CXL FOR VETERINARY SURGEONS

CLINICAL RESULTS

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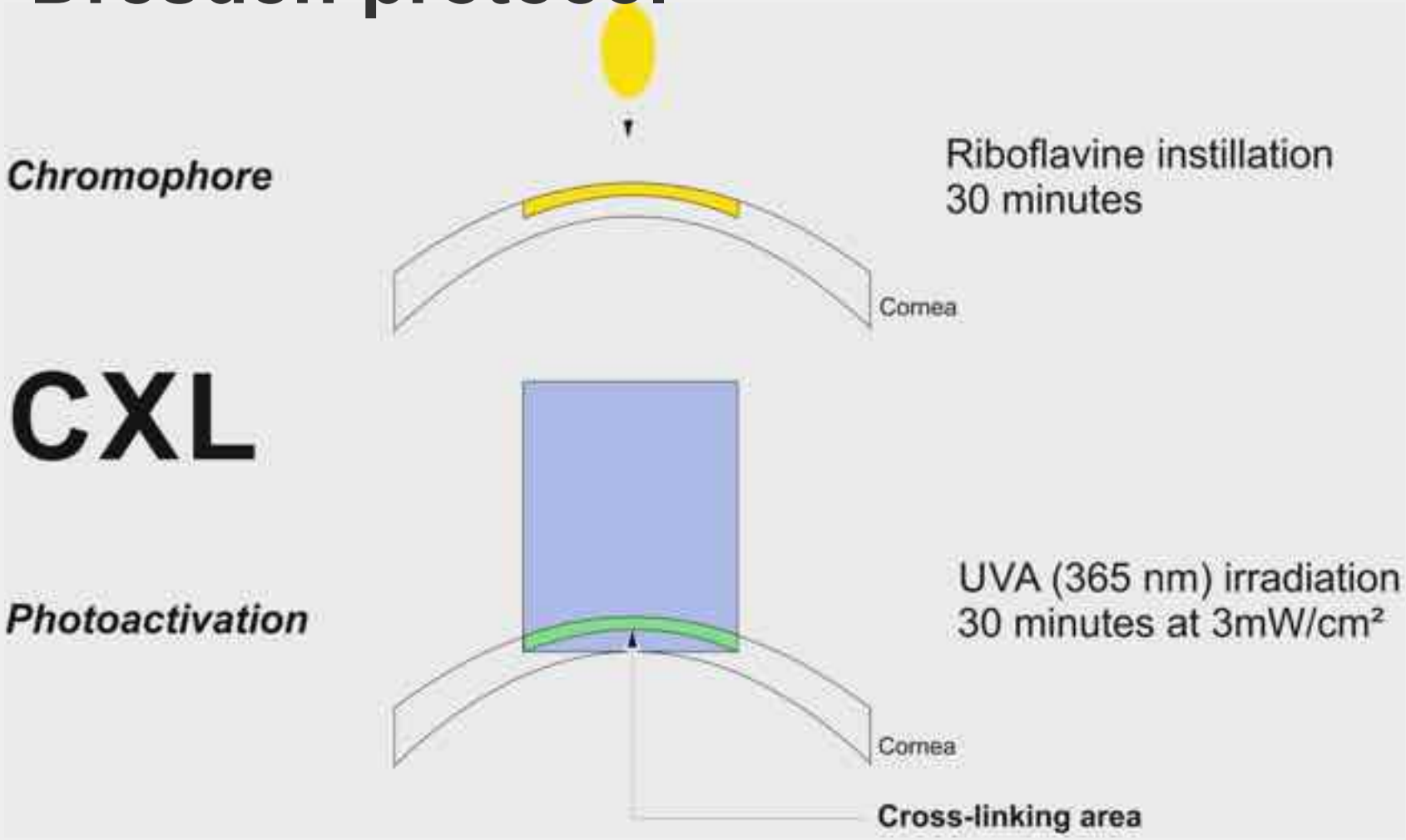
