A review about Diphotérine®
the solution for emergency decontamination of chemical splashes

Presented at ISSA Congress, Athens, Greece, 19-21 May 2003

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Introduction

The diverse range of chemicals currently being used throughout industry present a significant potential hazard to health(1) when personnel become contaminated as a result of accidental splashes(2). The need to use a polyvalent and active rinsing solution becomes more and more necessary.

Materials and methods

Diphotérine® is an emergency first aid rinsing solution for eye/skin chemical splashes. Using its hypertonicity(3) and its chemical properties(4), Diphotérine® is able to stop and absorb the aggressiveness of a wide spectrum of chemicals and remove them from the tissues. Diphotérine® is a non toxic(5) solution (Oral Toxicity LD_{50}>2000 mg/Kg, Test 6564 TAR 1990 CIT, France; Acute Dermal Toxicity LD_{50}>2000 mg/Kg, test 133/9, 1988, Safepharm Laboratories, UK). It is slightly irritant on the skin and non irritant in the eye (test 133/3-133/4, 1987, Safepharm Laboratories, UK). Its residues with acids and bases are non irritant (test 6463TAL/6462TAL, 1990, CIT, France). The environmental effects of Diphotérine® have been studied and it was found non toxic by Microtoxicity (CE_{50}-15 minutes>5000 mg/l, CE_{50}-30 minutes>5000 mg/l) and Aquatic Toxicity (on Daphnia Magna, CE_{50}-24h>5000 mg/l) (tests n°D9811\0611, 1998, SGS Crépin Laboratory, France). Diphotérine® is a medical device CE 0459, first classifying and sterile. Most of the companies mentioned in this report, were previously using water for emergency first aid decontamination of eye/skin chemical splashes without complete success : irremediable sequelae, numerous secondary care and loss of work. Subsequently, the Medical and Health and Safety Services decided to introduce Diphotérine® (or Previn®) for rinsing chemical splashes and to train workers to use it correctly. Previn® is the German version of Diphotérine®. Each ocular or cutaneous chemical splash was rinsed in emergency (some seconds to a few minutes) with Diphotérine®, on location, while undressing if necessary. Then each person went to the medical centre for an examination. In the MANNESMANN company, a secondary rinsing with Diphotérine® was performed in the medical centre.

Results

A SERIE(6) OF 24 CHEMICAL SPLASHES
rinsed with Diphotérine®
in the MANNESMANN factory, in Germany, 1994-1998

Exposure	Cutaneous splashes	Ocular splashes
Acids*	8	11
Bases**	1	4

*acids : sulfuric acid, nitric acid, phosphoric acid or sulfamic acid, alone or in mixture with the other acids, with a concentration of 5 to 100%.
**bases : calcium oxide, 30-45% sodium hydroxide, 30% basic solution

Results : no DAMAGE, no secondary care, no loss of work excepted two accidents with one day lost from time

Preliminary results on 652 cases(7)
rinsed with Diphotérine® versus water
in the ATOFINA factory, in France, 1992-2000

In total, 652 chemical splashes were reported in the infirmary of ELF ATOCHEM in Saint-Avold between the 1.1.1992 and the 30.04.2000, involving either ELF ATOCHEM workers or subcontractors. After 1995, 68% of the chemical splashes were rinsed with Diphotérine ª. On 652 chemical splashes, 379 splashes were due to the 5 main products (AA, Acrylates, H_2SO_4, NaOH, ADAME). Four cases of wrong use of the protocol with Diphotérine ® were excluded. The preliminary analysis of the results was made on these 379 cases of chemical splashes which are divided as follows :

Analysis of the criterion "no after effect"

The percentage of chemical splashes without any after effect (52%) is signicantly different (p<0.05) from the one noted for washing with water rinsing ((33%). The criterion " no after effect" means a simple registration in the infirmary without any care.

Primary rinsing	water	Diphotérine®
Total number of cases	205	170
No after-effect	68	88
With after-effect	137	82

Analysis of the criterion "Loss of work"

In this analysis, we can exclude the 4 cases in which the rinsing protocole with Diphotérine® has not been respected (no sufficient rinsing) and we note a significant difference according to Fischer test (p<0.05) on the losses of work.

Rinsing	water	Diphotérine®
With loss of work	7	0
Without loss of work	198	170

A STATISTICAL STUDY(6) ABOUT 42 SODIUM HYDROXIDE (40-600 g/L) SPLASHES
rinsed with different rinsing solutions
in the MARTINSWERK factory, Germany, 1991-1993

	Diphotérine®	Acetic acid	Water
Loss of work	0,18d ± 0,4	2,91d ± 4,3	8d ± 8,12
No care	100% ± 15%	0 ± 15%	0 ± 15%
Simple care	0 ±15%	80% ±15%	25% ±15%
Medical care	0 ±15%	20% ±15%	75% ±15%

Results : Using Diphotérine® resulted in a noticable decrease in sick leave average and a standard deviation. No secondary care was necessary. There is a significant difference (p<0.05) between Diphotérine® and water concerning secondary care.

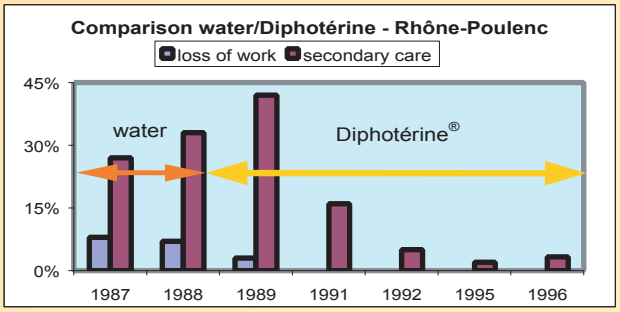
A STATISTICAL STUDY(6) ABOUT 195 CHEMICAL ACCIDENTS
in the RHÔNE-POULENC factory, France, 1987-1996
with two periods

*** Until 1989 : Immediate rinsing with water during 15 minutes**
=> Two splashes with big sequelae

Concentrated, hot nitric acid inducing
- burns on head, torso, all of the body, eye
- Hypertension for the rignt eye
- reject for the left corneal grafting
- ocular vision stable at 2/10

Condensa of soda inducing
- burns on back and right buttock
- Important necrosis of the buttock 48 hours after the accident
- Necessary of a grafting

*** from 1989 to 1996 : Immediate rinsing with Diphotérine®**
=> No accidents with sequelae



Results : Using Diphotérine® instead of water completely suppressed loss of work and significantly reduced the need for secondary care.

Conclusion

The emergency use of Diphotérine® is a good way for the decontamination of ocular or cutaneous chemical splashes. Its emergent use often gives an immediate pain relief. It achieves a reduction of loss of work and secondary care in all cases and avoids sequelae for the workers.

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