EFFECT OF ANTIBIOTICS ON CHANGES IN THE IMMUNOLOGICAL SPECIFICITY OF PROTEINS IN ACUTE RADIATION SICKNESS

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The author has previously shown [1] that 48 h after exposure to the action of ionizing radiation in a dose of 600 R autoantibodies to the liver (and subsequently to other organs) are formed, the titer of which rises with the development of radiation sickness. It has been found that antibiotics in therapeutic doses appreciably depress the formation of autoantibodies against various organs of the irradiated animals. The appearance of autoantibodies to proteins of organs and tissues is due to changes in their immunological specificity, and dependent on preservation of the mechanisms responsible for antibody formation. Several investigators [2, 3] have shown that changes in the antigenic structure of the tissue proteins under the influence of ionizing radiation arise during the first few hours after the beginning of irradiation.

The object of the present investigation was to study the effect of penicillin, streptomycin, and oxytetracycline on changes in the immunological specificity of the liver proteins of rabbits irradiated in a dose of 600 R.

EXPERIMENTAL METHOD

Experiments were carried out on rabbits weighing 2.0-2.5 kg. The animals were divided into four groups, with 12 animals in each group, and irradiated on the RUM-11 apparatus (voltage 180 kV current 20 mA, filter 0.5 mm Cu, tube 20 · 20 cm, skin-focus distance 50 cm, dose rate 46.1 R/min).

The animals of group 1 received an intramuscular injection of penicillin, the animals of group 2—an injection of streptomycin, group 3—oxytetracycline, and group 4—physiological saline (control) 15 min before irradiation. The antibiotics were given in a dose of 20,000 units/kg body weight.

At intervals of 10, 30, 60, and 360 min after irradiation the animals were sacrificed, three from each group, by air embolism. A saline extract was made from the liver of these animals and used as antigen. Antigen from the liver of unirradiated rabbits was prepared in the same way.

The immunological specificity of the liver proteins of the irradiated animals was studied by the method of anaphylaxis with desensitization in guinea pigs. The animals were sensitized by a single subcutaneous injection of 2 mg of the corresponding antigen from the liver of irradiated rabbits. The guinea pigs were regarded as sensitized 21 days after injection of the antigen. These animals were desensitized by a saline extract of the liver of unirradiated rabbits. The first desensitizing dose of antigen (8 mg) was injected subcutaneously, and the second (4 mg) intravenously on the next day.

Anaphylactic shock was produced in the guinea pigs by the intravenous injection of 6 mg of antigen from the liver of irradiated rabbits, used earlier to sensitize the animals.

EXPERIMENTAL RESULTS

The results given in the table show that a change in the immunological specificity of the liver proteins of the irradiated rabbits took place 30 min after exposure to ionizing radiation. After 6 h these changes were so considerable that one guinea pig died from anaphylactic shock. It also follows from the table that injection of penicillin into the rabbits before irradiation had no significant effect on the time of appearance of the antigenic changes in the tissue proteins of the liver and on the character of the course of the reaction of anaphylaxis with desensitization in the guinea pigs. In the groups of rabbits receiving streptomycin or oxytetracycline before irradiation the antigenic changes in the liver proteins did not take place until 6 h after exposure. These changes were evidently very slight, for the anaphylactic shock in the reaction of anaphylaxis with desensitization followed a mild course.

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Effect of Antibiotics on Changes in Immunological Specificity of Liver Proteins of Irradiated Rabbits

Antibiotics (injected 15 min before irradiation)	Time after irradiation (in min)	No. of animals	Sensitization		Desensitization		Tests of completeness of desensitization		Reacting injection	
			AGIL (in mg)	reaction	AGHL (in mg)	reaction	AGHL (in mg)	reaction	AGIL (in mg)	reaction
Penicillin	10	3	2	–	8	++	4	–	6	–
	30	3	2	–	8	++	4	–	6	+,++
	60	3	2	–	8	++	4	–	6	++
	360	3	2	–	8	++,+++	4	–	6	++,+++
Streptomycin	10	3	2	–	8	++	4	–	6	–
	30	3	2	–	8	++,+++	4	–	6	–
	60	3	2	–	8	++	4	–	6	–
	360	3	2	–	8	++	4	–	6	+
Oxytetracycline	10	3	2	–	8	++	4	–	6	–
	30	3	2	–	8	++,+++	4	–	6	–
	60	3	2	–	8	++,+++	4	–	6	–
	360	3	2	–	8	++,+++	4	–	6	+,++
Control (physiological saline injected)	10	3	2	–	8	++,+++	4	–	6	–
	30	3	2	–	8	++,+++	4	–	6	+,++
	60	3	2	–	8	++,+++	4	–	6	++,+++
	360	3	2	–	8	++,+++	4	–	6	++,+++, ++++

Legend: AGIL—antigen from liver of irradiated rabbit; AGHL—antigen from liver of healthy, unirradiated rabbit; +varying degree of anaphylactic shock.

Hence, the positive effect following administration of streptomycin and oxytetracycline was probably due to some extent to blocking of the processes leading to changes in the antigenic structure of the proteins of the irradiated animals.

LITERATURE CITED

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