

Advances in ocular burns

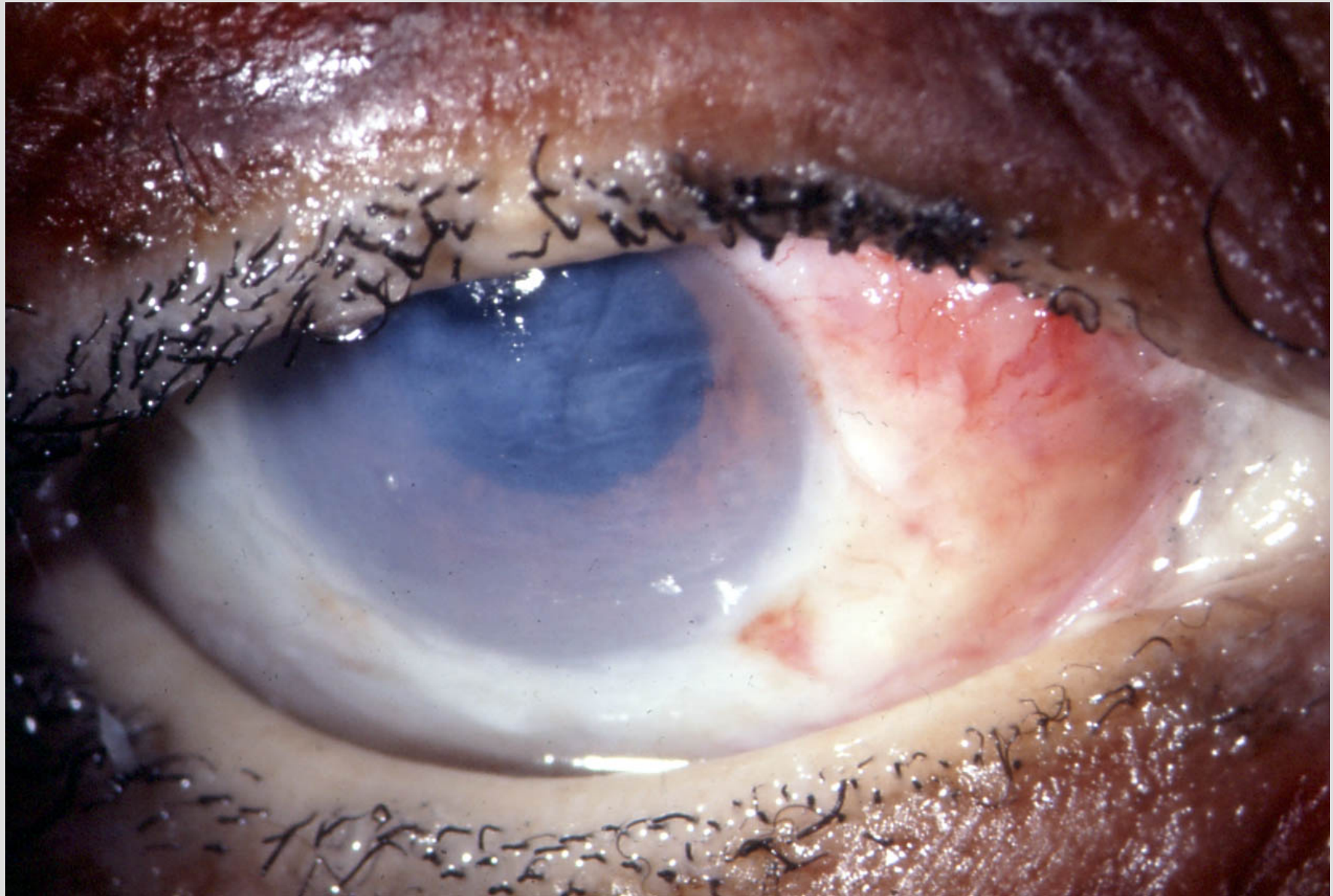
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Cologne Merheim
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Severe ischemia two days after firework burn

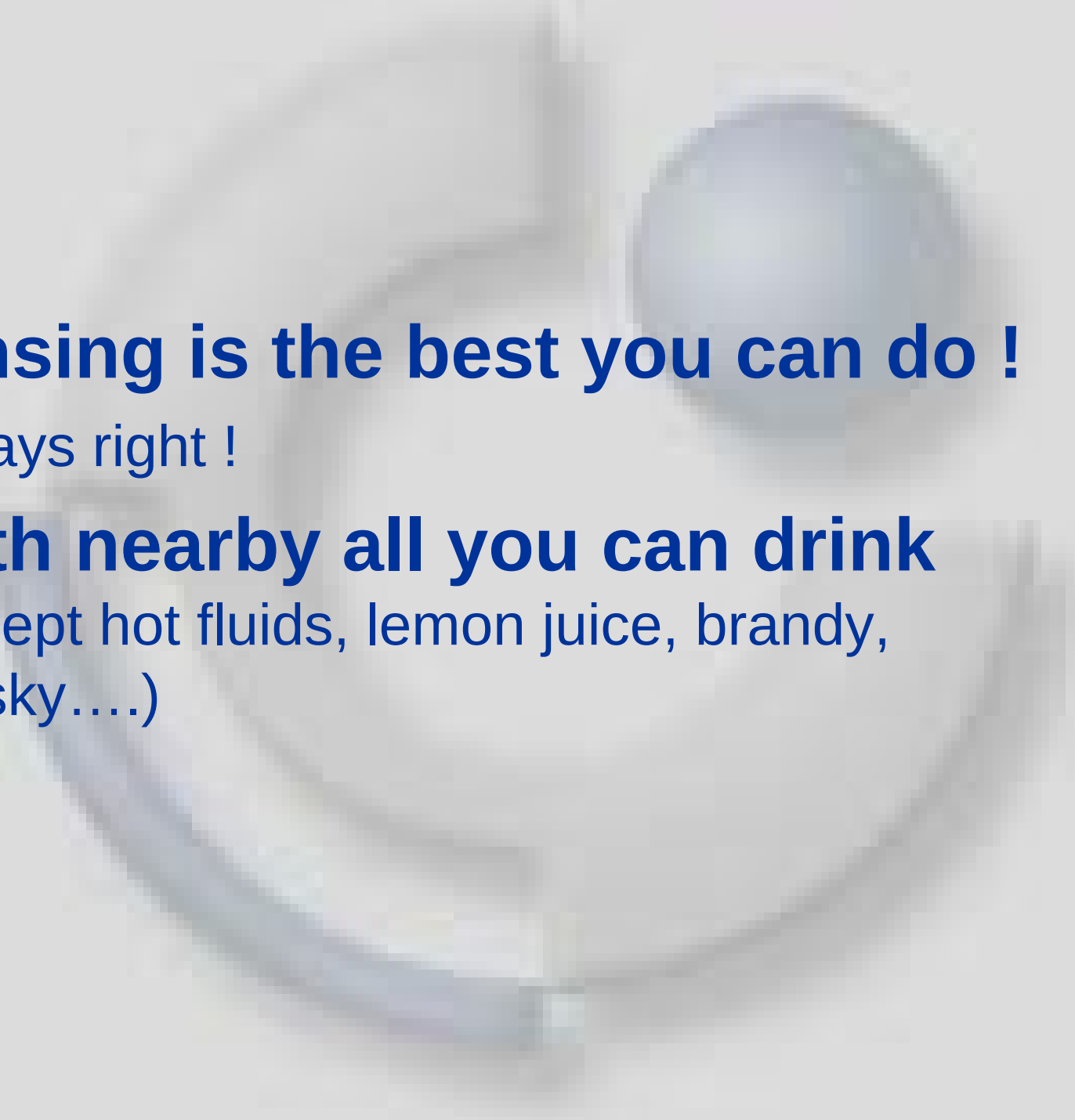




What to do ?

How to rinse ?

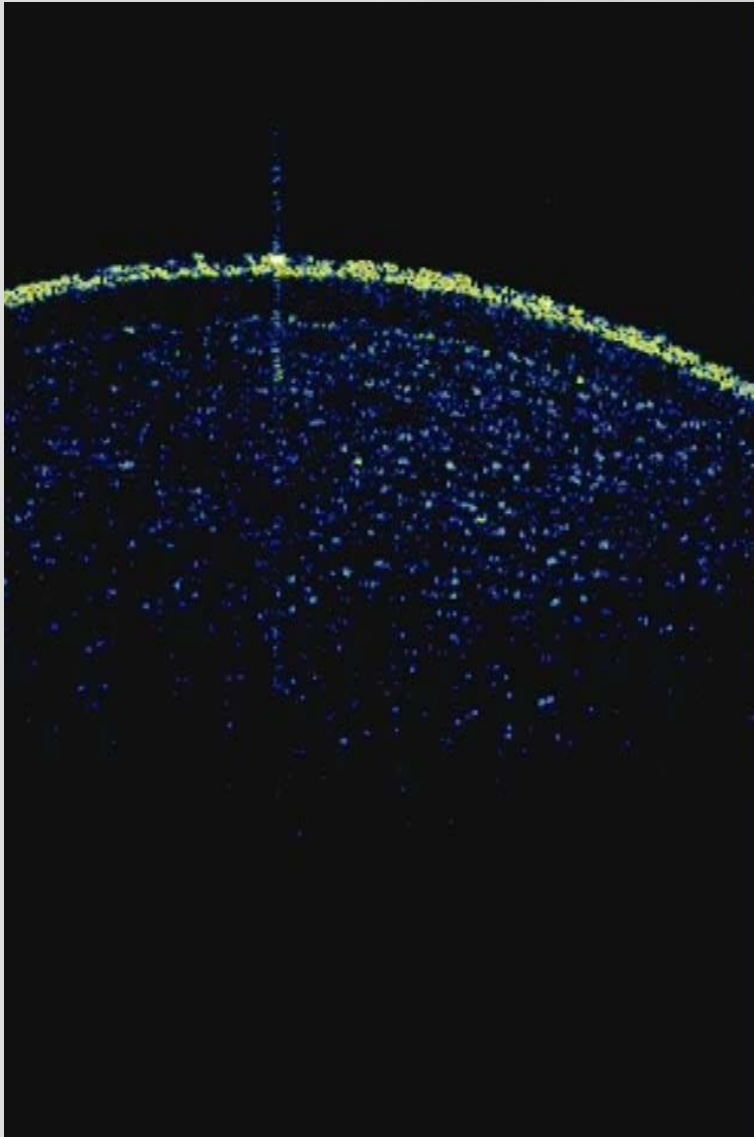


- 
- **Rinsing is the best you can do !**
 - Always right !
 - **With nearby all you can drink**
(except hot fluids, lemon juice, brandy, whisky....)



