



# Amphoteric Compound Chemical Eye/Skin Splash Decontamination: Clinical Experience

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## Objective and method

- To evaluate clinical experience with using an amphoteric compound in a hypertonic solution as a decontamination solution for eye/skin chemical splashes, extending previously published data.(1-4)
- A review of cases of clinical use of an amphoteric solution for eye/skin chemical splash decontamination voluntarily reported to the manufacturer as part of a post-marketing surveillance program was done.

1 Hall AH et al. *Vet Human Toxicol* 2002;44:228-231.

2 Merle H et al. *Burns* 2005;31:205-211.

3 Nehles J et al. *Cutan Ocular Toxicol* 2006;25:249-258.

4 Donoghue AM. *Int J Dermatol* 2010;49:894-900.

# Mechanism of the chemical injury

- = result of a contact of the skin/the eye with an irritant or a corrosive
- The severity of the burn depends mainly on:
  - nature and concentration of the chemical involved,
  - energy level involved,
  - time of contact.
- And also:
  - physical factors like the pressure or the temperature
  - the Total Body Surface Area (TBSA)
  - and whether the skin/eye is healthy or not.
- **Chemicals can also be toxic! (Ex: hydrofluoric acid, HF)**



*Caustic soda (NaOH) burn at 24 hr not washed*



## What is Diphoterine®?

- An active washing solution for ocular and cutaneous **chemical splashes**
- An aqueous solution containing the fundamental properties of water:
  - = mechanical effect of pulling the chemical agent away from the surface of the body tissue.
- an amphoteric solution
  - = Acts in the same way on the acids and the bases, with a rapid return towards a zone of physiological pH. Also amphoteric for oxidisers/reducing agent and solvents.
- A hypertonic solution
  - = Stops the penetration of corrosive chemicals into the tissues creating a flux from the inside to the outside of the body.



**A medical device EC 0459, IIa class**

*14<sup>th</sup> European Burns Association Congress, The Hague, The Netherlands*




## Collected results

- From 1987 to 2010
- 58 reports from 52 different industrial facilities/organizations
- 44 total cases reported
- Some cases exposed several people on several body areas

## Chemicals involved

Chemical	Range of conc.	N	Conc. not specified
<b>Sodium hydroxide (NaOH)</b>	flakes – 50% - 25%	<b>14</b>	4
<b>sulfuric acid (H<sub>2</sub>SO<sub>4</sub>)</b>	98% - 96% - 87%	<b>9</b>	3
Caustic solution or basic substance	pH>8.2	6	5
Phenol & derivates		4	4
Nitric acid (HNO <sub>3</sub> )	100% - 70%	2	
Lubricants		2	2
Trichloroethane		1	1
Acrylic acid	100%	1	
Acrylamide	50%	1	
Acrylic varnish		1	1
DMEA		1	1
Others		2	1
<b>Total</b>		<b>44</b>	<b>22</b>

# Body surfaces splashed

- 
- 1 eye: 8
  - 2 eyes: 4
  - **Face: 11**
  - Forearms: 3
  - Hands: 3
  - Arms: 3
  - Legs: 2
  - Feet: 2
  - Neck: 2
  - Cheek: 1
  - Chest: 1
  - Back: 1
  - **Total body: 1**
  - Unknown: 4

**16 eyes**

➤ Eyes and face were the most involved body areas

➤ Skin splashes (5):  
Mean of TBSA: 9.1%

## FIRST AID MANAGEMENT

- 40 cases washed with Diphoterine® first
- 3 cases washed with tap water first
- 1 phenol splash washed with tap water + PEG + Diphoterine®

PEG: Polyethylene Glycol

<sup>5</sup> Management of the major burn, Ames WA, practical procedures, Issue 10(1999) art. 10

## First aid management

	Yes	No	Not mentioned
Secondary treatment	4	9	31
Lost work time	1	26	17
Sequelae	9	19	16

- In 2 cases, Diphoterine<sup>®</sup> was only used on *some but not all* exposed body parts. Outcome was worse in those parts not washed with Diphoterine<sup>®</sup>.
- In one case, Diphoterine<sup>®</sup> was used rapidly on some body parts and only erythema developed. However, sodium hydroxide soaked through a shoe and Diphoterine<sup>®</sup> washing was delayed by 15 minutes, resulting in a second degree skin injury (see picture).
- In the 3 cases with water washing first, the outcome in 2 of 3 cases was generally less good than in the cases where Diphoterine<sup>®</sup> was used first.



## Other data(4)

- Clinical case series of 180 alkali splashes on skin from Oct. 2006 to March 2008
- Dr M. Donoghue, Chief Medical Officer, Alcoa Australia

	Diphoterine® first	Water first
<b>n</b>	<b>138</b>	<b>42</b>
<b>Time elapsed</b>	<b>1 min.</b>	<b>5 min.</b>
<b>No chemical burn</b>	<b>52.9%</b>	<b>21.4%</b>
<b>Blisters or more severe signs</b>	<b>7.9%</b>	<b>23.8%</b>

4 Donoghue AM. *Int J Dermatol* 2010;49:894-900

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## Conclusion

- Diphoterine<sup>®</sup> is currently used in industry, as a first aid solution
- Used as primary action, it limits chemical burn development
- In this non-random retrospective series, Diphoterine<sup>®</sup> was associated with good clinical outcomes.

**Thank you**



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