70 % HYDROFLUORIC ACID (HF) CUTANEOUS DECONTAMINATION: COMPARISON OF DIFFERENT WASHING PROTOCOLS WITH A NEW TYPE OF *EX VIVO* DATA

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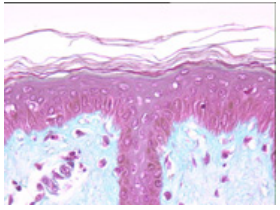
Abstract #1175

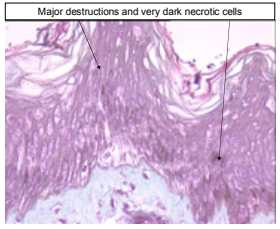
Objective

HF is a hazardous acid (toxic and corrosive) used mainly in glass etching, surface treatment and electronics manufacturing.
The objective is to determine the benefit of different rinsing protocols compared with no decontamination of an innovative *ex vivo* skin model.

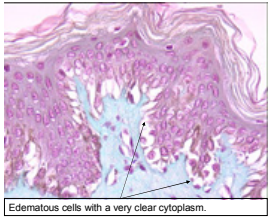
Results



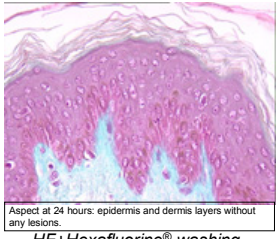
Non exposed explant general aspect



HF, 24H after contact (no decontamination)



HF+Water washing+CaGlu 24 hours after contact



HF+Hexafluorine® washing 24 hours after contact

[a]: Spöler F. & al., Burns. 34(4):549-55 (2008).

Time of exposure and skin layers		Control (untreated group) 20 explants	HF without washing 18 explants	HF + water washing + calcium gluconate 16 explants	HF + Hexafluorine® 16 explants
T0	Epidermis	GM = good morphology	GM	GM	GM
	Papillary dermis				
	Reticular dermis				
20 s	Epidermis				
	Papillary dermis				
	Reticular dermis				
5 min	Epidermis		PN + AC		
	Papillary dermis		PN + CA moderately		
	Reticular dermis				
10 min	Epidermis		PN = pyknotic nuclei AC = Acidophilic cytoplasm		
	Papillary dermis				
	Reticular dermis			PN + AC moderately	
15 min	Epidermis				
	Papillary dermis			PN + AC	
	Reticular dermis				
30 min	Epidermis			Some necrotic cells	
	Papillary dermis				
	Reticular dermis			GM	
1 h	Epidermis				
	Papillary dermis				
	Reticular dermis				
2 h	Epidermis				
	Papillary dermis				
	Reticular dermis				
4 h	Epidermis			Slightly edematous cells with mild acantholysis	
	Papillary dermis			GM	
	Reticular dermis				
24 h	Epidermis		Totally necrotic	Very edematous cells with a very clear cytoplasm	
	Papillary dermis			PN + AC	
	Reticular dermis		PN + AC	Lesser alterations	

Table 1: Schematic summary of the histological results for all the groups and for each skin layer.
Abbreviations: Good morphology (GM), Pyknotic Nucleus (PN) and Acidophilic Cytoplasm (AC)

Methods

86 explants human skin in 4 groups (in duplicate):

- 1 control group

3 exposed to hydrofluoric acid (HF) for 20 seconds from filter paper disks saturated with 30 µl 70% HF:

- without decontamination;
- washing with tap water (15 minutes, 2000ml) + one topical application of calcium gluconate (CaGlu) 1mg/cm²
- washing with Hexafluorine®, a chelating and amphoteric molecule (10 minutes, 400ml).

Histological samples taken at the end of washing, then regularly up to 24 hours.
Observation by optical microscopy X 40.

Water flushing of the explants for 15 minutes, prior to GluCa application (1mg/cm²)

Hexafluorine® sprays washing for 10 minutes

Conclusion

70% HF burns develop rapidly, within the first minutes following exposure, with specific patho-physiological mechanisms that require specialized decontamination to prevent or decrease both corrosive acidic and toxic fluoride aggressiveness.
Under these experimental conditions the severity and the speed of penetration of 70% HF burns are confirmed. This permits an exposure time to be determined, allowing the efficacy of emergency first aid care to be evaluated. The lesions shown by our model are in perfect accordance with both experimental data and reports of previous accident situations. This study underlines the need for early decontamination. The standard protocol involving water washing and topical calcium gluconate application delayed the appearance of the burn but did not completely prevent HF damage in the explants. The need for repeated calcium gluconate applications is confirmed. No lesion was observed using Hexafluorine® as initial decontamination washing, no matter what the time of observation was. This confirms similar results obtained on an ocular model[a].