Sodium hydroxide

film 01



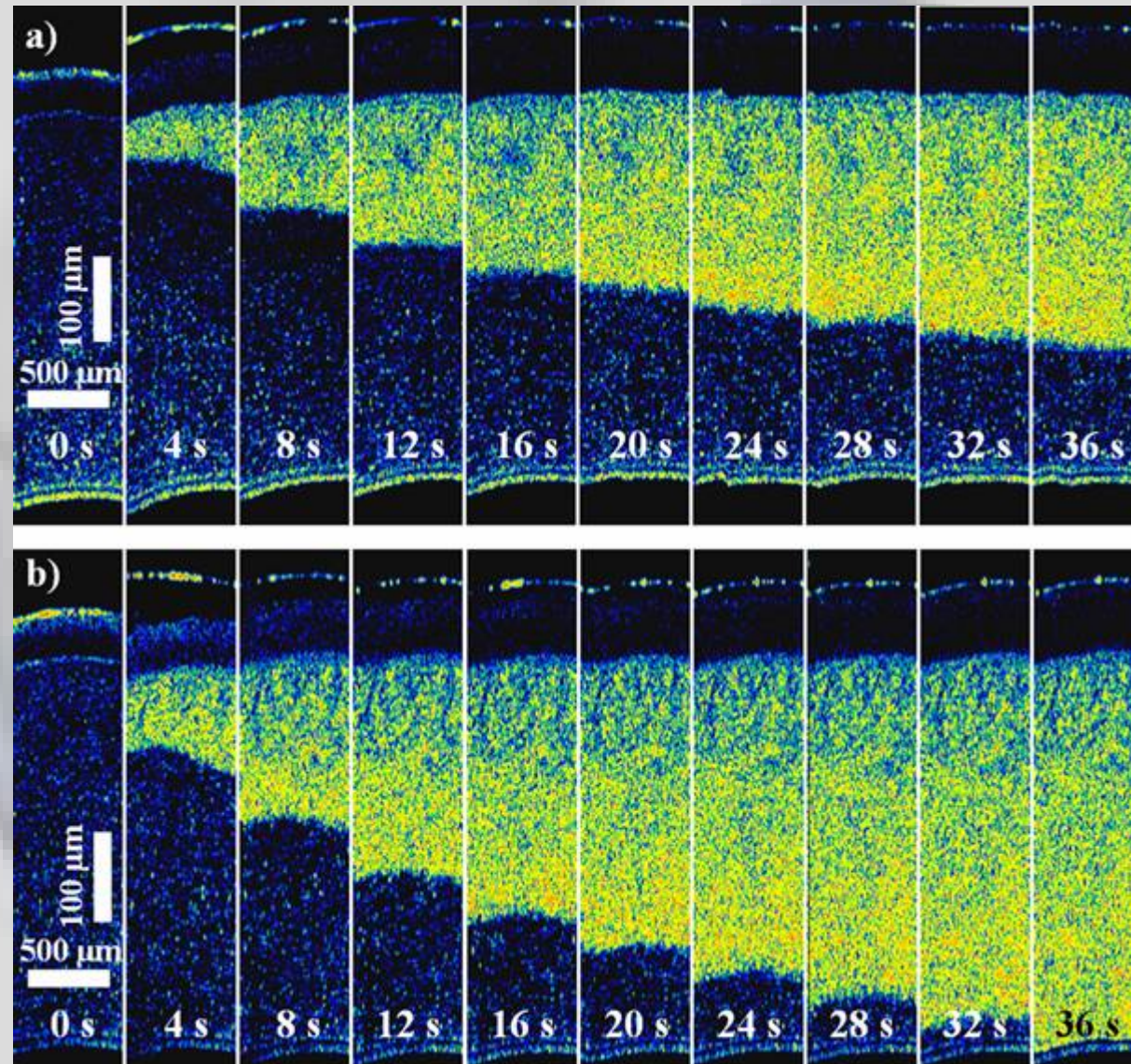
Eye burn video

How long does it take to burn a cornea?

