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TITLE

A COMPARISON OF THE ERYTHEMA AND VESICLE PRODUCING CAPACITY OF HT/ MM AND HT

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EXPERIMENTAL STATION
SUFFIELD, ALBERTA

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TECHNICAL MINUTE NO. 72

A COMPARISON OF THE ERYTHEMA AND VESICLE PRODUCING CAPACITY OF HT/MM AND HT

SUMMARY

A sample of the HT/MM which had been charged into an accidentally exploded bomb has been tested for its vesicancy and erythema producing capacity against HT on the flexor surfaces of volunteer's forearms. The results have been assessed by the methods described in Suffield Technical Minute No. 16.

It was found that under the conditions of these trials:

1. The HT/MM charging in the bomb was efficient as a vesicant.
2. When Student's test was applied, no significant difference was detected in the degree of erythema produced by 2 m.m. drops of HT and HT/MM when applied to the skin of volunteers through one or two layers of battle dress serge, but the vesication produced by HT/MM was significantly less than that produced by HT.
3. When decontamination was carried out at two minutes; no difference was noted between the lesions produced on the bare skin by HT and HT/MM. When decontamination was carried out at 10 or 20 minutes, HT produced a greater degree of erythema and vesication.
4. Whilst statistically there was a significant difference between the two chargings it is too small to have any practical significance.

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EXPERIMENTAL STATION

SUFFIELD, ALBERTA

TECHNICAL MINUTE NO. 72

A COMPARISON OF THE ERYTHEMA AND VESICLE PRODUCING CAPACITY OF HT/MM AND HT

Reference: Suffield Technical Minute No. 61.

INTRODUCTION

1. A recent accident in which a bomb charged HT/MM exploded and contaminated a number of individuals (Suffield Technical Minute 61), raised the question whether HT/MM was as efficient a vesicant as HT.

2. The majority of the men experienced contamination of their clothes, which were removed quite rapidly. The obvious skin contamination was dealt with within ten to fifteen minutes. A number of individuals were observed to have minute drops of HT/MM on the skin of their faces for as long as twenty minutes. In some cases no subsequent vesication occurred.

EXPERIMENTAL METHODS

3. A sample of HT/MM charging used in the accidentally exploded bomb, and a sample of HT were the mustard preparations used.

4. Drops of one and two millimeters diameter respectively were applied to the flexor surfaces of the bare and clothed forearms of human observers by means of a micro-caliper fitted to a 0.25 c.c. tuberculin syringe with a blunt #27 gauge needle. The HT/MM was applied in all cases to the right forearm flexor surface, and the HT to the flexor surface of the left forearm, each application being equidistant from the wrist. Decontamination was carried out using anti-gas ointment No. 5.

Group 1 Five men were used; a one millimeter drop of each preparation was applied to the bare flexor surface of the forearms. Decontamination was carried out at Zero plus 2 minutes.

Group 2 As in group one, except that decontamination was carried out at Zero plus 10 minutes.

Group 3 As in group one, except that decontamination was carried out at Zero plus 20 minutes.

Group 4 Eight men were used in this experiment. A two millimeter drop of HT or HT/MM was applied to one layer of Battle Dress, fastened to the flexor surface of the forearm. The Battle Dress was removed at Zero plus 30 minutes and decontamination of the arms was carried out.

Group 5 As in group 4, but the Battle Dress was removed at Zero plus 60 minutes, when decontamination was carried out.

Group 6 As in group 4, using two layers of Battle Dress which were removed at Zero plus 30 minutes. Decontamination was then carried out.

Group 7 As in group 6, but the Battle Dress was removed at Zero plus 60 minutes, when decontamination was carried out.

17. When one m.m. drops of HT and HT/MM were applied to the bare skin, and decontamination was carried out after 2 minutes, no difference was observed between the degree of erythema and vesication produced. If decontamination was carried out after 10 or 20 minutes, greater erythema was produced by HT. HT also produced larger vesicles if decontamination was delayed for 10 or 20 minutes.

