase also bleedings from the nose and the anus are manifested and on day 18 the first deaths were noticed.

The phase of recovery begins after the day 25 in animals that survive. It is characterized by a gradual disappearance of symptoms that were expressed in the previous phase, but even after day 30 the survived animals couldn't be characterized as clinically healthy.

The frequency and the period of appearance of clinical symptoms of the radiation syndrome are shown in figure 1.

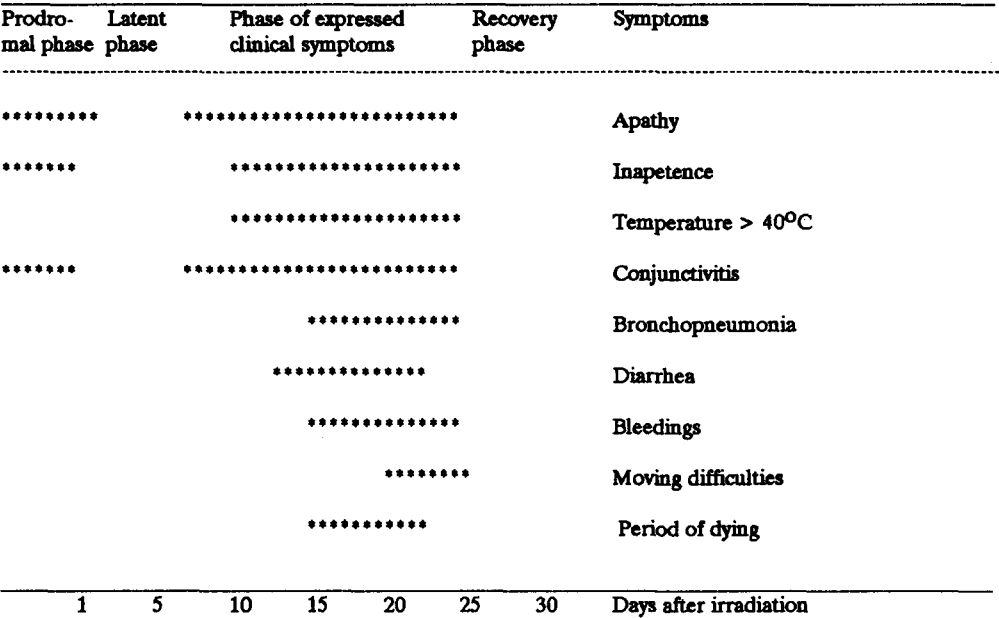


Figure 1. Frequency and period of appearance of clinical symptoms in semilethally irradiated pigs.

Table 1. Relative values of leukocyte and trombocyte number in semilethally irradiated pigs.

Days after irradiation	Relative number of leukocytes, % in relation to the normal	Relative number of trombocytes, % in relation to the normal
0	100	100
1	70	80
3	50	60
7	40	45
14	20	15
21	30	20
28	40	35

Haemathological changes were reflected in a rush decrease of the formed blood elements (leukocytes and trombocytes) already 24 hours after irradiation (table 1).

CONCLUSION

The main characteristic of the radiation syndrome in semilethally irradiated pigs was a strong haemorrhagic diathesis with expressed bleedings on the skin and from the nose and the anus. The changes on the skin were manifested by strong hyperaemia, erythema and dermatitis, especially on the inside of thighs and on the stomach. In the later phase, blood spots and diffused bleedings on the skin and from the nose and the anus appeared. Changes in the haemathological status were obvious already 24 hours after irradiation, with a drastic decrease of leukocyte and trombocyte number. On day 14 after irradiation, the leukocyte and trombocyte number decreased to only 10-20% of their normal value.

REFERENCES

1. J. O. Archambeau et al: Radiation Research, 299-326, (1978).
2. Z. Milošević, R. Kljajić, I. Selak et al: Proc. XIV simp. YRPA, 231-233, Novi Sad, (1987).
3. R. Kljajić, Z. Milošević, E. Horšić et al: Radiation Protection: Advances in Yugoslav and Italy, Proc. 83-86, ENEA, Udine, Italy, (1988).