



Understanding Diphoterine® solution



Reduces lesion severity

Relieves pain

Simplifies emergency

Reduces installation
and maintenance costs

Fast intervention

Increases intervention
margin

Available everywhere
portable and transportable

Immediate use in
all circumstances



Avoids
hypothermia



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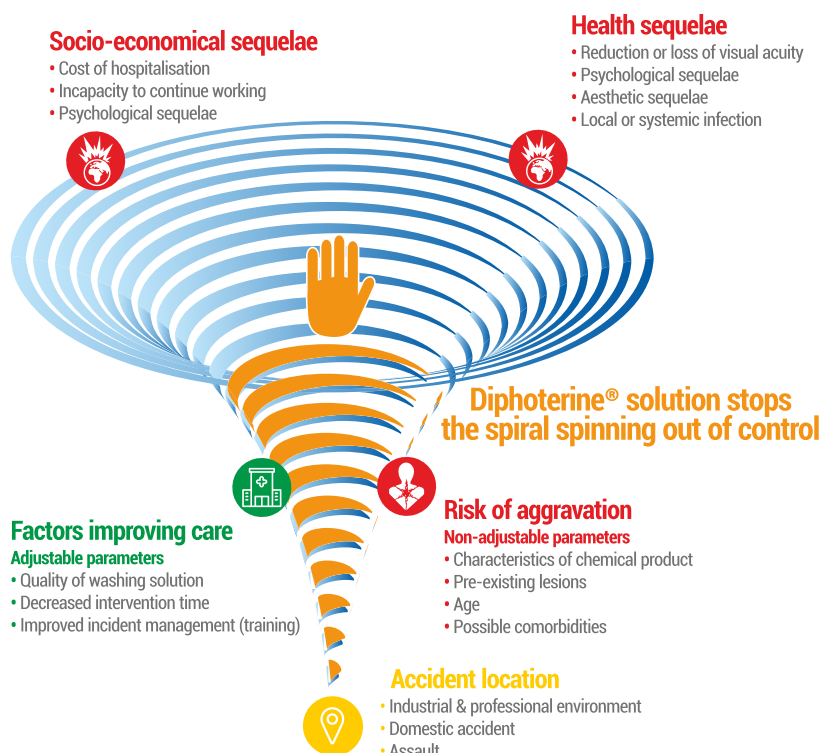




Risk of chemical burns, a daily reality

Throughout the world, chemical eye or skin burns are a major health issue^{8,10}. There are more than 25.000 chemicals listed as irritants or corrosives. There are many examples of possible accidental exposure to a chemical product: industrial and domestic environments, laboratories, educational facilities, and waves of chemical attacks, like recently in the United Kingdom⁸.

Ocular or cutaneous exposure to a chemical can cause serious physical complications for the victim. Regarding the eye, there may be a reduction or even loss of visual acuity. As for the skin, it may result in local or systemic infection. Effective treatment of chemical lesions is thus a major challenge.



Which emergency decontamination solution?

Upon chemical exposure of skin or eyes, the concerned victim immediately faces a serious risk of aggravated bodily harm. This risk will in fact depend on two categories of factors.

The first category of factors, without any possible intervention to modify them, are **non-adjustable**:

- Patient age and possible co-morbidities (advanced diabetes, chronic corticosteroid therapy both disrupting healing processes, for example).
- Impaired pre-existing skin quality (atherosclerosis, diabetes, renal failure).
- Characteristics of chemical concerned (pH, concentration, temperature, quantity).

Factors of the second category, being **adjustable**, an intervention is possible so as to improve the condition of the exposed site(s):

- Choice of washing solution
- Improve reactivity and application time, according to the washing solution protocol, in order to limit chemical exposure time.

We thus understand the importance of the washing choice, application time, volume used and duration of application.

Along with these fundamental considerations, it is difficult, in particular in emergency and stressful situations, to know the chemical's exact nature, that is (its composition and concentration) linked to accidental exposure. Moreover, specific antidotes are inexistant for many products available on the market.

Thus, Diphoterine® washing solution has several physicochemical characteristics which make it effective for emergency treatment of chemical skin and eye lesions regardless of the type of product concerned (with the exception of hydrofluoric acid*, where it is recommended to use Hexafluorine® solution). Diphoterine® solution, in addition to performing a surface washing due to its aqueous nature, is hypertonic, sterile, amphoteric (will act on all corrosives), active and stops penetration of chemical present on the victim^{9,12}.