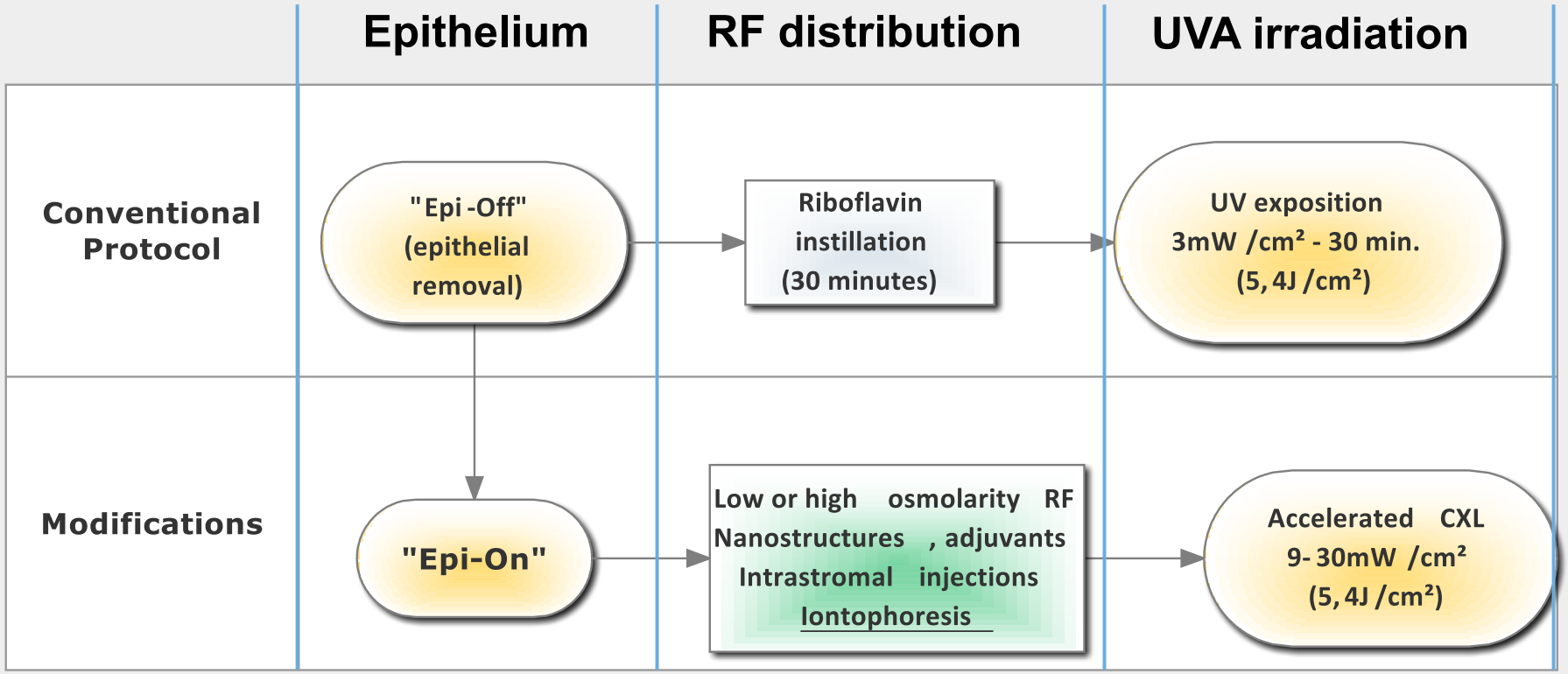
OUTLINE
ADAPTATIONS OF THE DRESDEN PROTOCOL
PITFALLS
WHAT IS THE BEST FOR MY PATIENT ?