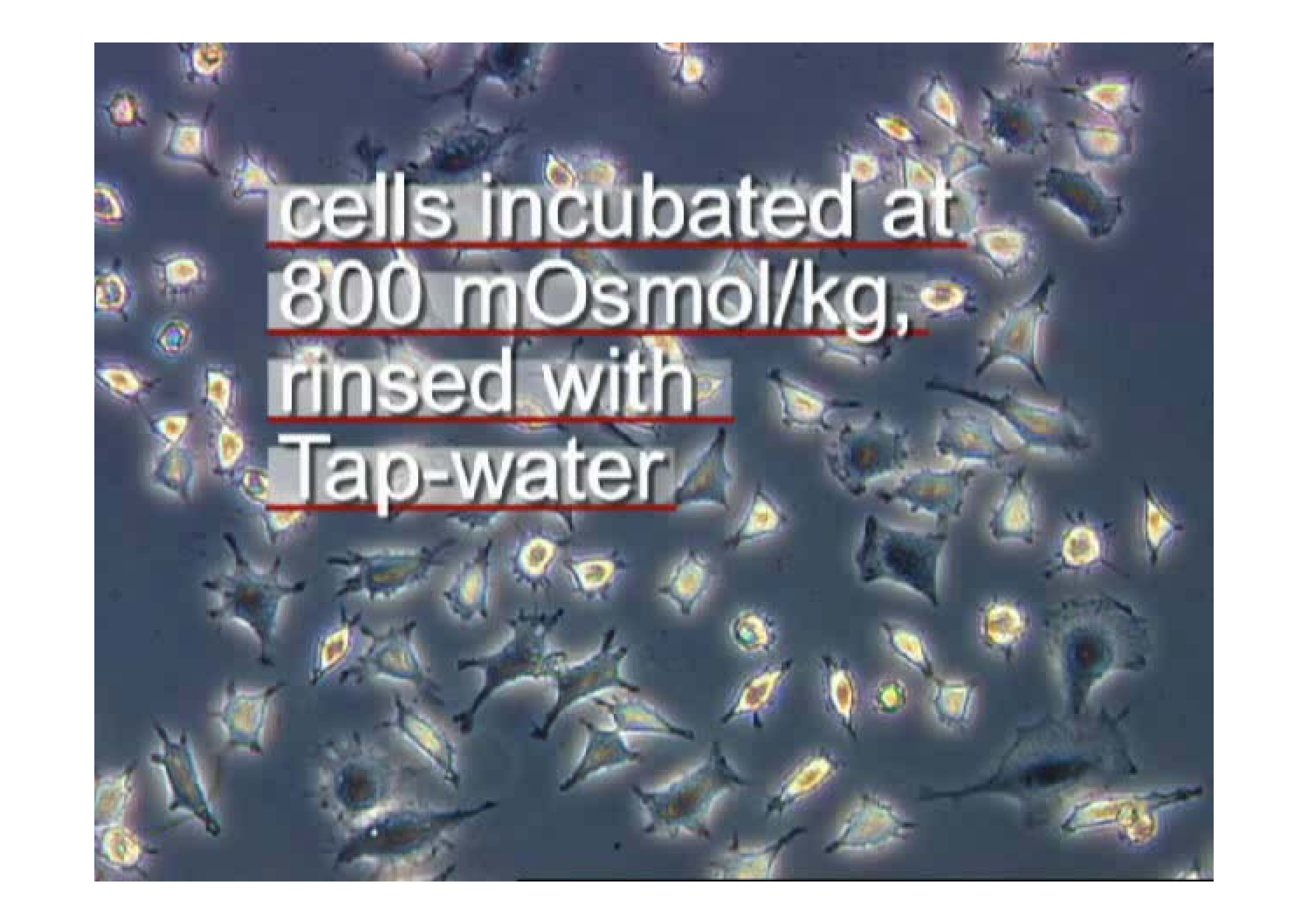
1 mol NaOH

The higher the
concentration
the faster the
burn

2 mol NaOH



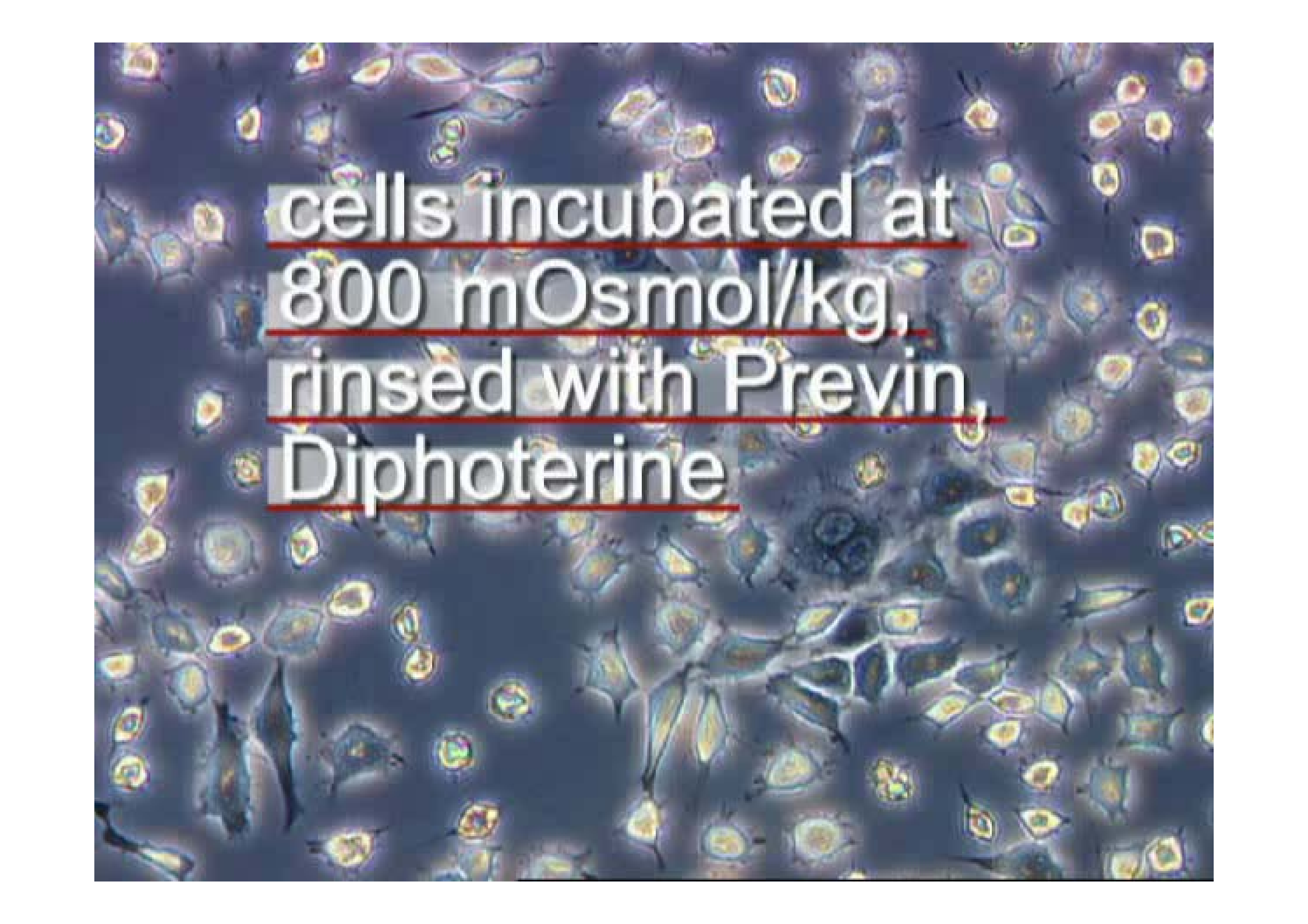
- 
- Film 02

A phase-contrast micrograph showing a large number of cells, likely erythrocytes, that have undergone osmotic lysis. The cells are in various stages of rupture, with some showing internal organelles and others appearing as ghost cells. The background is a dark, granular medium. The text is overlaid on the upper left portion of the image.

cells incubated at
800 mOsmol/kg,
rinsed with
Tap-water

- Film 04



A microscopic image showing a dense population of cells, likely epithelial or fibroblastic in nature. The cells are stained, showing prominent nuclei and some cytoplasmic detail. The background is a dark, mottled blue-grey. Overlaid on the upper left portion of the image is a text block with four lines, each underlined with a red line. The text is white with a slight shadow effect.

cells incubated at
800 mOsmol/kg,
rinsed with Previn,
Diphoterine

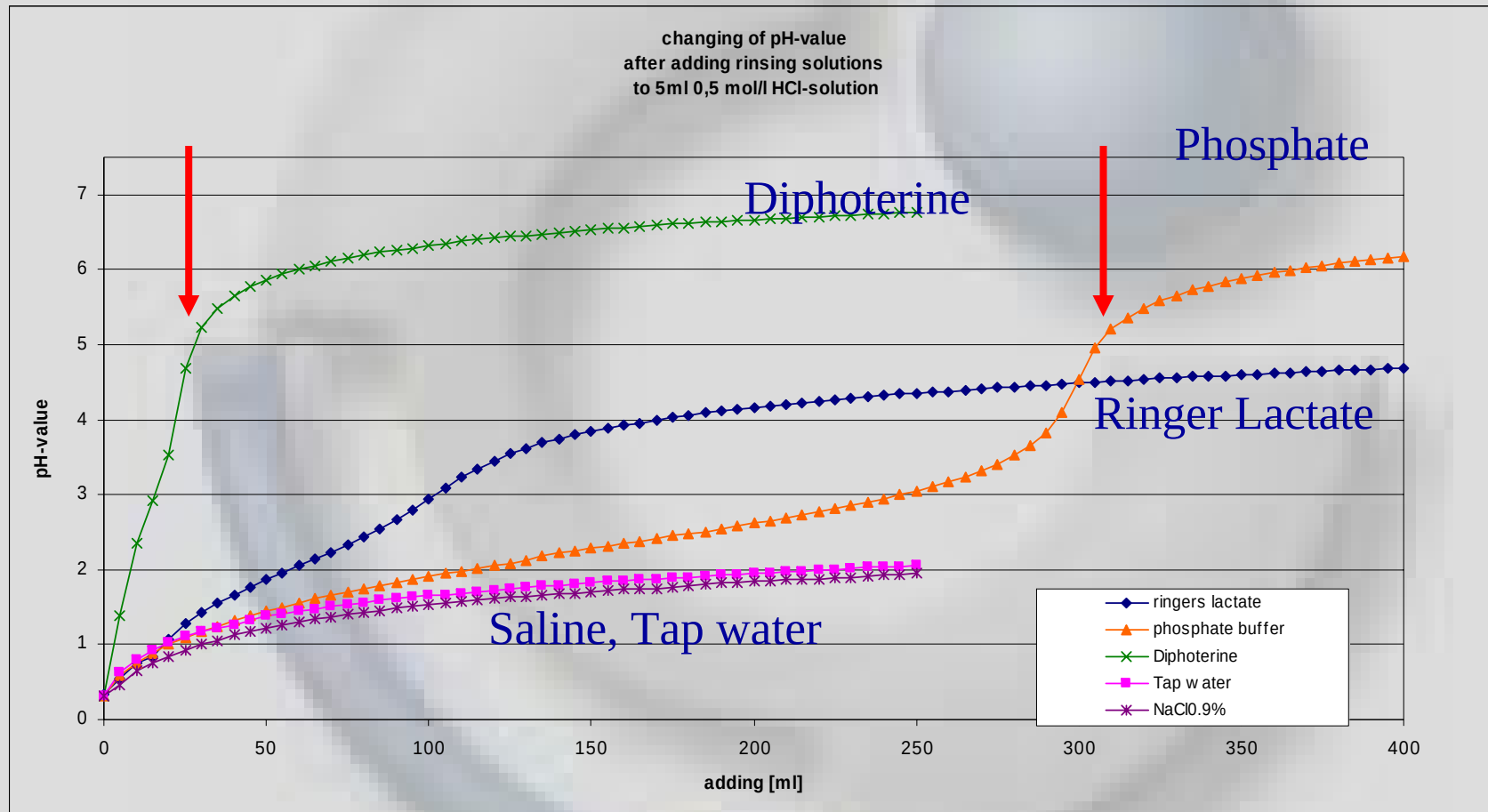
Osmolarity considerations



Take home

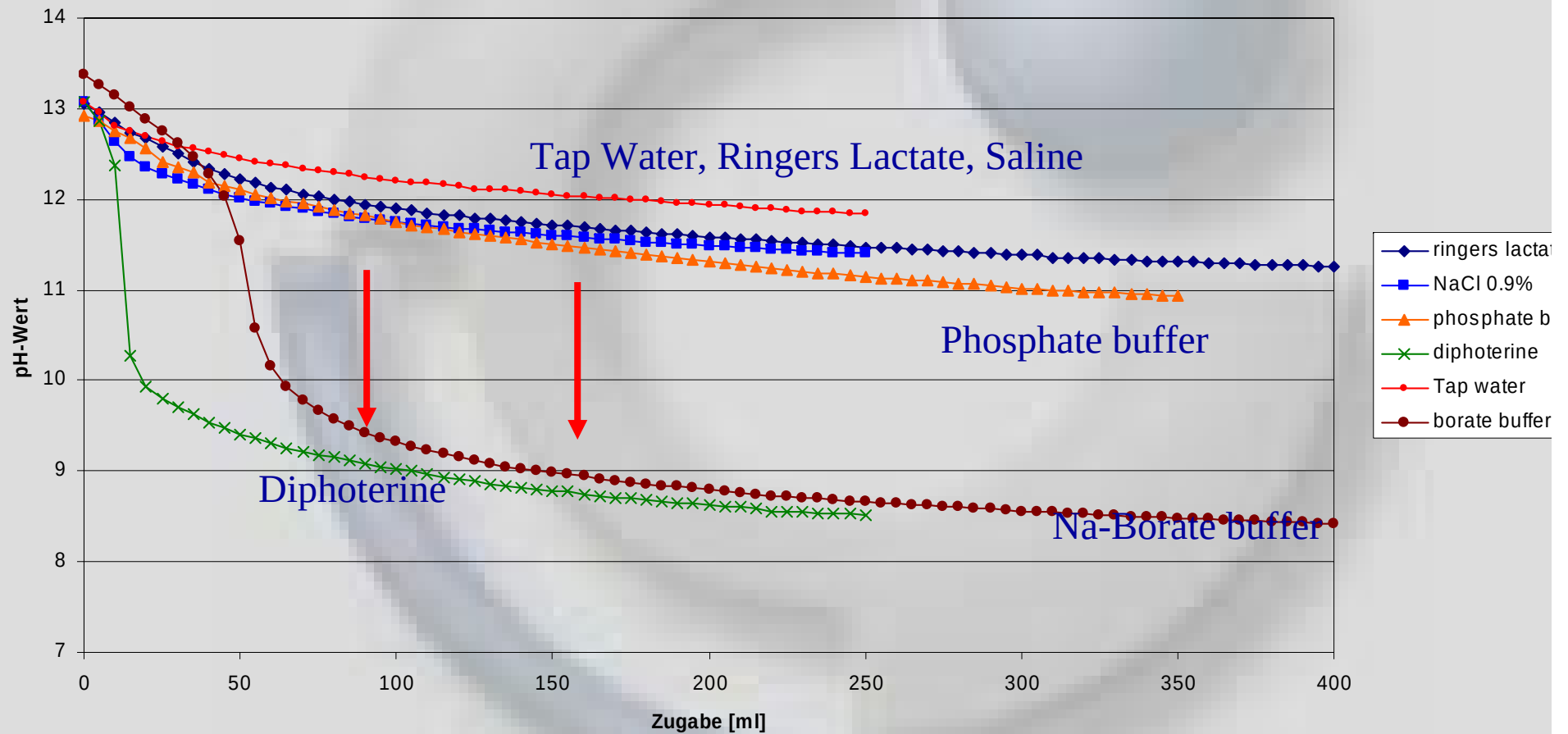
- **Osmoshock causes additional trauma**
- **hyperosmolar solutions like diphoterine stabilises tissues best**