18. Whilst statistically there was a significant difference between the two chargings it is too small to have any practical significance.

SUMMARY

19. A sample of HT/MM charging used in an accidentally exploded bomb has been tested for its vesicant and erythema producing capacity against HT on the flexor surfaces of volunteer's forearms. The results have been calculated by the methods described in Suffield Technical Minute No. 16.

20. It was found that under the conditions of these trials:

1. The HT/MM charging in the bomb was efficient as a vesicant.

2. When Student's Test was applied, no significant difference was detected in the degree of erythema produced by 2 m.m. drops of HT and HT/MM when applied to the skin of volunteers through one or two layers of Battle Dress serge, but the vesication produced by HT/MM was significantly less than that produced by HT.

3. When decontamination was carried out at two minutes, no difference was noted between the lesions produced on the bare skin by HT and HT/MM. When decontamination was carried out at 10 or 20 minutes a greater degree of erythema and vesication was produced by HT.

4. Whilst statistically there was a significant difference between the two chargings it is too small to have any practical significance.

This report was prepared by Surg. Lt. Cmdr. D.D. Bonnycastle of the Physiology Section.

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TABLE I

A Comparison of the Vesicant Effect of 1 MM drops of HT and HT/MM on the Bare Skin of the Forearm when Decontamination is carried out at 2 Minutes

NUMBER	Right Arm HT/MM from bomb		Left Arm HT	
	Erythema	Vesicle	Erythema	Vesicle
1	E 0.5 x 0.5	0	E^- 1.6 x 1.0	0
2	E^- 0.3 x 0.3	0	E^- 1.3 x 1.2	0
3	E^+ 1.1 x 1.4	0	E^+ 2.5 x 2.8	ppt
4	nil	nil	nil	nil
5	nil	nil	nil	nil

TABLE II

A Comparison of the Vesicant Effect of 1 MM drops of HT and HT/MM on the bare skin of the Forearm when Decontamination is Carried out at 10 Minutes

Number	Right Arm HT/MM from bomb		Left Arm HT	
	Erythema	Vesicle	Erythema	Vesicle
1	E^+ 1.3 x 1.5	0.7 x 0.7	E^+ 3.4 x 2.5	2.7 x 1.7
2	E^+ 1.2 x 1.1	0.7 x 0.5	E^+ 3.7 x 2.5	2.8 x 1.4
3	E^+ 1.2 x 1.2	0.9 x 0.8	E^+ 4.2 x 2.3	2.5 x 1.4
4	E^+ 1.3 x 1.5	0.7 x 0.7	E^+ 1.0 x 1.1	0.2 x 0.5
5	E^+ 1.5 x 1.3	ppt	E^+ 4.0 x 2.0	1.3 x 0.7

TABLE III

A Comparison of the Vesicant Effect of 1 MM drops of HT and HT/MM on the Bare skin of the Forearm when Decontamination is Carried out at 20 Minutes

Number	Right Arm HT/MM from bomb		Left Arm HT	
	Erythema	Vesicle	Erythema	Vesicle
1	E^+ 3.7 x 2.2	0.9 x 0.9	E^+ 6.0 x 3.2	2.1 x 1.8
2	E^+ 1.7 x 1.5	1.0 x 0.8	E^+ 4.0 x 3.5	2.8 x 2.1
3	E 1.7 x 1.6	0.7 x 0.8	E^+ 3.1 x 3.6	2.5 x 2.3
4	E^+ 2.3 x 2.0	1.0 x 0.9	E^+ 3.8 x 3.0	2.6 x 2.6
5	E^+ 1.7 x 1.6	0.5 x 0.6	E^+ 4.2 x 3.5	2.3 x 1.6

TABLE IV

A Comparison of the Vesicant Effect of 2 MM drops of HT and HT/MM Applied to one layer of BD serge fixed to the forearm.
(B.D. serge removed after 30 minutes and decontamination carried out.)