The Dresden protocol



Dresden Protocol adaptations



RIBOFLAVIN FORMULATION

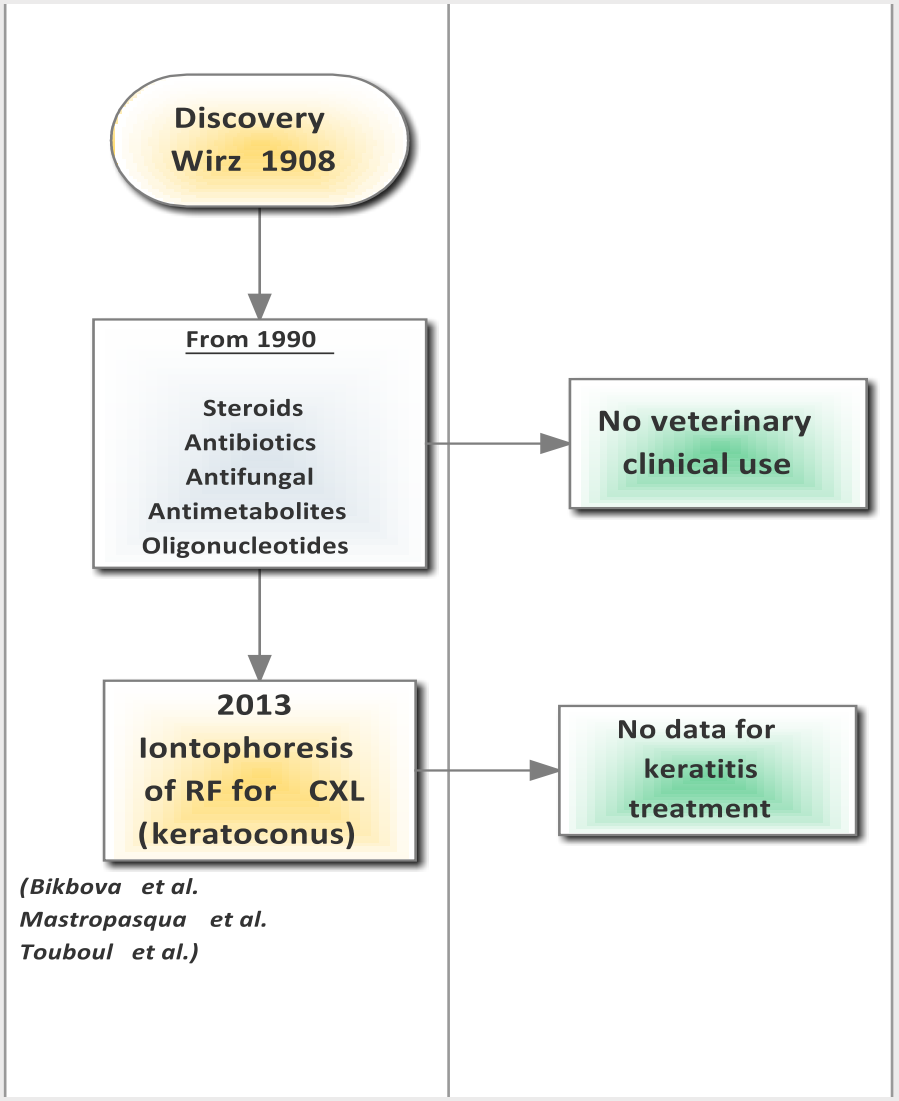
		Time dependant
Isotonic (0,1% + Dextran)	hyperosmolarity	Reduces corneal thickness
Hypotonic (0,1%)	isoosmolarity	Increases corneal thickness
Isotonic (0,1 % + HPMC)	isoosmolarity	No effect on corneal thickness
Hypotonic for iontophoresis	isomolarity	Increases corneal thickness