Buffering of acids



Buffering of alkali

pH- change after
addition of rinsing fluids to
5ml 0,5 mol/l NaOH-solution

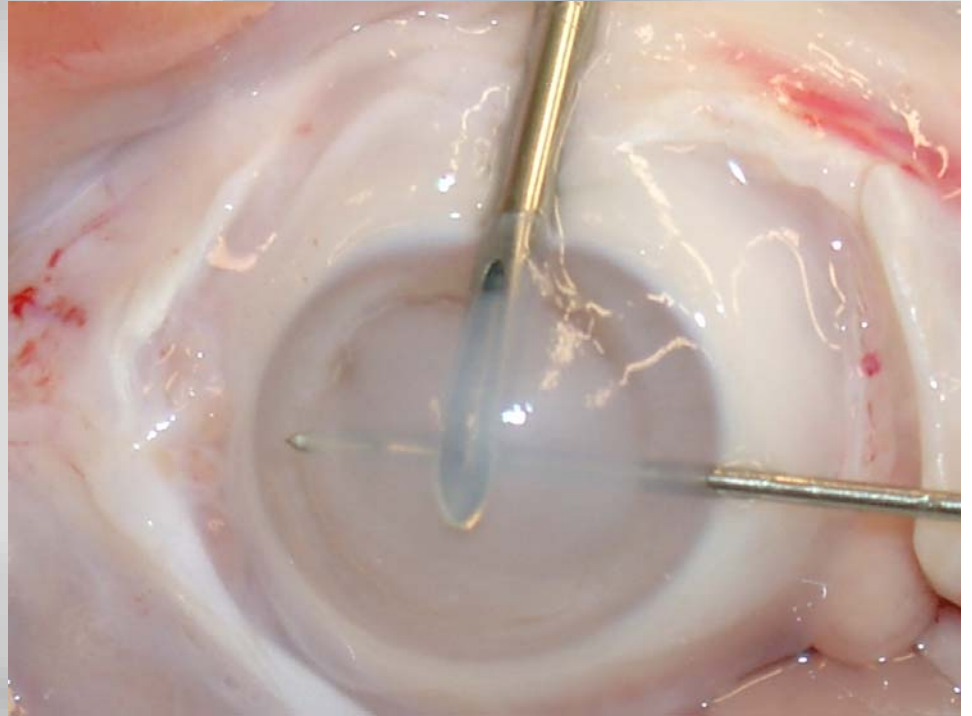
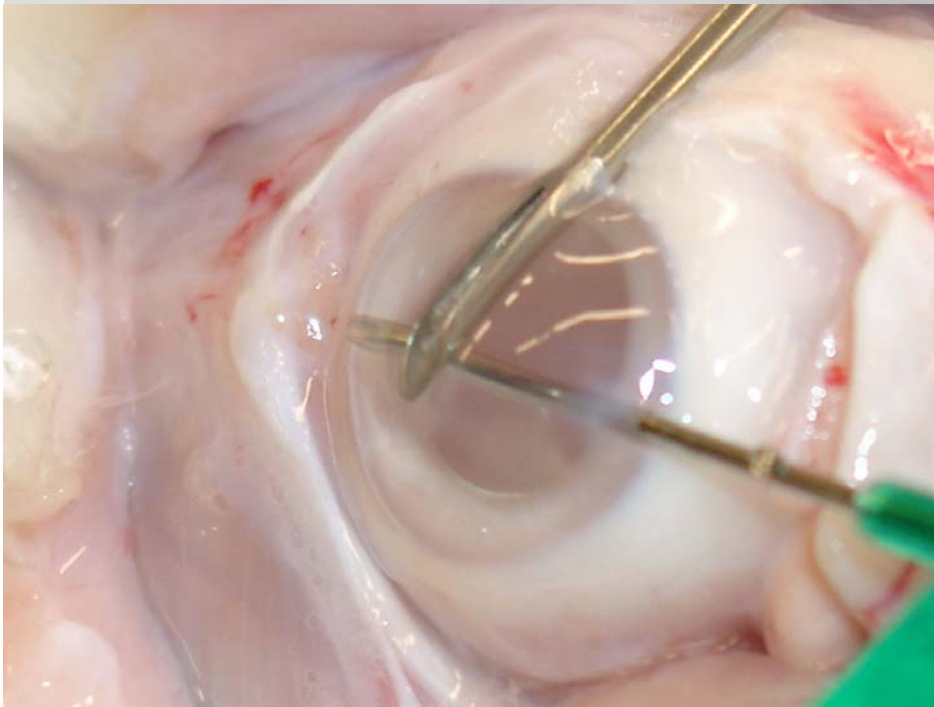




Take home!

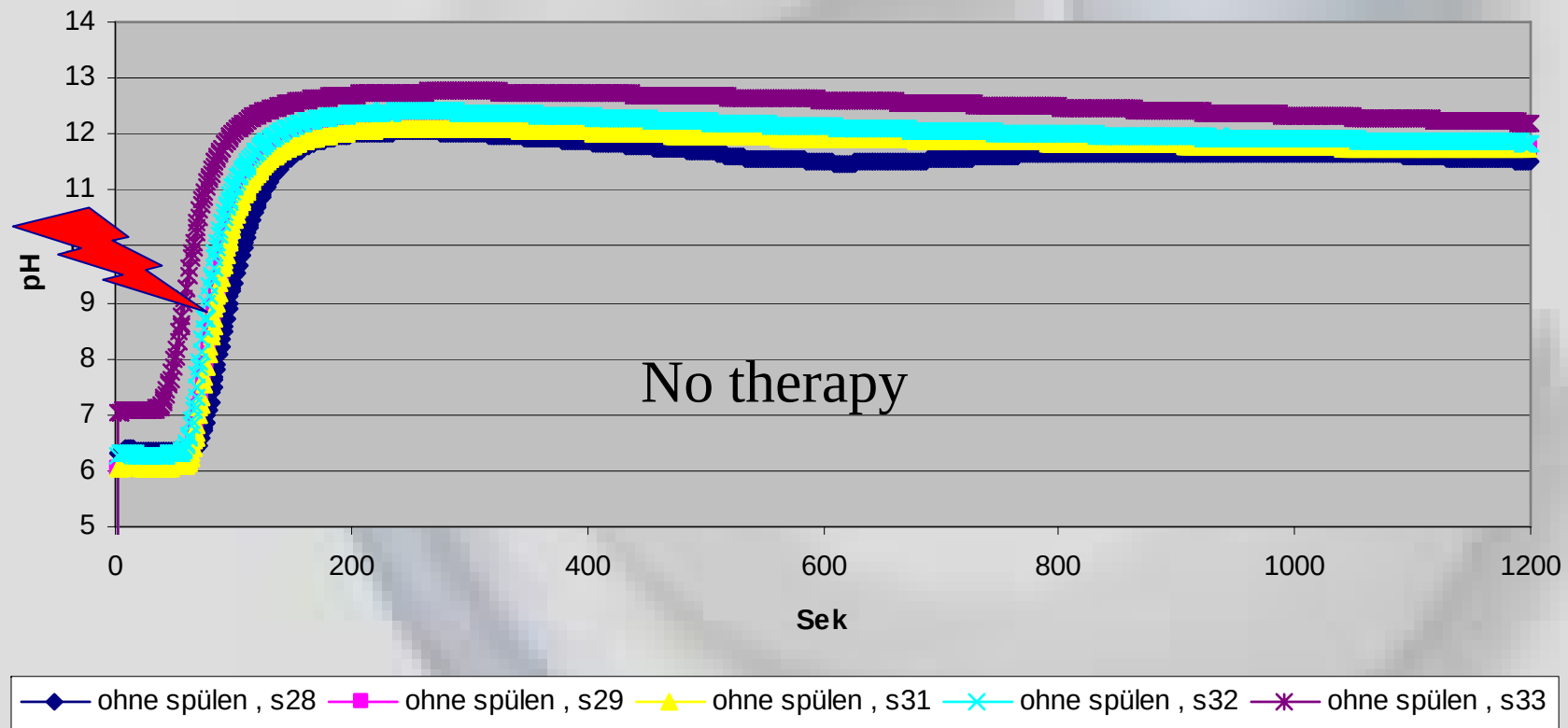
- **Only diphoterine is acting on acids and bases**