Unlike water, it does not present a risk of eye edema because water is hypotonic. The amount of water required is important, namely 6L / min for 15 min or 90L in total. For the whole body, 60L/min for 15 min, that is 900L in total are necessary in case of water washing. It is easy to understand technical and practical difficulties encountered in this case⁶.



Diphoterine® solution is recommended

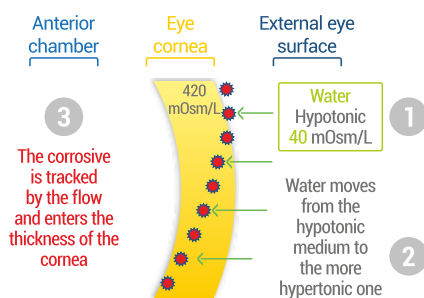
Also, other important advantages of Diphoterine® solution can be summarised in terms of increased intervention margin (within 60 seconds)¹, ergonomics, simplicity and safety of use for both victim and intervenor. These fundamental aspects allow urgent and effective management of chemical burns victims, both at accident site and in hospitals^{1, 2}. Thereby reducing the infernal spiral linked to physical, psychological, social and economic consequences in the event of a victim's exposure to a chemical.

The convergent results obtained, whether in an industrial environment, during first aid, or in hospital environment, have led various countries and international scientific communities, such as France, UK, Germany, South Africa, Slovenia, Canada and Australia, to include Diphoterine® and Previn® solutions in their consensus, health guidelines, and treatment database.

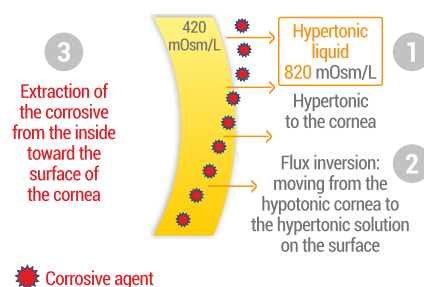


Diphoterine® solution's clinical advantages and user benefits

Case of hypotonic solution



Case of hypertonic solution



Corrosive agent

Clinical benefits

- Washes on surface.
- Stops product penetration.
- Removes product, enables starting washing later.

Effective for health

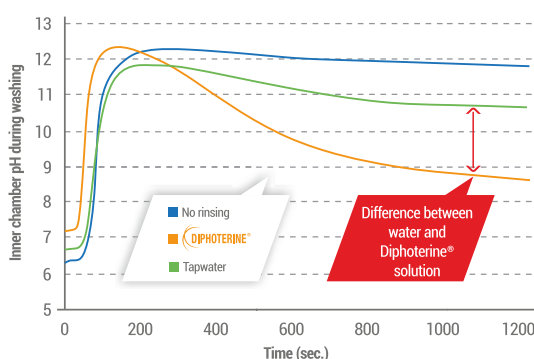
- Active on all chemicals (amphoteric).
- Hypertonic in relation to eye and skin (tonicity around 820 mosmoles / kg).
- Relieves victim by reducing pain, need for analgesics as well as improving medical examination quality^{2,4,11} and reducing need for specialized surgical care¹.
- Preserves victim (decreases lesions severity and maintains physiology).
- Avoids hypothermia.

Simplifies first aid

- Unique protocol.
- Portable, facilitates quick initiation to washing.
- The shower is brought to victim and not the other way around.
- Increased intervention margin (60 versus 10 seconds for water). If washed with water after 10 seconds, what has penetrated cannot be removed.
- Adapted format (eye wash, skin spray, portable autonomous shower DAP).
- Washing with confidence, both by victim or anyone else, on healthy or injured skin.