Number	Right Arm HT/MM from bomb		Left Arm HT	
	Erythema	Vesicle	Erythema	Vesicle
1	E† 2.3 x 2.3	1.1 x 0.8	E† 4.0 x 3.1	1.9 x 1.5
2	E† 2.1 x 2.1	1.1 x 1.1	E† 2.5 x 1.8	2.0 x 1.4
3	E† 2.3 x 2.5	1.2 x 1.2	E† 2.4 x 3.2	1.3 x 2.1
4	E† 2.7 x 2.5	1.6 x 1.7	E† 3.4 x 3.3	2.0 x 2.0
5	E† 4.0 x 3.7	1.3 x 1.4	E† 4.5 x 4.0	2.0 x 1.3
6	E† 4.5 x 4.5	1.5 x 1.7	E† 4.0 x 3.7	1.6 x 3.0
7	E† 2.3 x 2.5	1.2 x 1.2	E† 3.2 x 2.7	2.3 x 1.6
8	E† 2.3 x 2.3	1.3 x 1.3	E† 3.0 x 2.5	1.8 x 1.5

TABLE V

A Comparison of the Vesicant Effect of 2 MM drops of HT and HT/MM Applied to one layer of B.D. serge fixed to the forearm.
(B.D. serge removed after 60 minutes and decontamination carried out)

Number	Right Arm HT/MM from bomb			
	Erythema	Vesication	Erythema	Vesication
1	E† 2.4 x 2.7	1.4 x 1.5	E† 3.6 x 3.6	2.1 x 2.4
2	E† 2.4 x 2.5	1.2 x 1.2	E† 3.2 x 3.1	1.5 x 1.5
3	E† 3,2 x 3.2	1.5 x 1.5	E† 3.5 x 2.8	2.4 x 1.3
4	E† 2.2 x 2.1	1.2 x 1.4	E† 2.7 x 2.8	1.4 x 1.4
5	E† 5.4 x 4.3	1.5 x 1.6	E† 4.7 x 3.8	1.6 x 2.1
6	E† 2.4 x 2.7	1.3 x 1.8	E† 4.0 x 2.7	2.9 x 1.6
7	E† 2.8 x 3.0	1.6 x 1.8	E† 3.8 x 2.3	2.2 x 1.4
8	E† 2.5 x 2.1	1.4 x 1.3	E† 3.7 x 2.5	2.2 x 1.8

TABLE VI

AComparison of the Vesicant Effect of 2 MM drops of HT and HT/MM Applied to two layers of B.D. serge fixed to the forearm. (B.D. serge removed after 30 minutes and decontamination carried out).

Number	Right Arm HT/MM from bomb		Left Arm HT	
	Erythema	Vesication	Erythema	Vesication
1	E 2.7 x 2.6	-	E 2.5 x 2.5	--
2	E^{+} 2.2 x 2.3	1.2 x 1.2	E^{+} 3.5 x 2.6	1.8 x 1.7
3	E^{+} 2.9 x 3.2	1.5 x 1.3	E^{+} 2.6 x 2.6	1.6 x 1.6
4	E^{+} 2.7 x 2.6	1.2 x 1.2	E^{+} 3.2 x 3.2	1.5 x 1.4
5	E^{+} 3.5 x 3.2	--	E^{+} 4.1 x 4.1	1.5 x 1.3
6	E^{+} 3.4 x 3.8	1.4 x 1.3	E 4.0 x 3.7	1.6 x 1.5
7	E^{+} 2.0 x 2.0	1.1 x 1.3	E^{+} 2.7 x 3.2	1.8 x 1.4
8	E^{+} 2.7 x 2.5	1.0 x 0.8	E^{+} 2.3 x 2.3	1.0 x 1.0

TABLE VII

A Comparison of the Vesicant Effect of 2 MM drops of HT and HT/MM Applied to two layers of B.D serge fixed to the forearm. (B.D. serge removed after 60 minutes and decontamination carried out).