EXAMPLES

Name	Isotonic	Hypotonic	Rapid	Plus	TE
Volume/does	3ml	1.5ml	3ml	2.0 ml	1.0 ml
PH	6~7.6	6~7.6	6~7.6	6~7.6	6~7.6
Formula	Riboflavin > 0.1% Dextran 500 20% Na_2HPO_4 NaH_2PO_4 Water for injection	Riboflavin > 0.1% Na_2HPO_4 NaH_2PO_4 Water for injection	Riboflavin > 0.1% HPMC 0.9% Phosphate buffer saline (PBS)	Riboflavin = 0.25% 0.9% Phosphate buffer saline (PBS)	Riboflavin = 0.25% BAC EDTA Tris 0.45% Phosphate buffer saline (PBS)

Iontophoresis

Use of a **low intensity continuous electric current** to enhance the **penetration of a ionized substance** through a biological tissue



Riboflavin distribution time = 5 min

Ribovet Formula optimized for Iontophoresis

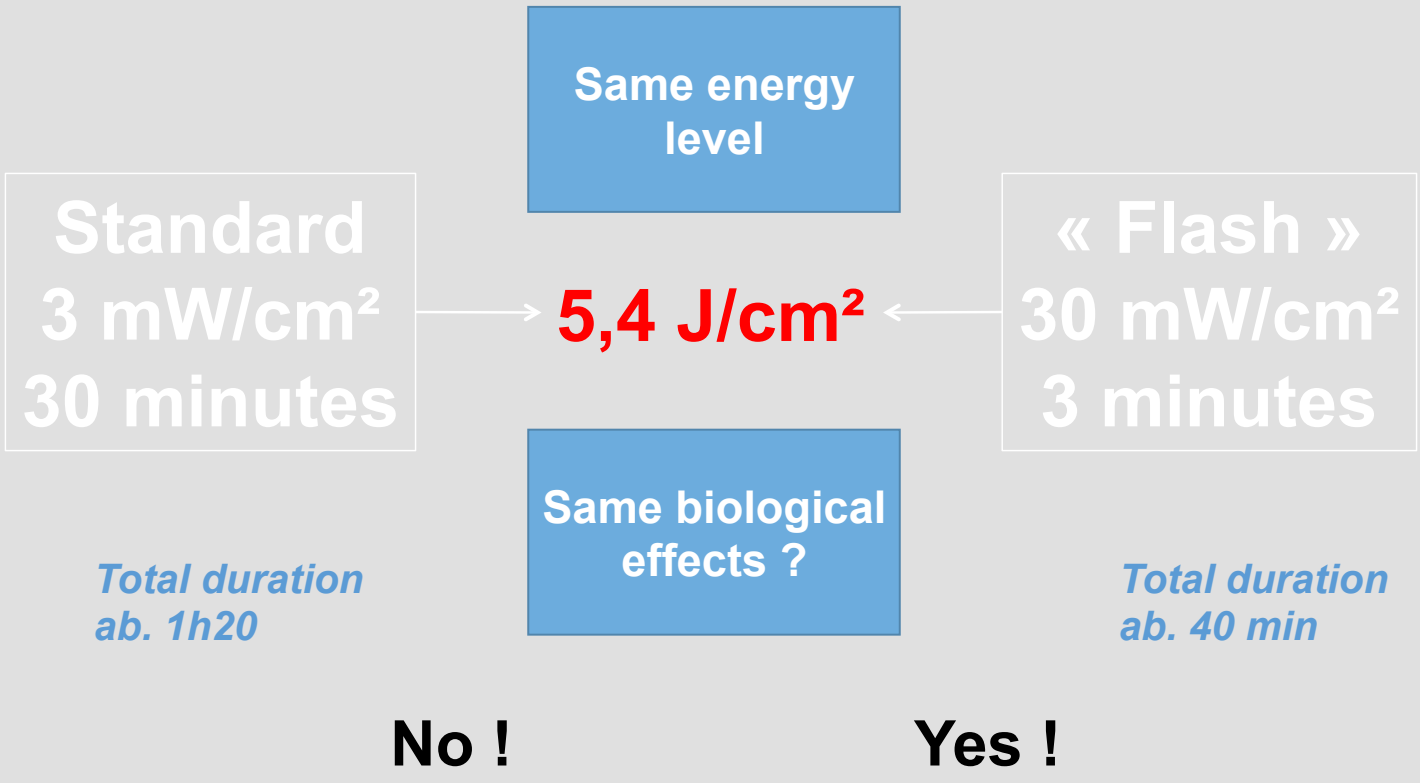
Pour 100 ml		
Riboflavine disodique (pour une concentration de Riboflavine base de 0,1%)	0,147 g	
EDTA sodique	0,1 g	Penetration enhancer
Tris (tromethamine)	0,05 g	Penetration enhancer
Phosphate Monosodique	0,217 g	Buffer, minimal quantity to limit pH shift
Phosphate disodique	0,385 g	Buffer, minimal quantity to limit pH shift
Eau distillée	Up to 100 ml	
Osmolarité	96 mOsmol/l	
pH	7,0	