Reduces installation and maintenance costs

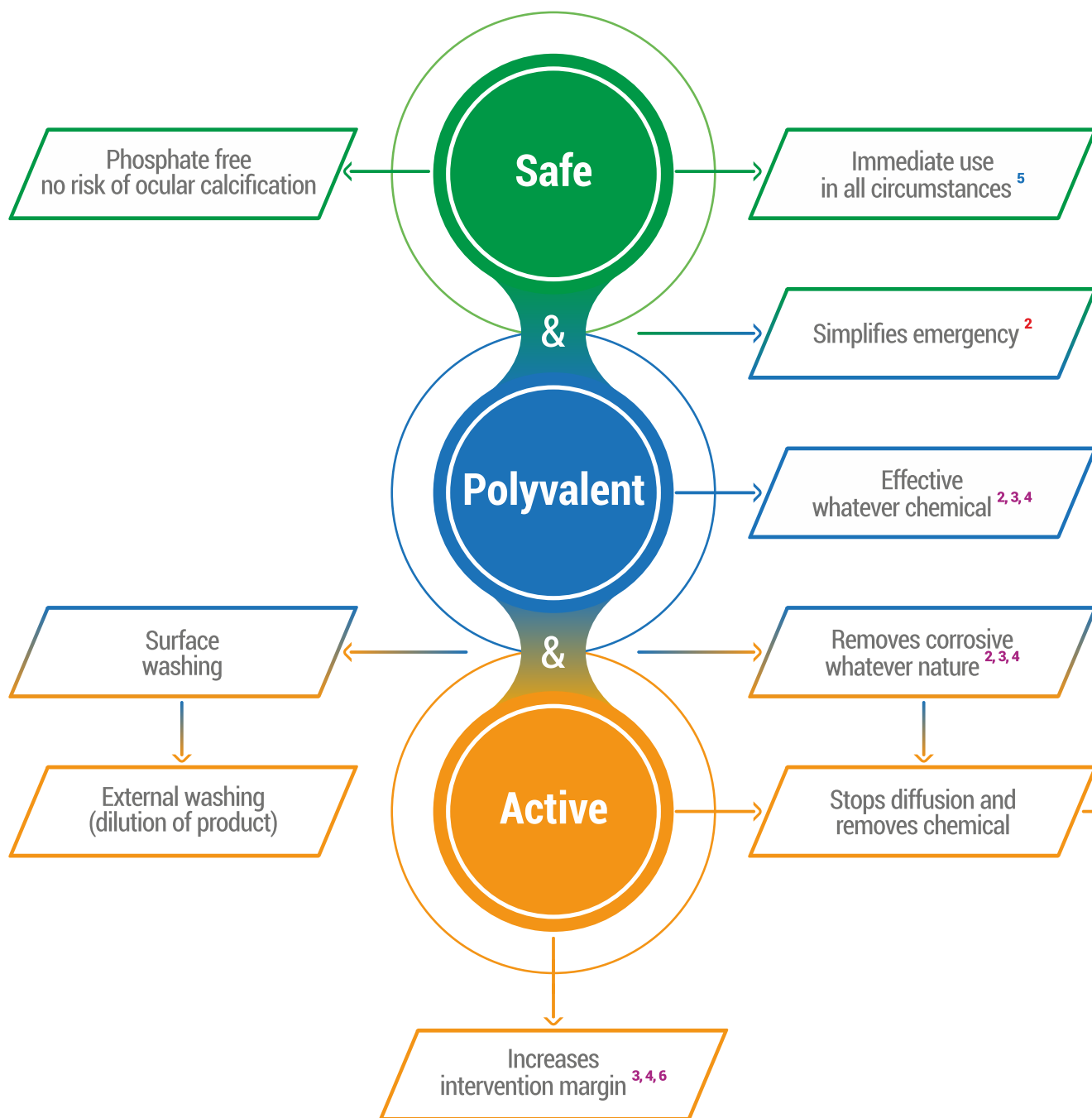
- No water shower installation required.
- Mobile, washing anywhere (may be available for emergency mobile medical services).
- Sterile, renewable upon expiry (two years) versus weekly maintenance required for water showers.
- No risk of bacterial superinfection (legionellosis)⁵.