The intracameral pH and the buffer capacity



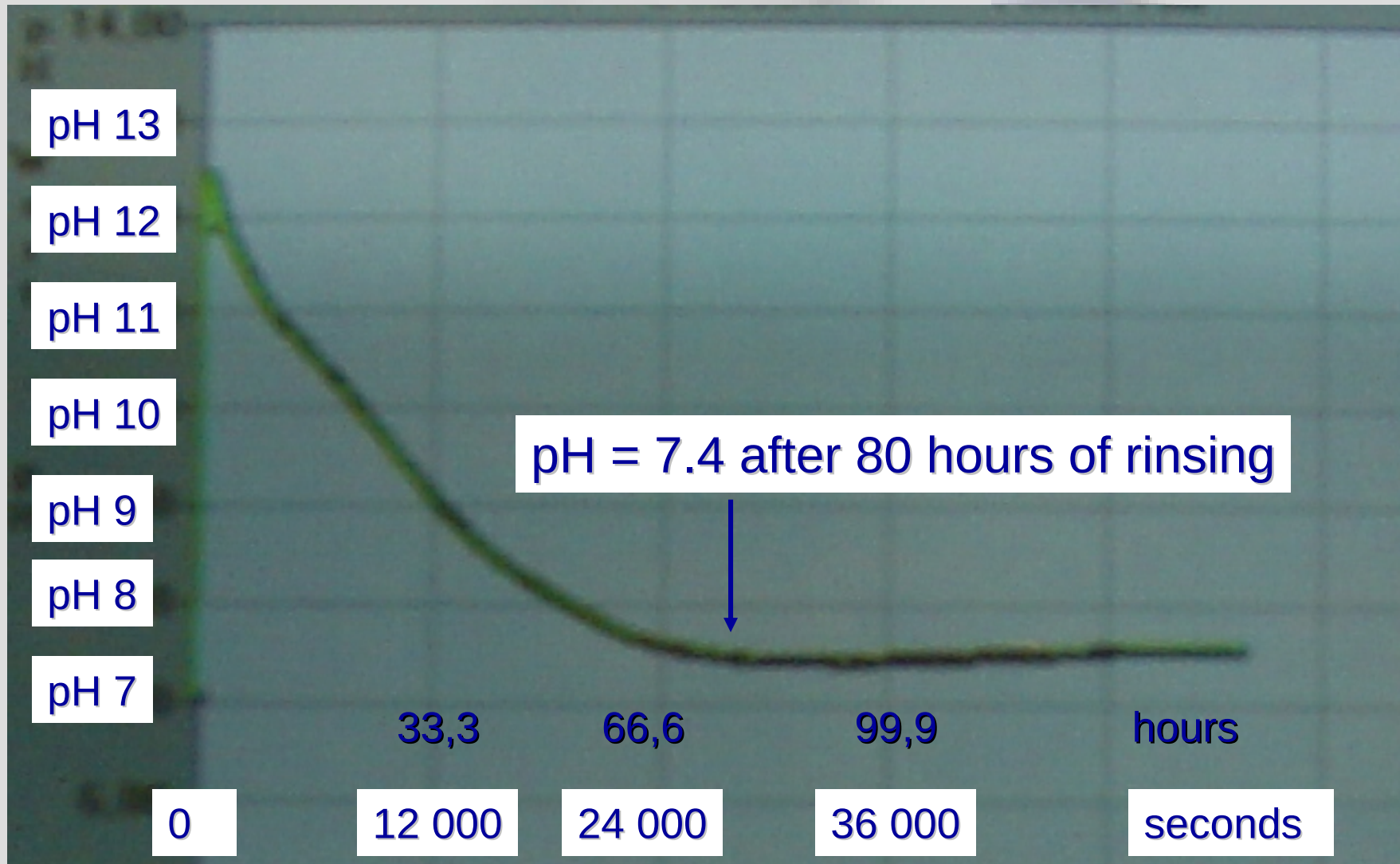


Verätzung mit N=2 NaOH, Filterpapier 10mm für 20s, Elektrode im Zentrum der VK, ohne spülen bei Kaninchen

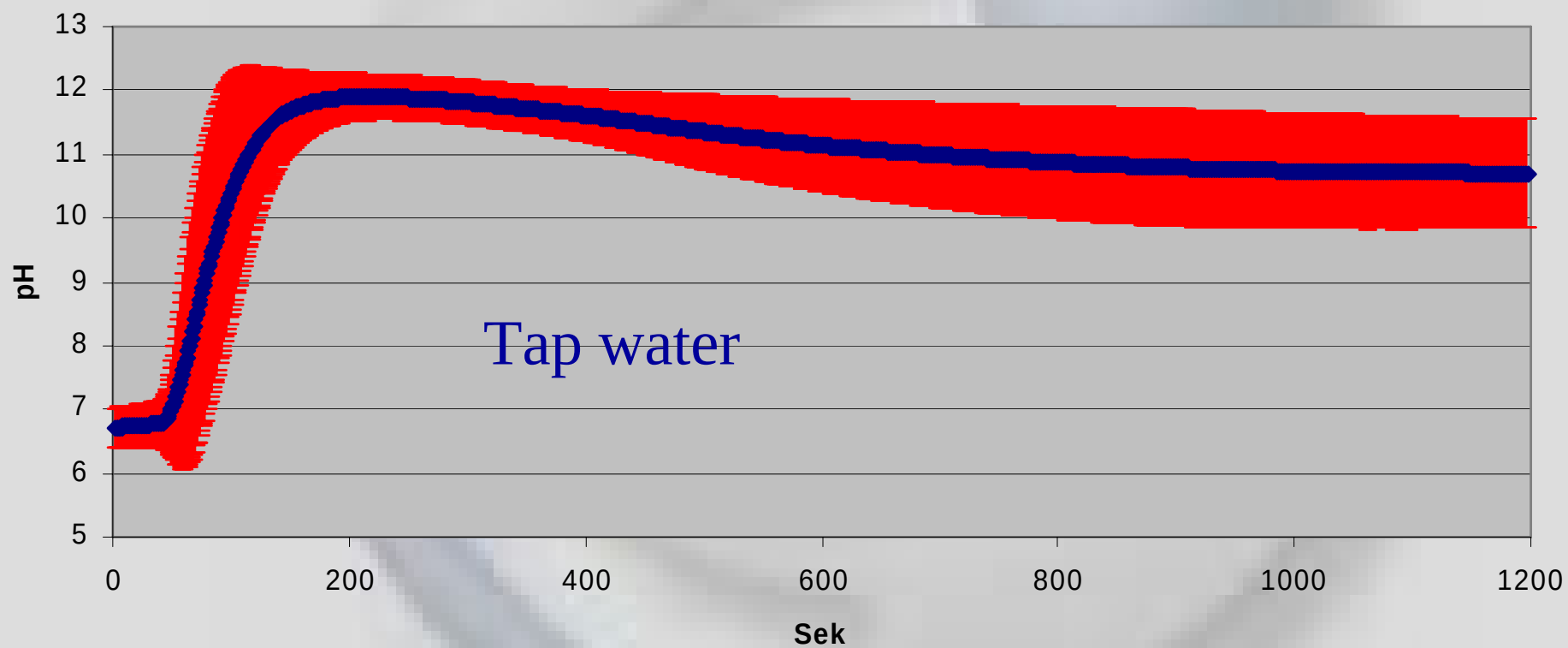


No therapy bad results!