Courtesy P. Roy

PACK-CXL after iontophoresis in dogs and cats

	Total	Dogs	Cats
# eyes (Unpublished data)	53	35	18
Treatment failure	2/53 (3,8%)	1/35	1/18
Brachycephalic/total		25/35	9/18
Corneal Abcess	5/53	4	1
Ulcer depth (%)	35% (0-80)		
Ulcer size (in mm)	0-6		
Interval start treatment – stabilization (days)	7		
Interval start treatment – defect closure (days)	13,2		

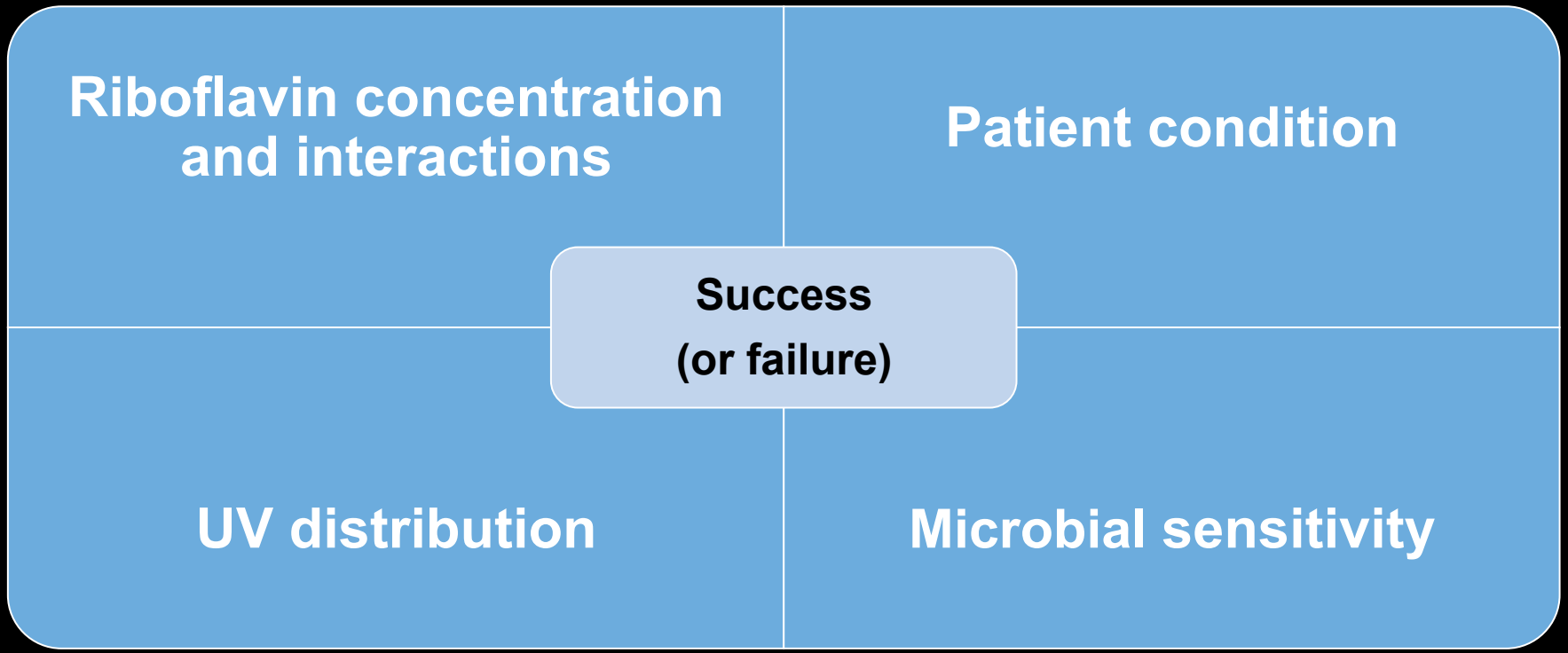
Lambert-Beer law



Protocols

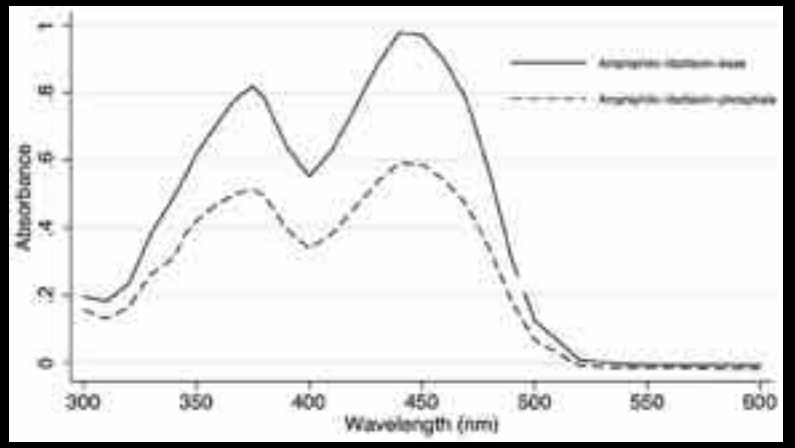
Infectious keratitis or ulceration		
Very thick or oedematous corneas	Isotonic hyperosmotic	30 to 45 mW/cm²
Normal corneal thickness	Isotonic isoosmotic or iontophoresis	30 to 45 mW/cm²
Very thin corneas	hypotonic or iontophoresis	9 to 18 mW/cm²
Bullous keratopathy	Isotonic hyperosmotic	3 to 30 mW/cm²

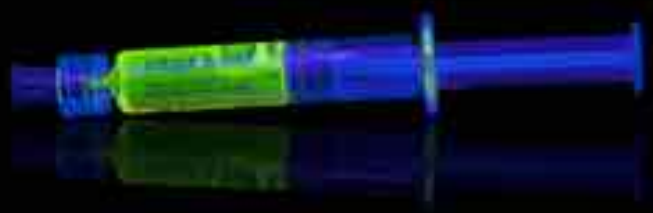
Pitfalls : why some cases respond better than others ?