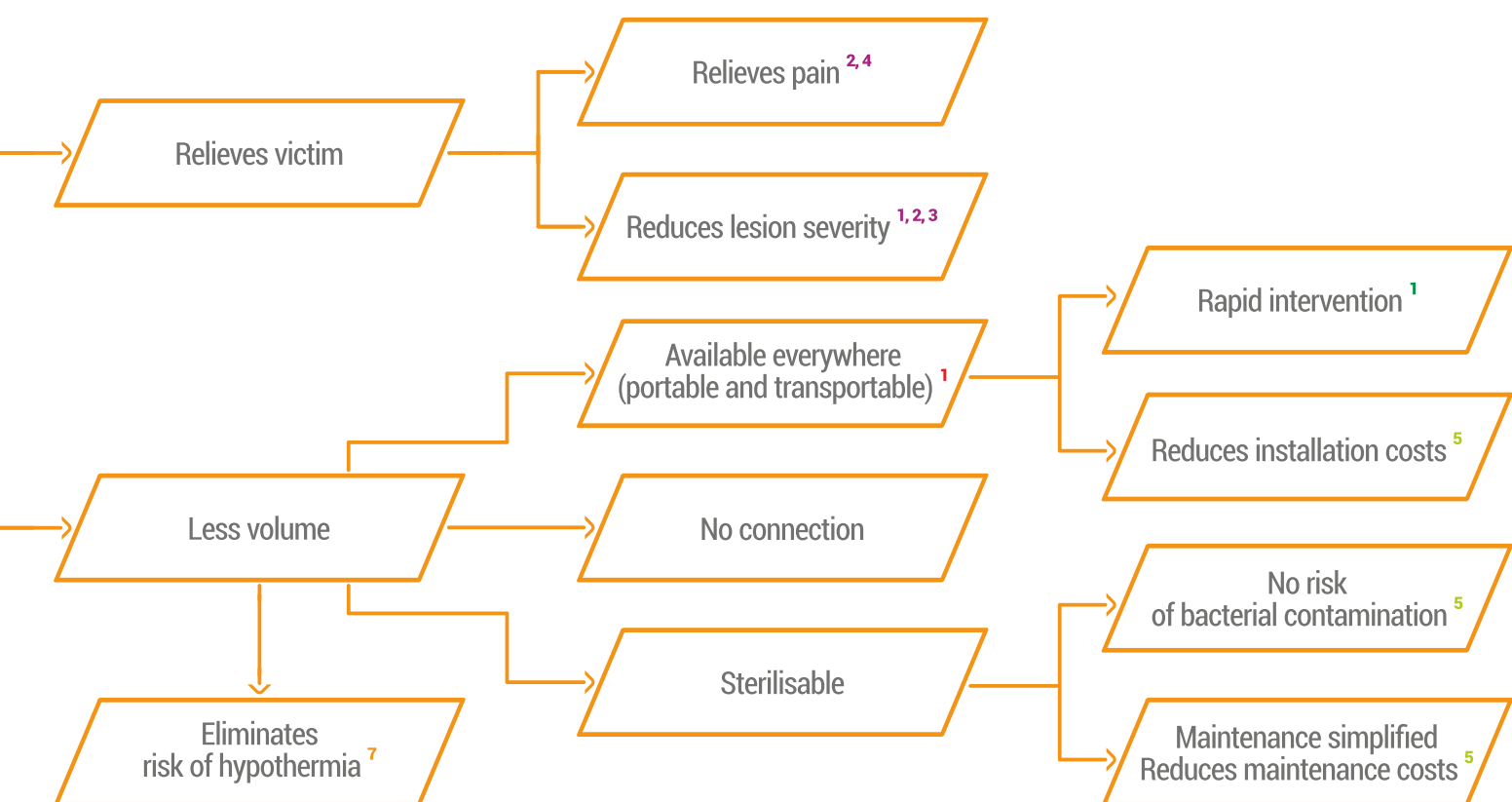


Comparative curves of pH decrease, after 2N NaOH ocular contamination, according to washing solutions



DIPHOTERINE® Solution







Conclusion & medical recommendations

Diphoterine® washing solution is **active, safe, ergonomic and economical**. It constitutes an effective and important therapeutic arsenal for the treatment of ocular and/or cutaneous chemical lesions. It helps stop the infernal spiral linked to physical, psychological and social consequences following the accident.

Furthermore, its **amphoteric and polyvalent nature allows its use regardless of chemical concerned**. Without wasting time identifying causative agent, thereby delaying the washing and risking worsening lesions.

Use of Diphoterine® washing solution soon after chemical exposure helps reducing lesion severity ^{1,2,4,7}.

Training on how to use Diphoterine® solution will facilitate the smooth running of first aid in the event of an accident. This cannot be achieved without the commitment of Occupational Health Personnel, in particular in industrial environment. As for chemical burns, the latter must become familiar with the training of first aid techniques using Diphoterine® solution and preventive simulation.

Since the early use of Diphoterine® solution reduces sequelae, it seems important to make Diphoterine® washing solution available to ambulance personnel, mobile emergency services and intensive care unit as well as firefighters ².

Finally, the presence of Diphoterine® washing solution in emergency departments, in ophthalmological surgeries remote from hospitals and in burn treatment centers ensures an effective first washing when the victim arrives, which ensures better care for the patient and reduces lesion severity.

Learn about chemical risk !