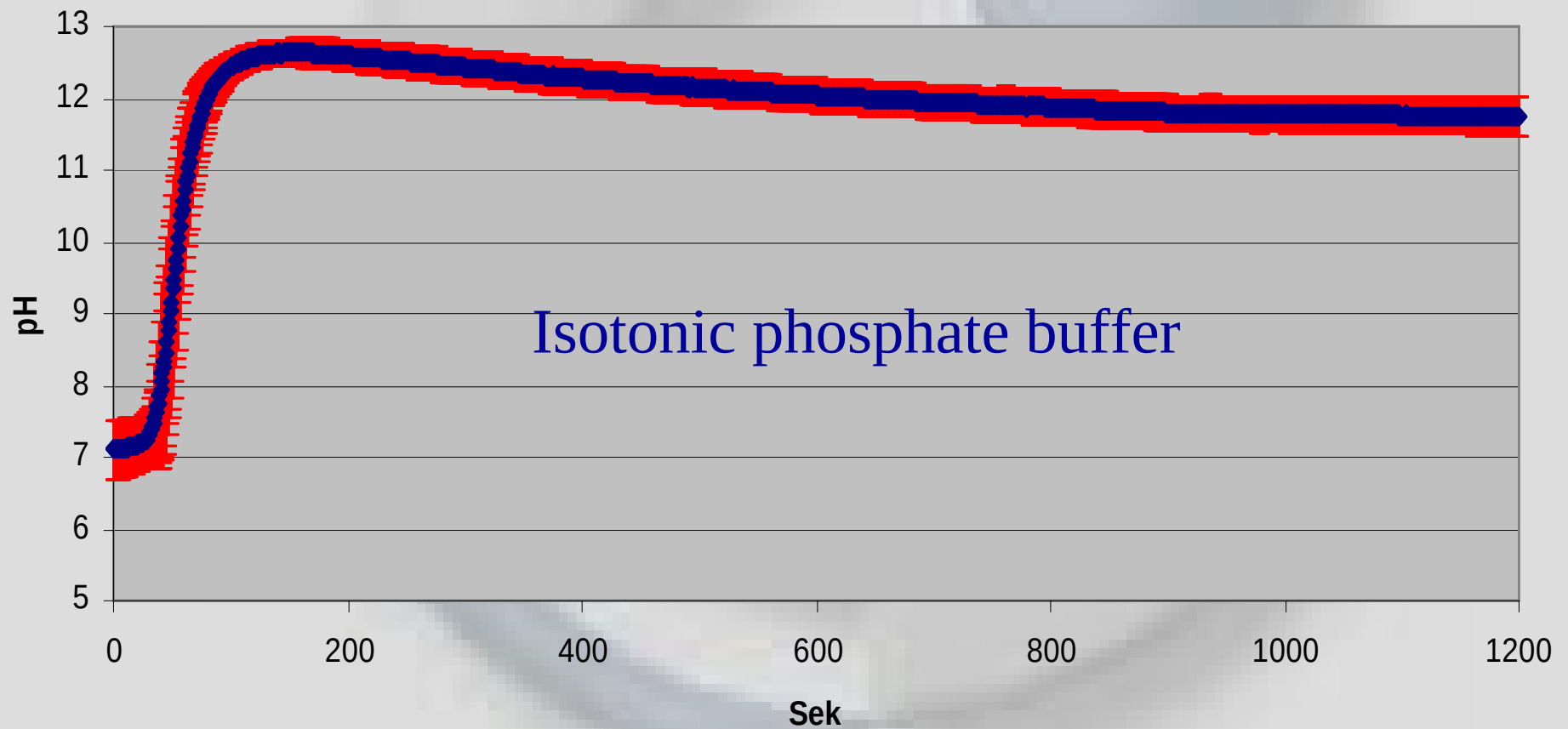
Rinsing with water



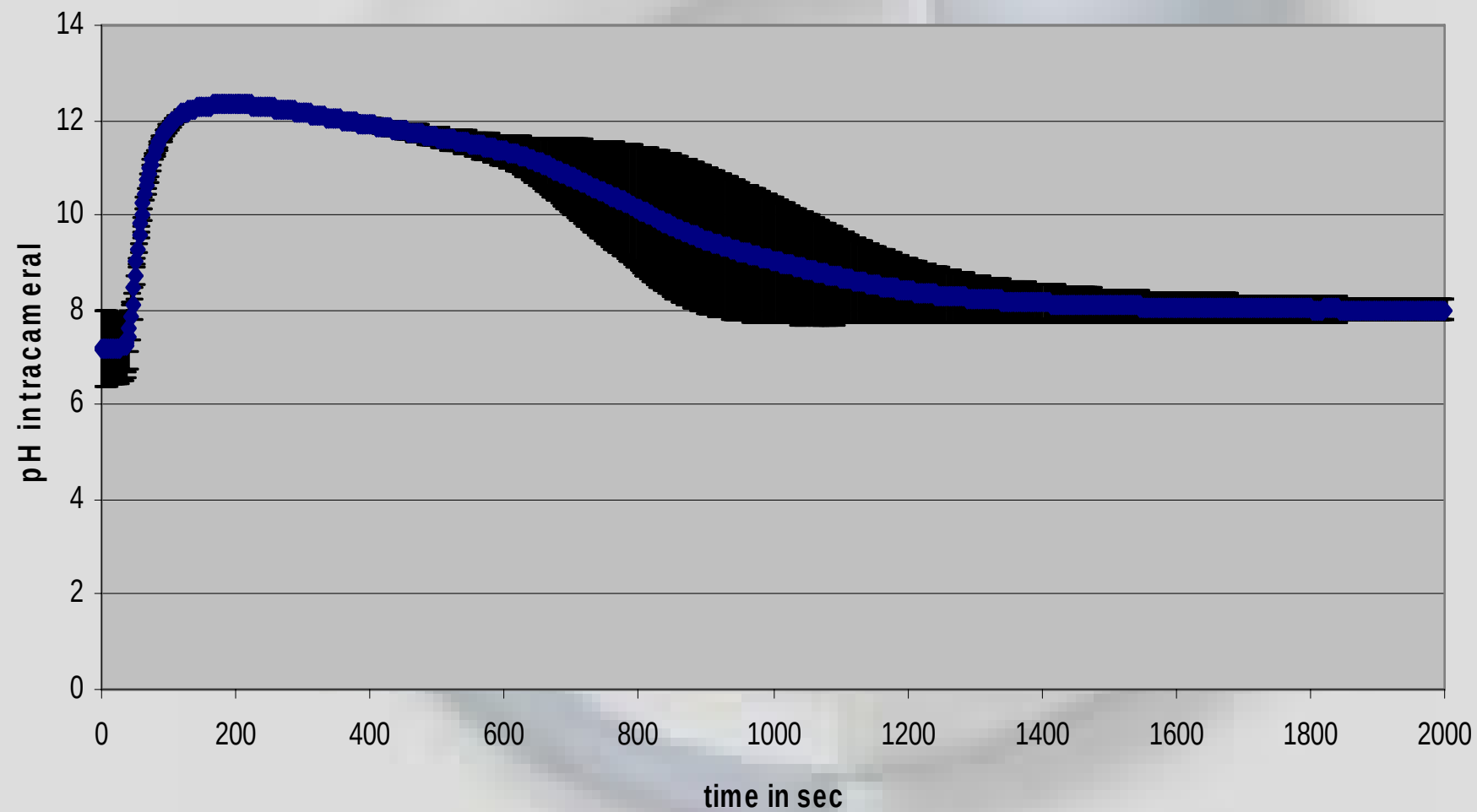
eye burns with 2 mol NaOH filter paper 10mm for 20s, immediate rinsing with
tap water for 15 min
mean of 5 measurements on rabbit eyes



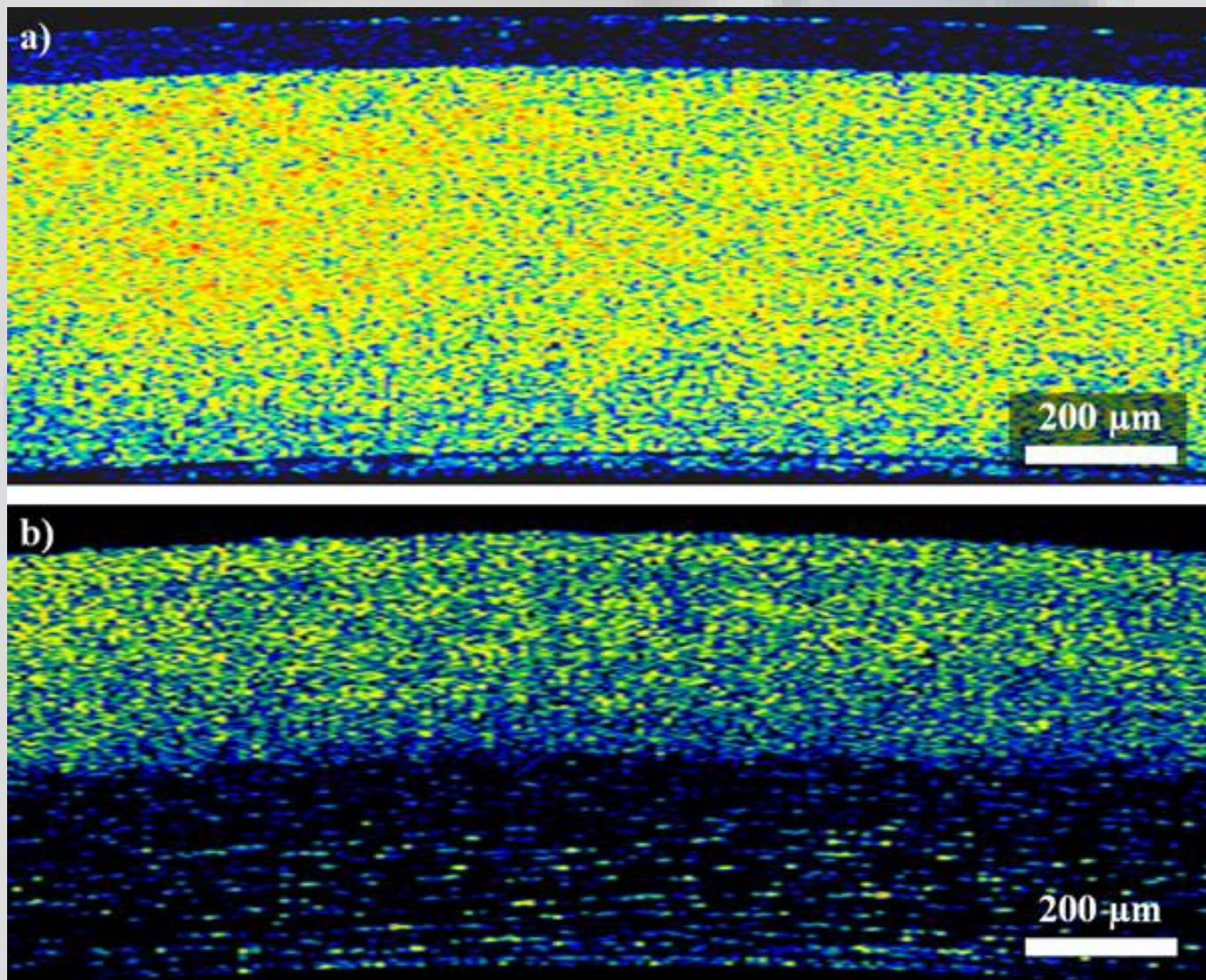
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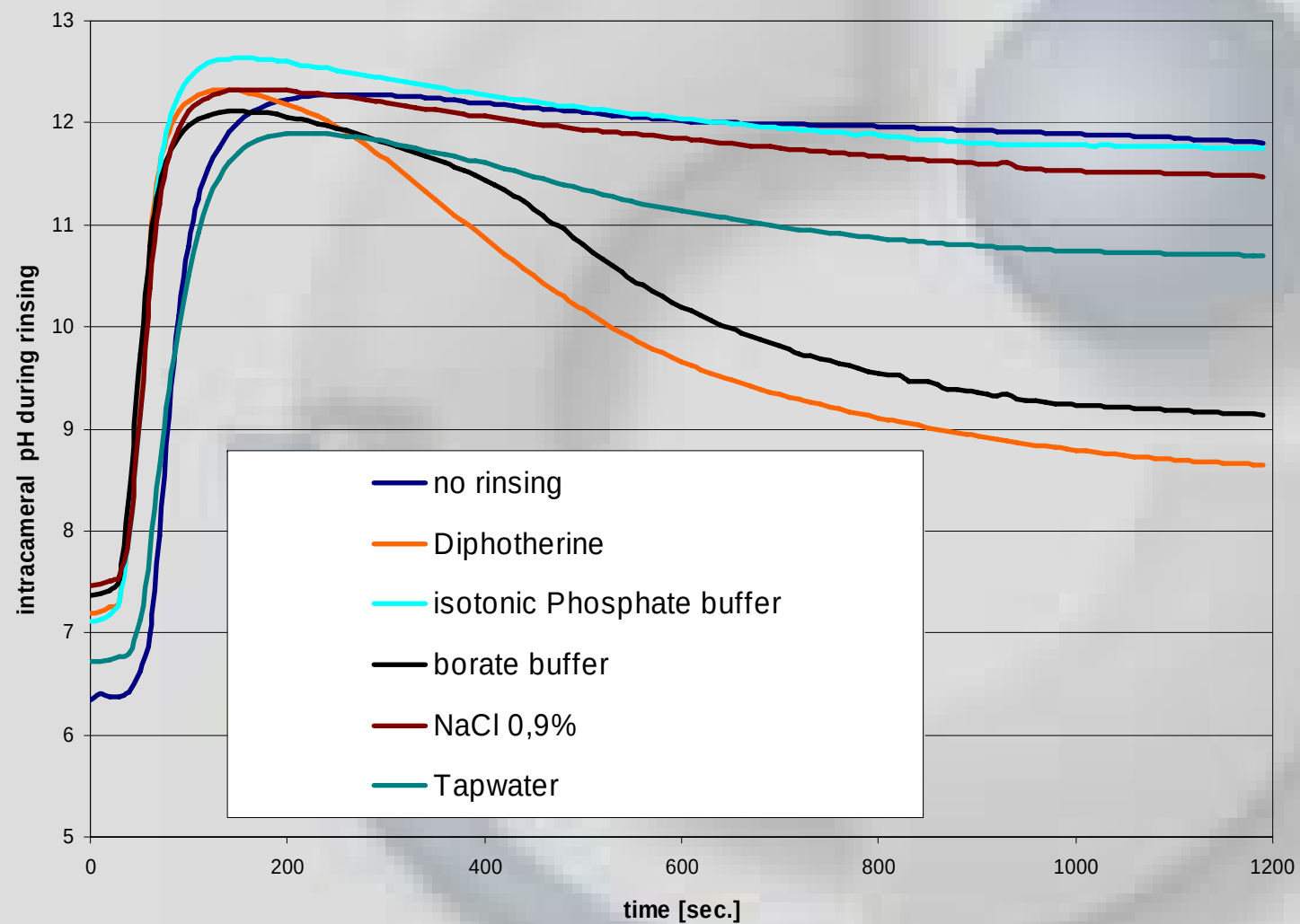


rinsg with 66 ml/min Plum superphosphate on a burnt eye with 2 mol NaOH exposed for 20 sec.
with a filter paper soaked with 25 ul (mean 2 runs)