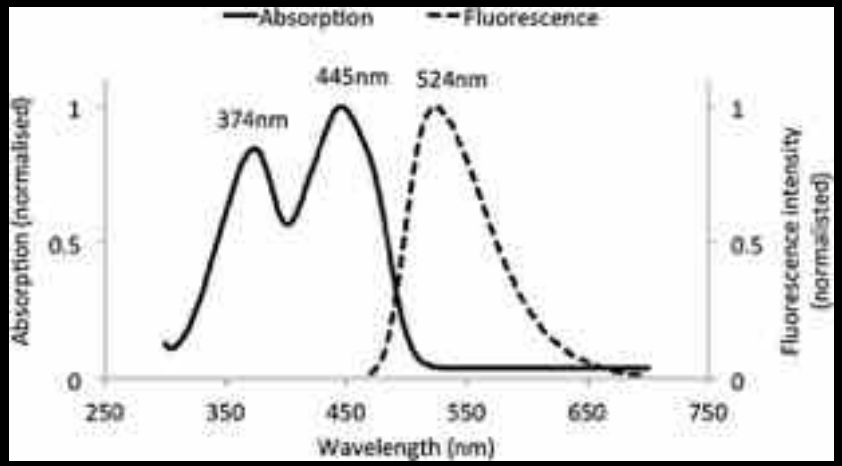


The patient

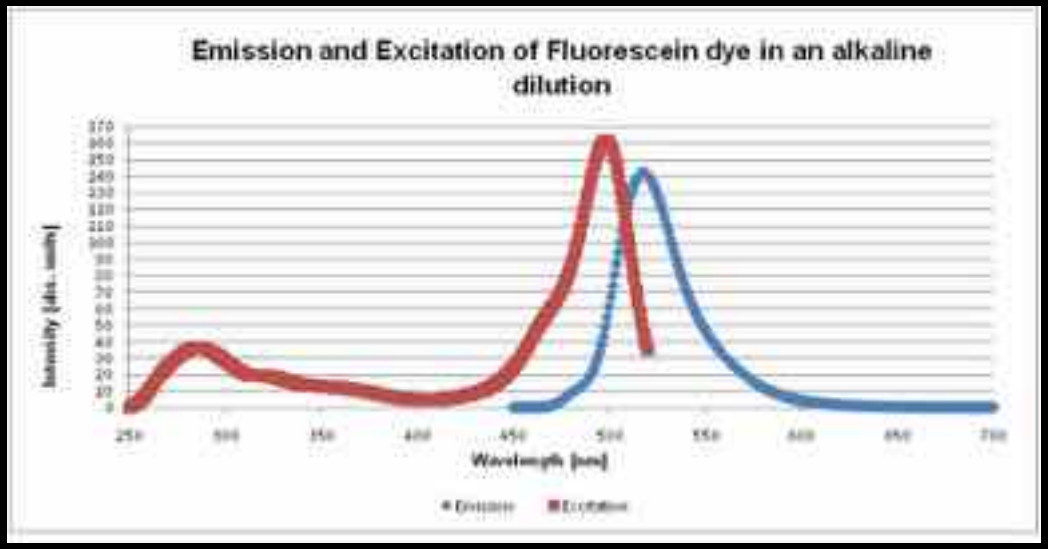
Riboflavin absorption Spectrum

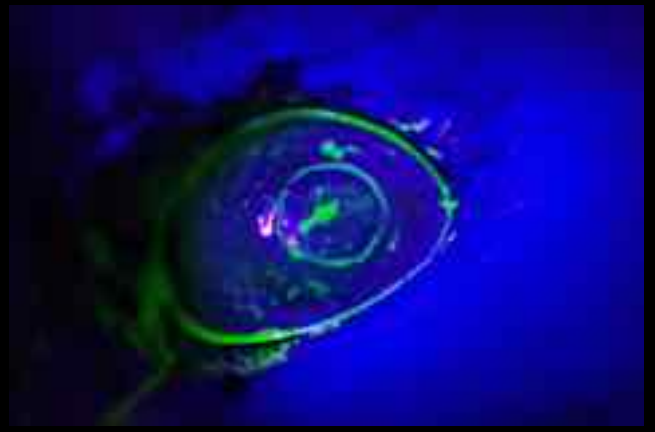






Competitor : Fluorescein





Other competitors

Storage

Store away from light

Discard after use or use it within 12 hours

Spontaneous reduction of concentration (3%/month) at room temperature

Store at +6 °C during summer

Quality concerns

RF : many purposes, many sources of purchase
(food coloring, vitamin B2 supplementation for human or animals…)

Many concerns due to poor RF quality
(home-made RF solutions)

Choose for good reputation suppliers

Be careful with promotional offers !!

First take-home message

Don’t use Fluorescein immediately before RF

Purchase RF solutions from certified medical companies

Store away from light and don’t reuse

Chose your RF solution according to your purpose

Do not substitute RF solutions (ex: isotonic for iontophoresis)

UV distribution : the lamp

Power (mW/cm^2)

- fixed
- variable (continuous or not)

Ergonomy

- hand-held
- fixed to the operating table
- with support

Easy use

Price

Open or closed system
(RF purchase)

