

Study of the Efficacy of CC-2 and Fuller's Earth Combination as a Decontaminant against Sulphur Mustard (Mustard Gas) Dermal Intoxication in Mice

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ABSTRACT

Decontamination efficacy of Fuller's earth and CC-2 independently; and in different combinations was evaluated against toxicity of sulphur mustard applied percutaneously on mice. Maximum protection was obtained with Fuller's earth and CC-2 in a combination of 80:20 (w/w).

1. INTRODUCTION

Sulphur mustard (HD), 2,2'-dichlorodiethyl sulphide; commonly known as mustard gas is a blistering agent¹ and is frequently used as a chemical warfare agent². It is one of the earliest known alkylating agents^{3,4} and binds to DNA, proteins and cell membranes². There is no specific antidote against HD intoxication; the treatment is only symptomatic^{5,6}. The best method for minimising the injury is by decontamination as soon as HD comes in contact with the skin.

Fuller's earth (FE), largely consisting of montmorillonite, is recommended for removal of HD from the skin due to its high adsorptive capacity⁷. *N, N'*-dichloro-bis (2,4,6-trichlorophenyl) urea (CC-2)⁸ has been used in the form of ointments⁹, and also impregnated in cloth¹⁰ for decontamination of HD.

In the present study FE (complying to BPC standard¹¹), CC-2 and their various combinations (w/w ratios) were evaluated for their decontamination efficacy against HD, when applied on mouse skin.

2. MATERIALS AND METHODS

Male Swiss albino mice of 25-28 g body weight, bred and maintained in this establishment were used for the experiment. The hair was clipped closely on dorsal side, caudally. HD (98 per cent) was dissolved in olive oil and applied uniformly. The animals were observed for mortality till 7 days and LD₅₀ was determined by Dixon's up and down method¹².

For decontamination experiments, the mice were given light anaesthesia with ether and 20 µl of pure HD was applied (equal to 6 LD₅₀) uniformly on the dorsal side. Exactly after 30 s the area was wiped with cotton only (control), or with the decontaminant or the decontaminant mixture (60 mg) on cotton. The decontamination was repeated once again at a gap of 15 s. The animals were given food (Lipton Feed, India) and water *ad libitum* and mortality was observed till 7 days. For preparing the decontaminant mixture, freshly recrystallised CC-2 was thoroughly mixed with FE in different w/w ratios. Statistical analysis of the data was done by χ^2 -test.

3. RESULT AND DISCUSSION

Table 1 shows the protection given by the decontaminants and their combinations against HD intoxication in different groups of mice. In the control group, all the mice

Table 1. Efficacy of decontaminants against sulphur mustard applied on mice skin

Treatment	Control	FE only	CC-2 only	FE:CC-2 (w/w ratio)			
				90:10 (a)	80:20 (b)	70:30 (c)	50:50 (d)
Days after application	No. died/No. treated (% mortality)						
1.	20/20 (100)	4/20 (20)	5/20 (25)	0/6 (0)	0/25 (0)	0/6 (0)	0/6 (0)
2.	20/20 (100)	4/20 (20)	6/20 (30)	0/6 (0)	0/25 (0)	0/6 (0)	0/6 (0)
3.	20/20 (100)	5/20 (25)	6/20 (30)	0/6 (0)	0/25 (0)	0/6 (0)	0/6 (0)
4.	20/20 (100)	5/20 (25)	8/20 (40)	2/6 (33)	0/25 (0)	0/6 (0)	2/6 (33)
5.	20/20 (100)	10/20 (50)	10/20 (50)	3/6 (50)	0/25 (0)	1/6 (17)	3/6 (50)
6.	20/20 (100)	13/20 (65)	12/20 (60)	3/6 (50)	1/25 (4)	2/6 (33)	3/6 (50)
7.	20/20 (100)	14/20 (70)	13/20 (65)	4/6 (67)	1/25 (4)	3/6 (50)	4/6 (67)

HD applied was equal to 6 LD₅₀. Calculated LD₅₀ of HD is 154.7 mg/kg by percutaneous route. Decontamination was done 30 s after applying HD.

Statistical analysis on last day data by χ^2 -test

b vs a : $\chi^2 = 9.80$; $P < 0.01$.

b vs c : $\chi^2 = 5.48$; $P < 0.05$.

b vs d : $\chi^2 = 9.80$; $P < 0.01$.

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