<https://www.prevor.com/en/online-training/>



1



2



3



Diphoterine® solution can be used during all stages of the emergency chain



Diphoterine® solution complies to standard

Use against chemical

- Increases intervention margin ^{3, 4, 6}
- Removes corrosives whatever chemical ^{2, 3, 4}
- Relieves pain ^{2, 4}
- Reduces lesion severity ^{1, 2, 3}

Others

- Safe solution, polyvalent and active
- Immediate use in all circumstances ⁵

Type of device

- Portable and transportable ¹ = Rapid intervention
- Lower installation and connexion costs ⁵

COMPLIES
TO STANDARD

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Flow/Washing time

- Active and polyvalent Solution = Less volume
- Portable and transportable ¹
- Simplifies emergency ²
- Usable in all circumstances ⁵

Water temperature

- Eliminates risk of hypothermia ⁷

Water quality

- Sterile solution: less volume = sterilisable
- Simplifies maintenance ⁵
- Reduces maintenance costs ⁵
- No risk of bacterial contamination ⁵



Diphoterine® solution - Technical sheet for use

Stop exposure to chemical agent, remove soiled clothing.
Then, apply as quickly as possible, ideally within 60 seconds, Diphoterine® washing solution.



EYE

Portable eye wash device (SIEW 50mL),
then/or washing using 500mL per eye (LPM).

Then wash with Afterwash II® solution
to avoid dry eye syndrome.



SKIN

100 or 200mL depending on the exposed
surface (respectively 3 or 9%).

5L via the use of a Portable Autonomous Shower (DAP)
in case of full body exposure.



Individual



Collective



Diphoterine® solution - Side effects?

No risk of ocular calcification due to the absence of phosphate in the solution^{12,13}
No anaphylactic reaction
No side effects have been reported to date

Why Diphoterine® solution?

- For the victim's health
- To reduce costs
- For its ergonomics



For the victim's health

- Relieves victim, reduces lesion severity and nursing time
- Avoids hypothermia (less volume)
- Active on all types of chemicals
- Safe washing: usable on injured skin and eye



For its ergonomics

- Simple to use
- Unique protocols
- Increased intervention margin
- Portable container
- Adapted container (skin and eye)



To reduce costs

- Sterile → Reduces maintenance costs
- Mobile → Reduces installation costs



References

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⁴ Kulkarni P. *et al*, The effects of the use of Diphoterine® solution on chemical burns in the Tarapur industrial complex, India, *Burns Open*. 2018, 104-107.

⁵ Crusius S. *et al*, Bacterial loads in fixed eye showers - before and after regular washing, *Arbeitsmedizinische Praxis*. 2008, 43, 509-515.

⁶ European Standard EN-15154 for safety showers and eye wash units.

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⁸ Schrage N.F. *et al*, Chemical Ocular Burns, Ed. Springer, 2011, ISBN 978-3-642-14550-6. & Maibach H.I. *et al*, Chemical Skin Injury, Ed. Springer. 2014, ISBN 978-3-642-39779-0.

⁹ Zack-Williams S.D.L. *et al*, The clinical efficacy of Diphoterine® in the management of cutaneous chemical burns : a 2-year evaluation study, *Annals of Burns and Fire Disasters*. 2015, 28(1), 9-12.

¹⁰ Hall A.H. *et al*, Acute chemical skin injuries in the United States: a review, *Critical reviews in toxicology*. 2018, 48(7), 540-554.

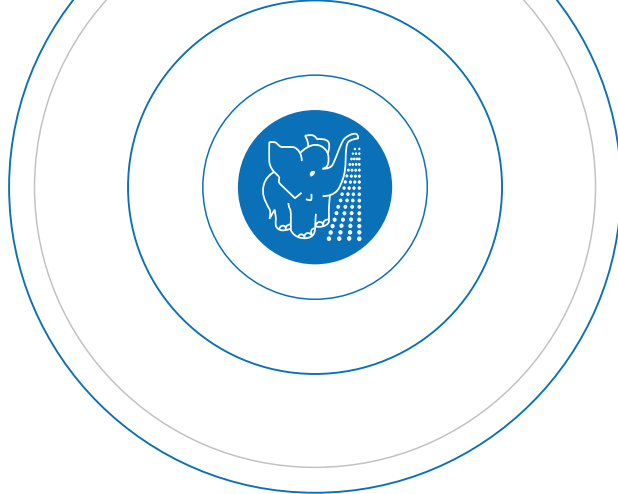
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¹² Lynn D.D. *et al*, The safety and efficacy of Diphoterine® for ocular and cutaneous burns in humans, *Cutaneous and Ocular Toxicology*. 2017, 36(2), 185-192.

¹³ Schrage N.F. *et al*, Irrigation with phosphate-buffered saline causes corneal calcification during treatment of ocular burns, *Burns*. 2019, 45(8), 1871-1879.

¹⁴ Hall A.H. *et al*, Safety of dermal Diphoterine® application : an active decontamination solution for chemical splash injuries, *Cutaneous and Ocular Toxicology*. 2009, 28(4), 149-156.

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