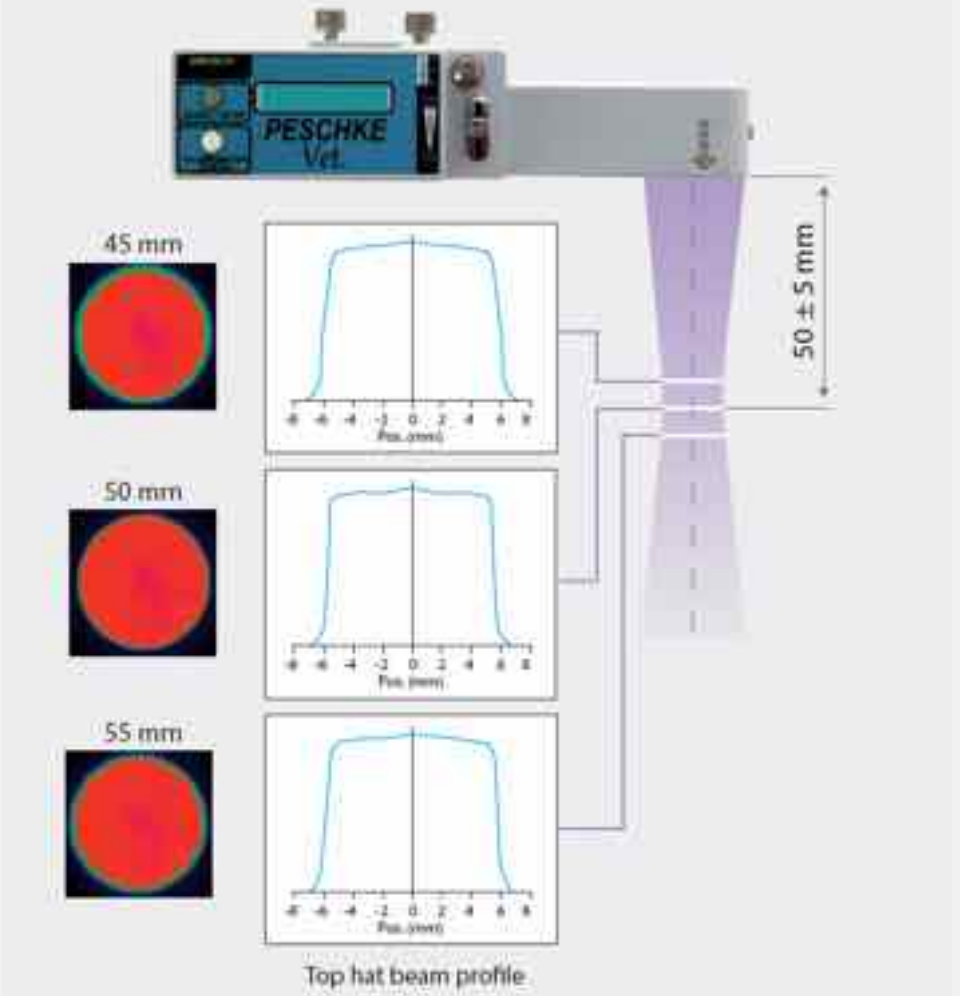
Focus and beam size

Focus length (1 to 8 cm)

Beam size (7 to 13 mm)

Beam profile

Power control and stability



Second take-home message

Choose a good quality lamp

Choose Power/time according to your purpose

WHAT IS THE BEST FOR MY PATIENT ?

Purpose ?

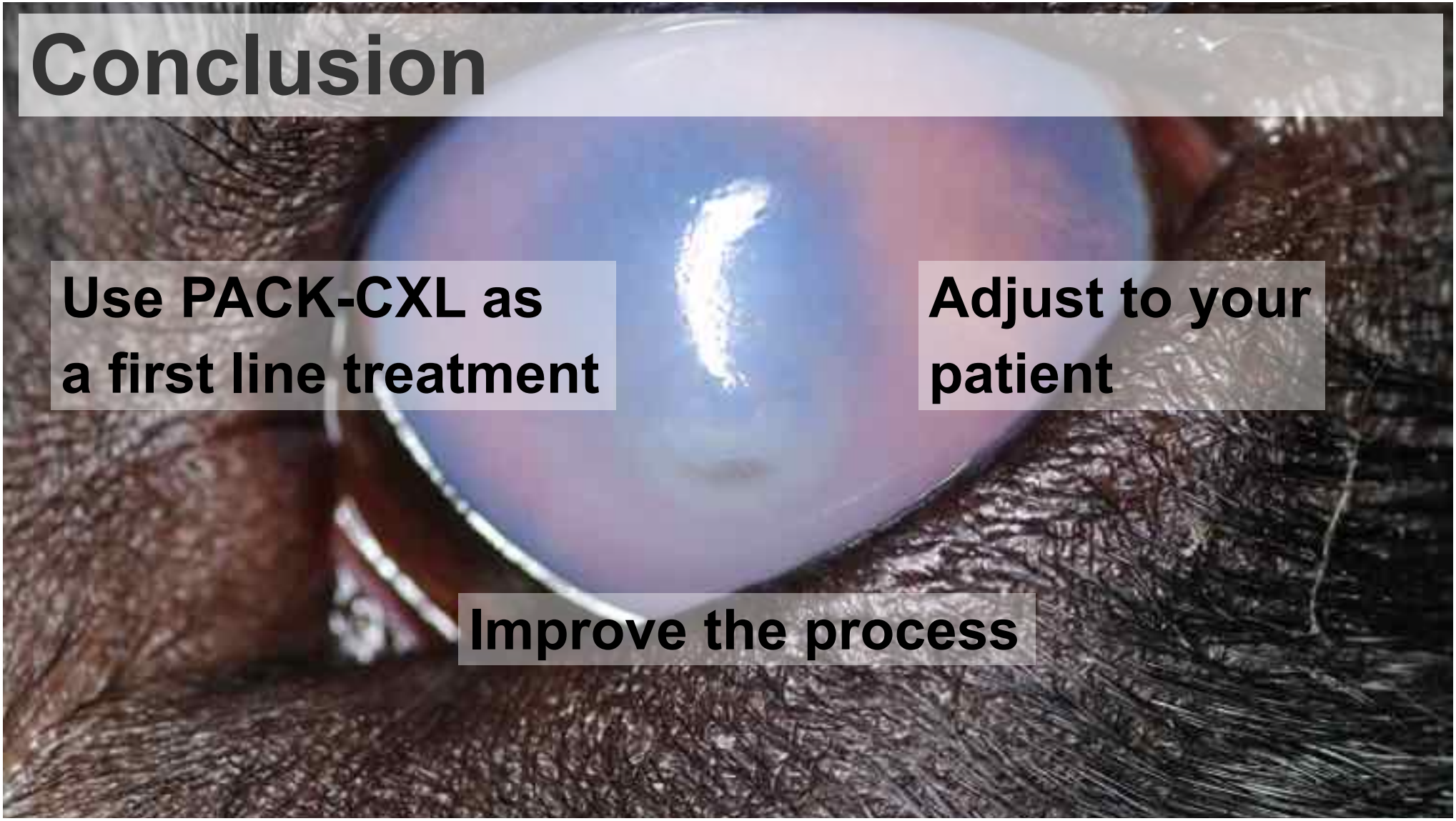
Patient ?