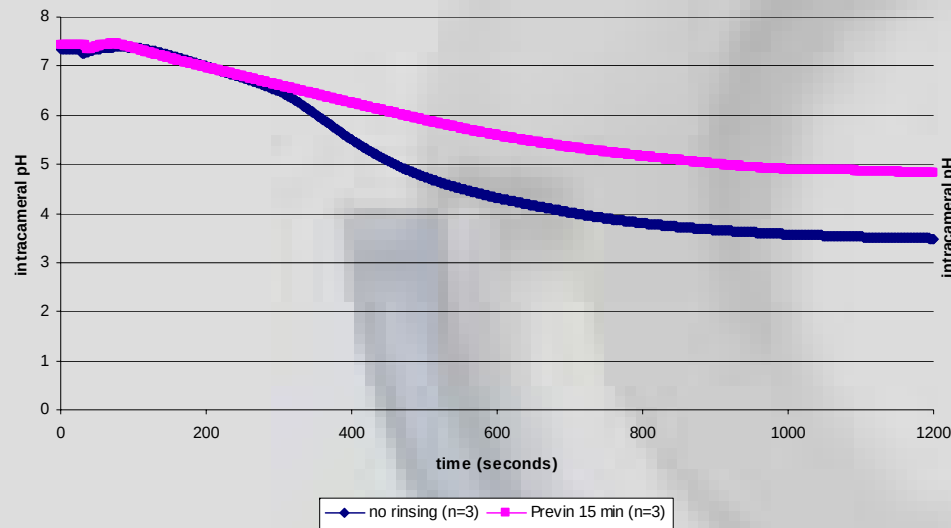
Burns with 2 mol NaOH, stop with Diphoterine 1000 ml
flow 66 ml/min (15 min)





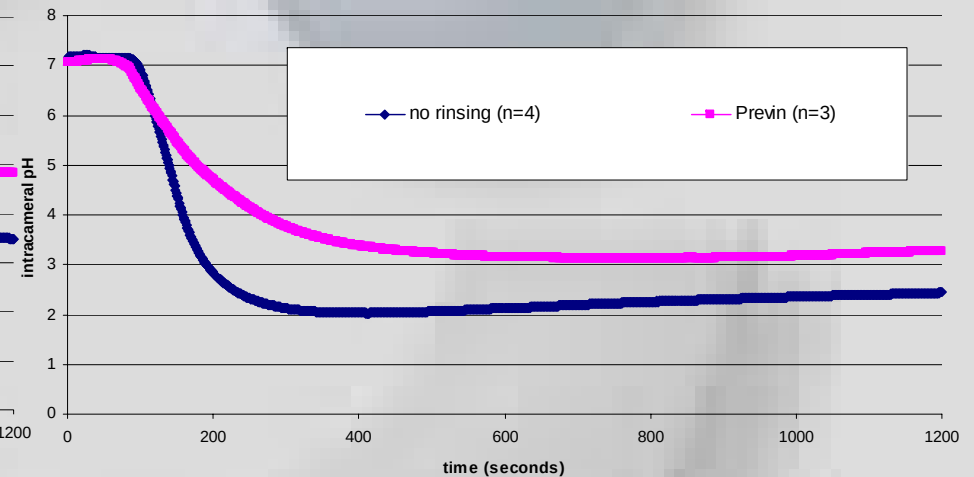
1 n H₂SO₄

Eye burns with 1n H₂SO₄ for 30 sec with 12 mm filterpaper (2 conus) electrode within center of anterior chamber close to the endothelium, rabbit corneas (n=6)



2 n H₂SO₄

Eye burns with 2n H₂SO₄ for 30 sec with 12 mm filterpaper (2 conus) electrode within center of anterior chamber close to the endothelium, rabbit corneas (n=7)



Burns with H₂So₄, and rinsing after burn with Previn
flow 66 ml/min (15 min)

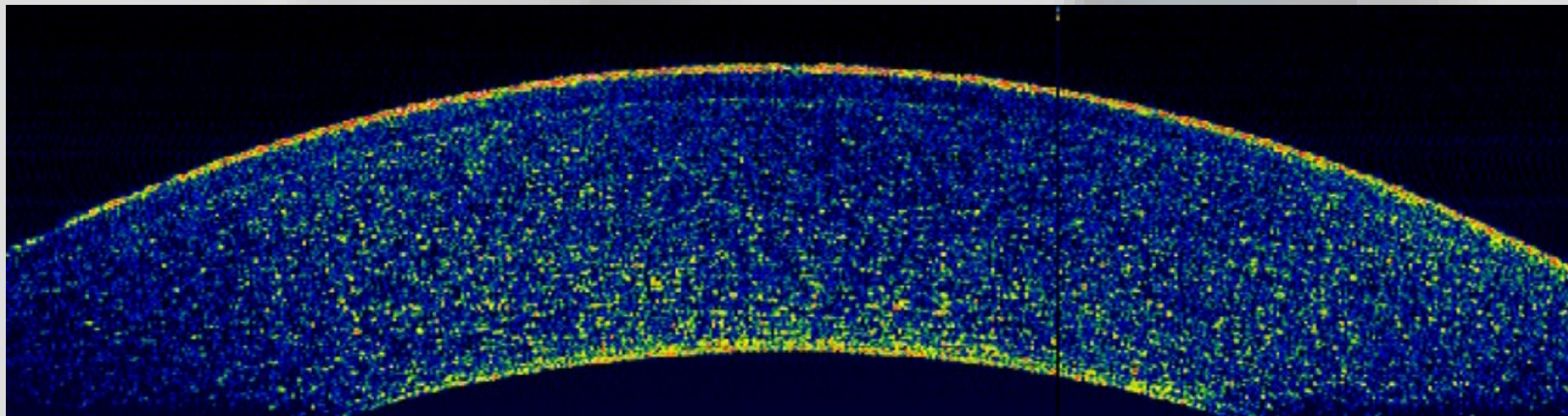
Conclusion

- No buffering at all in saline and phosphate buffer rinsing!
- Tap water diluted only!
- Most effective buffering for alkaline and acids burns was shown by Diphoterine & Previn

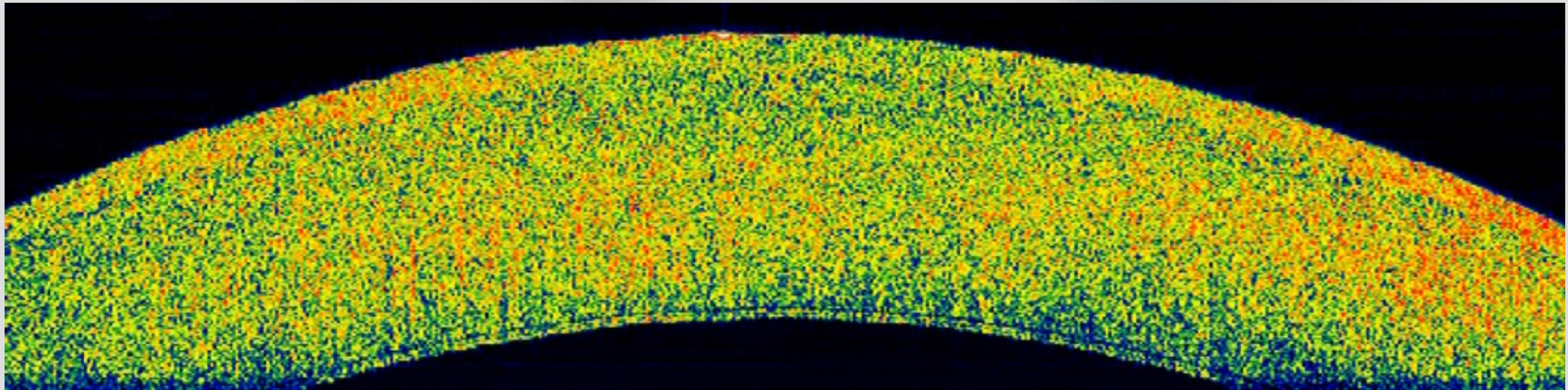
Hydrofluoric acid burns: Rinsing with ?

- Anti-HF solution „Hexafluorine“
 - >>Amphoteric binding without precipitations
- Calciumgluconate ?
 - >>Precipitations of CaF_2
- Do not take calciumchloride?
 - $\text{CaCl}_2 + 2 \text{HF} \rightarrow \text{CaF}_2 + 2 \text{HCl}$ (more toxic!!)

