EFFECT OF DECONTAMINATION TREATMENT IN PROPHYLAXIS
OF IRRADIATION AT CONDITIONS OF RADIOCONTAMINATION
OF NORMAL AND DAMAGED SKIN

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1. INTRODUCTION

The main goal of an adequate decontamination treatment for
different types of contamination, is to prevent or decrease
harmful effects of radionuclides on tissues, systems and orga-
nism. In this paper the decontamination efficiency of normal
and damaged skin, contaminated with ^{137}Cs is studied by esti-
mating the absorbed doses from beta radiation after performed
decontamination. The contribute to the absorbed dose from ga-
mma radiation was neglicted in this study.

2. EXPERIMENTAL

White male rats weighing about 200 g were used. Number of
animals in each group was 20. During the experiment the ani-
mals were in narcosis with urethane or ether. Conditions of
damage: Thermal burn was made on shawed skin between scapulae
by use of Deshevy thermocautery at temperature of 600°C. The
circular area after burn was two cm^2 and together with imme-
diate neighborhood represented 1% of the whole surface of
the rats skin. On the shawed skin between scapulae a full
thickness of the skin, 8 mm in diameter was excised with a
special circular perforator. Conditions of contaminations:
On normal skin and damaged skin 40 µCi ^{137}CsCl was applied.
Decontamination treatment was applied 10 and 30 minutes and
one hour and the method was based on rinsing with means for
decontamination. Techniques of measurement: Quantities of
the absorbed radiocesium was measured directly by a modified
scintillation counter for small experimental animals.

The dose rate at the moment where decontamination was perfor-
med, taken to be t = 0, was calculated by using the following
formula[1]:

$$D = 2,13.\bar{E} \cdot A \text{ rad/h}.$$

The integral absorbed dose for some time t afterwords was obtained from the expression[1]:

$$D = 73,8.\bar{E}_\beta \cdot A_o \cdot T(1 - \exp^{\frac{-0,693 \ t}{T}})\text{rad}$$

where T_{eff} is the effective half time of elimination, to for rats taken to be: 5,7 days for body[2] and, one day for skin[3] $\bar{E}_\beta$ – the average energy of the beta radiation and A_o-specific activity at t = 0.

3. RESULTS AND DISCUSSION

Efficiency of decontamination evaluated on total body burden of radiocesium and residual radioactivity in the decontaminated region is given in table 1.

Absorptive area	Time of contact (min)	Means	Activity body	local	Efficiency decontamination
Normal skin	60	Untreated	1,33±0,21	98,67±0,21	–
		Water	1,42±0,65	6,20±1,38	92,38±2,03
		Deterg.Badd	2,02±1,02	1,03±0,31	96,95±1,33
Excised Skin	10	Water	54,70±6,90	6,91±1,46	38,39±6,90
		Saline	55,91±7,17	5,49±1,19	38,60±7,17
	30	Water	86,08±2,77	7,76±2,08	6,16±2,77
		Saline	79,92±6,18	5,18±0,74	14,90±6,18
Thermal burn	30	Untreated	21,12±4,61	78,88±4,61	–
		Water	28,31±8,03	32,78±6,30	38,91±8,03
		1% soap	27,57±6,78	36,83±8,99	36,60±8,99

TABLE 1   Effect of external decontamination, in per cent of radioactivity applied (Contamination with ^{137}CsCl).

The calculated doses as a function of the contamination duration, the means used for decontamination and other parameters is given in table 2.

Absorptive area	Time of contact (min)	Means for decontamination	Time after decont. (days)	Doses in rads body(g)	local
		Untreated	t = 0	0,001	7,2
			1	0,020	125,6
			30	0,190	251,2
Normal skin	60	Water	t = 0	0,001	0,5
			1	0,023	7,9
			30	0,201	15,8
		Detergent Badd	t = 0	0,002	0,1
			1	0,034	1,3
			30	0,285	2,6
		Water	t = 0	0,1	0,7
			1	1,4	
			30	11,6	
	10	Saline	t = 0	0,1	0,5
			1	1,4	
			30	11,6	
Skin wound		Water	t = 0	0,1	0,8
			1	2,1	
			30	17,7	
	30	Saline	t = 0	0,1	0,5
			1	1,9	
			30	16,0	
		Untreated	t = 0	0,02	7,7
			1	0,47	
			30	3,98	
Thermal burn	30	Water	t = 0	0,03	3,2
			1	0,63	
			30	5,34	
		1% soap	t = 0	0,03	3,6
			1	0,61	
			30	5,20	

TABLE 2 Absorbed beta doses in cases of external decontamination (Contamination with ^{137}CsCl).

These results were obtained by assuming the uniform distri-
bution of radiocesium an approximation accepted in radioto-
xicology. On table 3 is given the distribution of radiocesium
and calculated beta doses.

Tissues and organs	Specific activity (μCi/g)	Doses in rads t=0	t = 30 d
Blood	0,0153	1,4	1,4
Muscles	0,0333	3,2	3,1
Heart	0,2784	27,0	26,2
Kidneys	0,3320	32,4	31,3
Liver	0,1707	16,5	16,1
Spleen	0,1473	14,3	13,9

TABLE 3 Distribution of radiocesium and absorbed beta
        doses/g of fresh tissue.

Our experimental results, given in table 3, show that the
above approximation might be too crude, and that it might
be necessary to estimate doses and corresponding risks, sepa-
rately for different organs and tissues. The work on the
risk estimate, including radiopathological states and radio-
sensitivity of different tissues, is underway.

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