Protocol ?

Post-operative treatment ?

Post-operative outcome ?

Conclusion

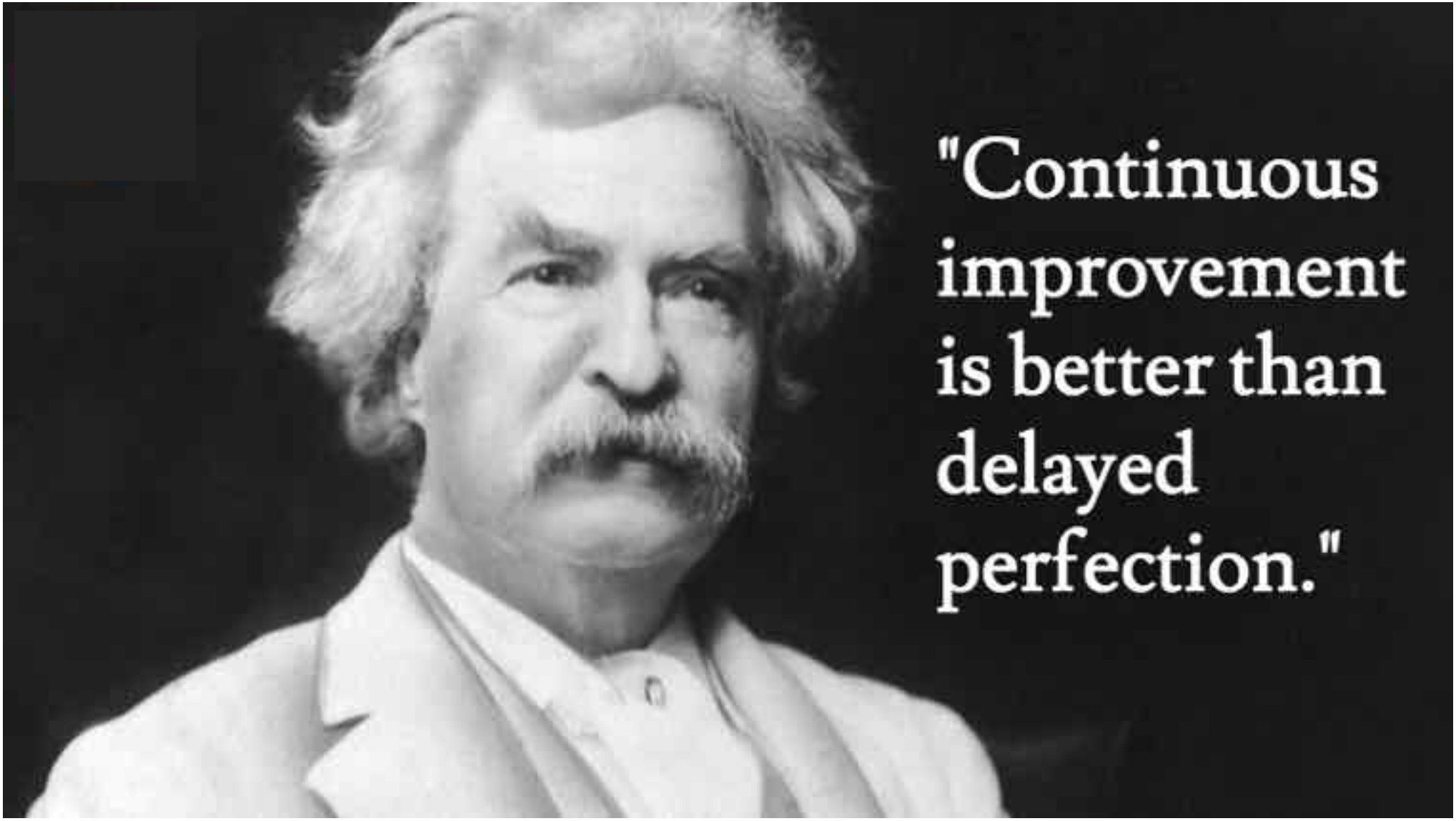


Use PACK-CXL as a first line treatment

Adjust to your patient

Improve the process

Marginal gains management


"Continuous
improvement
is better than
delayed
perfection."