Fresh cornea

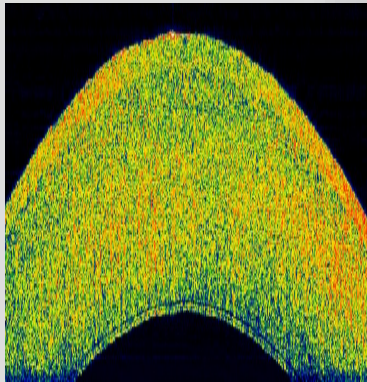


Cornea burned with 2.5% HF,
no rinsing

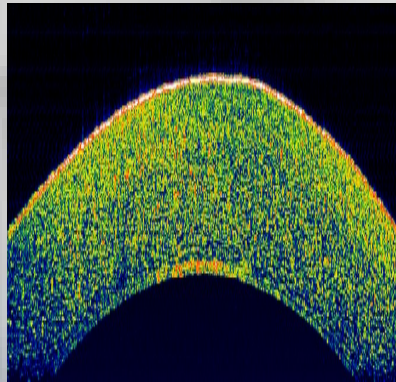


$t = 75 \text{ min}$

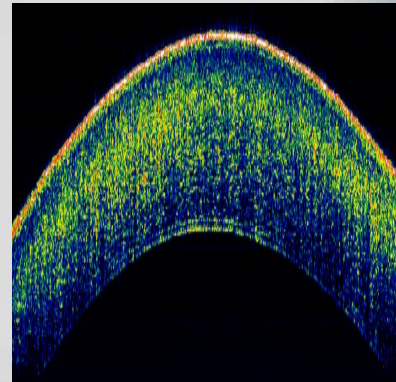
Cornea burned with 2.5% HF, comparison of status after 75 min



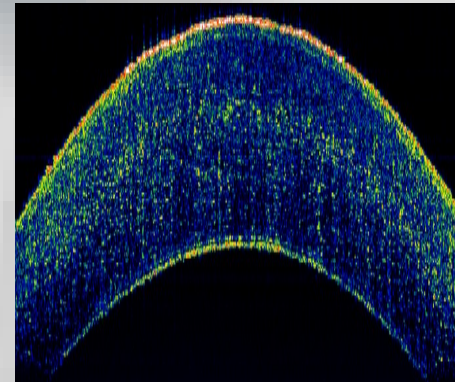
No rinsing



Water rinsing

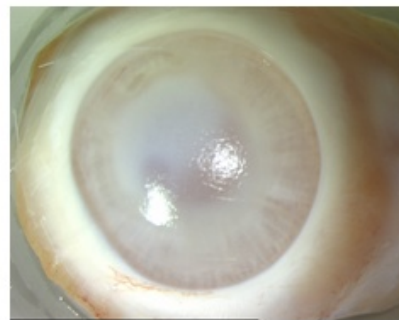
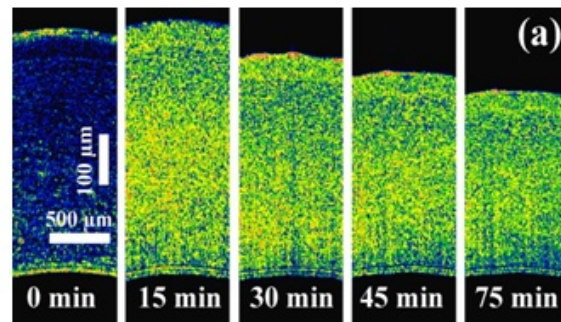


Ca-glu. rinsing

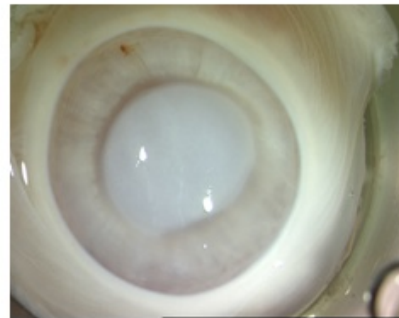
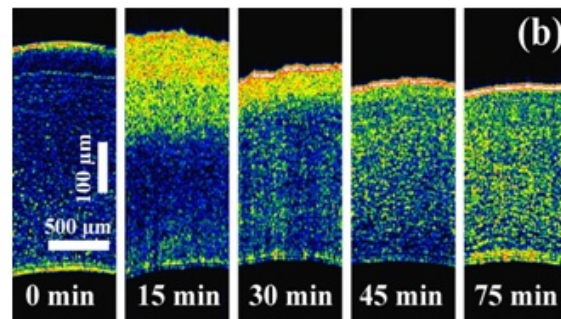


Hexafluorine rinsing

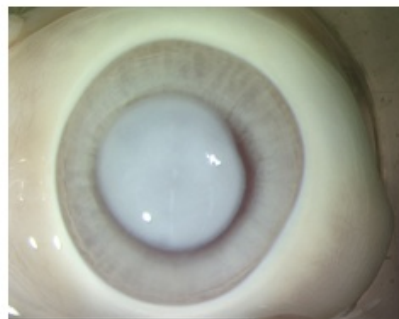
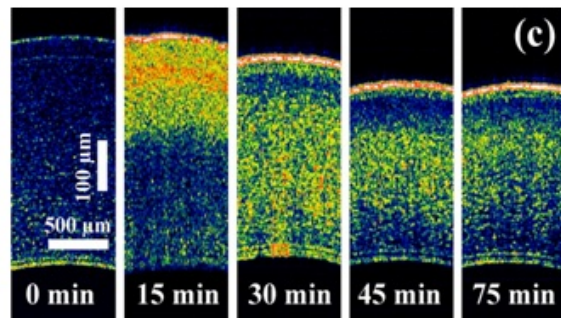
$t = 75 \text{ min}$



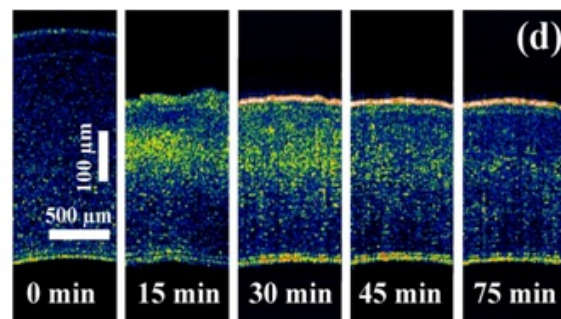
No rinsing



Rinsing with Tap water



Rinsing with calcium-
gluconate 2%



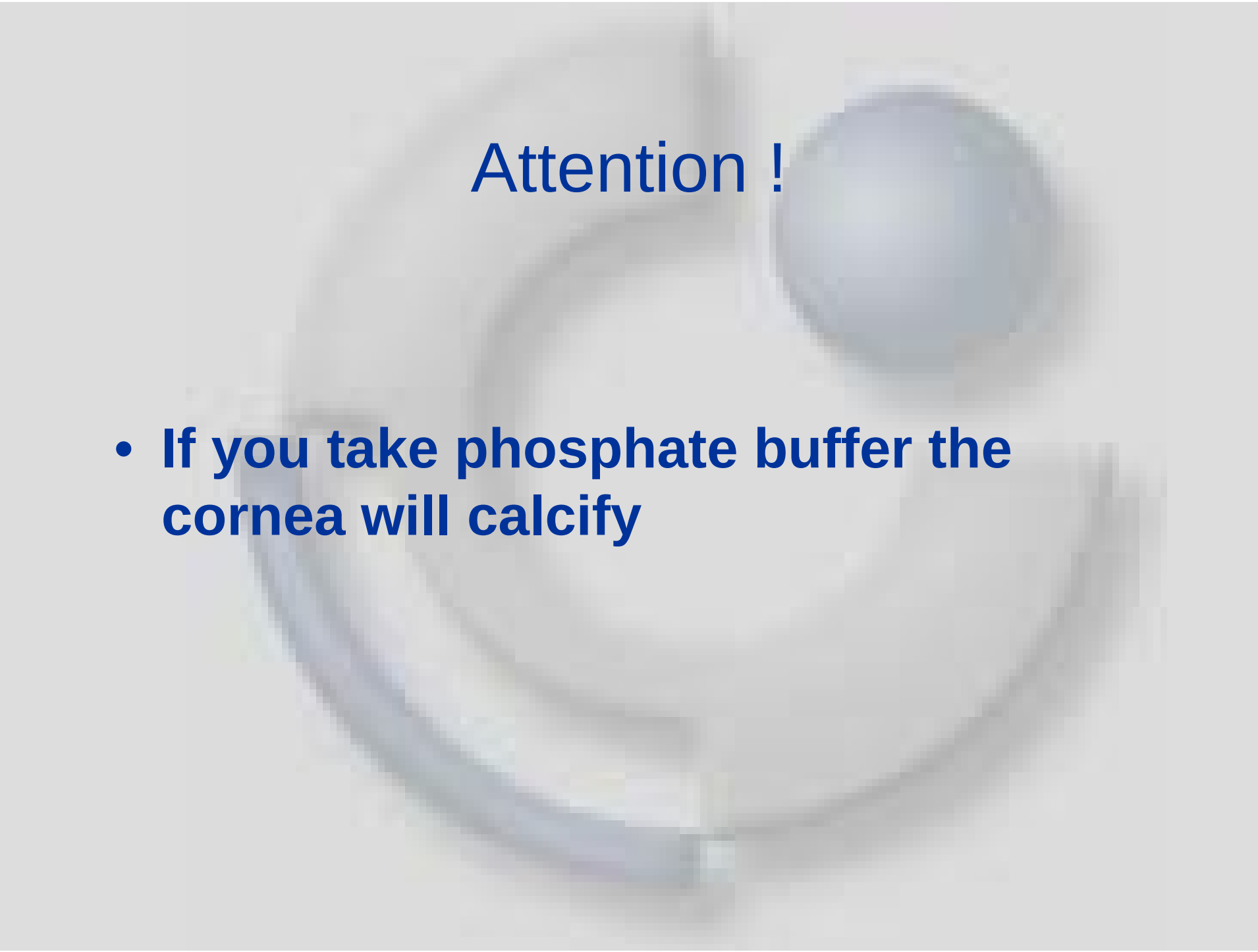
Rinsing with Hexafluorine
Anti HF solution

Conclusion

- Decontamination by early rinsing is always best
- Calcium gluconate improve decontamination of HF burns, but the best results are achieved with Anti-HF Solution Hexafluorine®

Lady being burnt with Spittacid and treated by phosphate buffer





Attention !

- **If you take phosphate buffer the cornea will calcify**

- 
- Mechanism of burns
 - NaOH burns
 - HF burns
 - Rinsing therapy
 - Buffer or water ?

Discussion ?

Films and downloads at www.acto.de

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