Number	Right Arm HT/MM from bomb		Left Arm HT	
	Erythema	Vesication	Erythema	Vesication
1	E^{+} 3.3 x 3.2	1.3 x 1.2	E^{+} 3.5 x 3.4	1.5 x 1.7
2	E^{+} 3.3 x 3.3	1.6 x 1.6	E^{+} 3.0 x 3.0	1.4 x 1.5
3	E^{+} 3.5 x 3.5	1.4 x 1.5	E^{+} 3.2 x 3.2	1.7 x 2.2
4	E^{+} 2.5 x 2.9	0.9 x 0.9	E^{+} 3.2 x 3.5	1.0 x 1.2
5	E^{+} 4.5 x 5.3	1.2 x 1.3	E^{+} 4.2 x 4.3	1.3 x 1.6
6	E^{+} 3.0 x 3.2	1.6 x 1.5	E^{+} 2.7 x 2.7	1.2 x 1.1
7	E^{+} 2.7 x 2.7	1.4 x 1.8	E^{+} 2.8 x 2.7	1.2 x 1.6
8	E^{+} 2.6 x 2.6	0.9 x 1.0	E^{+} 3.2 x 3.2	1.3 x 1.2

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TABLE VIII

A COMPARISON OF THE RESULTS OBTAINED IN THE VARIOUS TRIALS WITH HT/MM AND HT.

Conditions under which HT/MM and HT are compared	No. of cases.	Erythema produced by HT/MM and range. (sq. cm.)	Erythema produced by HT and range (sq. cm.)	P	Significance of difference	Vesication produced by HT/MM and range. (sq. cm.)	Vesication produced by HT and range (sq. cm.)	P	Significance of difference.
1. One m.m. drops of HT and HT/MM on bare skin. Decontamination at 4 minutes	5	0.5 (0 - 2.3)	2.5 (0.0 - 10.5)	0.1-0.2	Not significant	0 (0.0 - 0.0)	0.02 (0.0 - 0.1)	.9 - .8	Not significant
2. One m.m. drops of HT and HT/MM on bare skin. Decontamination at 10 minutes.	5	2.6 (2.0 - 2.9)	10.8 (1.1 - 14.5)	.05 - .02	Significant	0.4 (0.1 - 0.7)	2.6 (0.1 - 4.6)	.05-.02	Significant
3. One m.m. drops of HT and HT/MM on bare skin. Decontamination at 20 minutes.	5	6.0 (2.7 - 12.2)	21.1 (16.8 - 28.8)	<.01	Significant	0.7 (0.3 - 0.9)	5.2 (3.7 - 5.9)	<.01	Significant
4. Two m.m. drops of HT and HT/MM on B.I. serge. (One Layer) Decontamination at 30 minutes.	8	12.5 (6.6 - 30.1)	15.9 (6.8 - 27.0)	.2 - .1	Not significant	1.7 (0.9 - 2.7)	3.1 (1.9 - 4.8)	<.01	Significant
5. Two m.m drops of HT and HT/MM on B.D. serge. (One layer) Decontamination at 60 minutes.	8	13.2 (6.9 - 34.8)	16.3 (11.3 - 26.8)	.2 - .1	Not significant	2.1 (1.4 - 2.9)	3.6 (2.0 - 5.0)	<.01	Significant
6. Two m.m. drops of HT and HT/MM on two layers of B.D. serge. Decontamination at 30 minutes.	8	11.3 (6.0 - 19.4)	13.3 (6.3 - 25.2)	.4 - .3	Not significant	1.1 (0.0 - 2.0)	2.0 (0.0 - 3.1)	<.01	Significant
7. Two m.m. drops of HT and HT/MM on two layers of B.D. serge. Decontamination at 60 minutes.	8	16.6 (10.1 - 35.7)	16.6 (10.8 - 27.1)	.8 - .7	Not significant	1.8 (0.8 - 2.6)	2.1 (1.2 - 3.7)	.5 - .4	Not Significant

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