

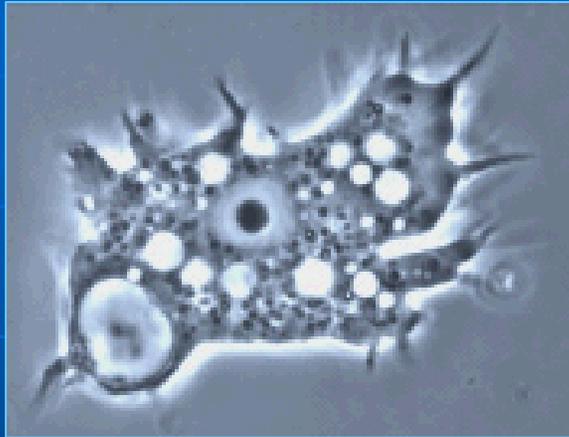
***Acanthamoeba* and Contact Lens Care**

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Acanthamoeba: Free-Living Amoeba



Trophozoite

- Feeding & dividing
- Asexual
- Cyst forming



Cyst

- Response to adversity
- Dormant, resistant
- Double-walled with pores

Acanthamoeba keratitis (AK)

- ❑ Potentially blinding infection of the cornea
- ❑ Affects previously healthy persons
- ❑ Rare and difficult ocular infection to treat



Contact lens wearers account for 90% of cases

- ❑ Poor hygiene practices
- ❑ Rinsing or storing in tap water
- ❑ Non-compliance to recommended use



Efficacy of CL Solutions Against *Acanthamoeba*

Unlike bacteria and fungi (ISO 14729), no standards exist for efficacy testing of CL solutions against *Acanthamoeba*

1. Physiological response of *Acanthamoeba* to CL solutions

- Encystment
- Aggregation

2. Development of efficacy testing methods:

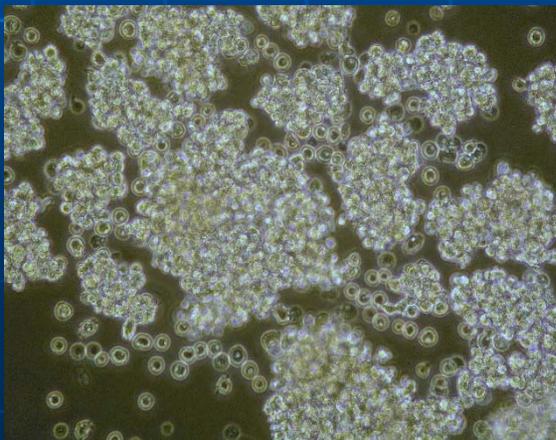
- Biocidal (killing in solution)
- Regimen (removal / killing on lenses)

Physiological Response



Trophozoite encystment by one multipurpose CL solution due to presence of propylene glycol in formulation

Kilvington, S., et al. (2008). Encystment of *Acanthamoeba* during incubation in multipurpose contact lens disinfectant solutions and experimental formulations. *Eye Contact Lens* **34**:133-9.



Trophozoite aggregation following 2 hr incubation in a contact lens formulation

Protection from disinfection?

1. Efficacy Against *Acanthamoeba*: Experimental Variables

1. Species / strain variation

Test solution	Active component	<i>A. castellanii</i>	<i>A. polyphaga</i>
C	PHMB (1 ppm)	+/+/+	+/-/-
F	PHMB (1 ppm)	+/+/+	+/-/-
K	peroxychlorite	+/+/+	-/-/-
O	Polyquarternium-1 (10 PPM)	+/+/+	-/-/-

2. Method of cyst production

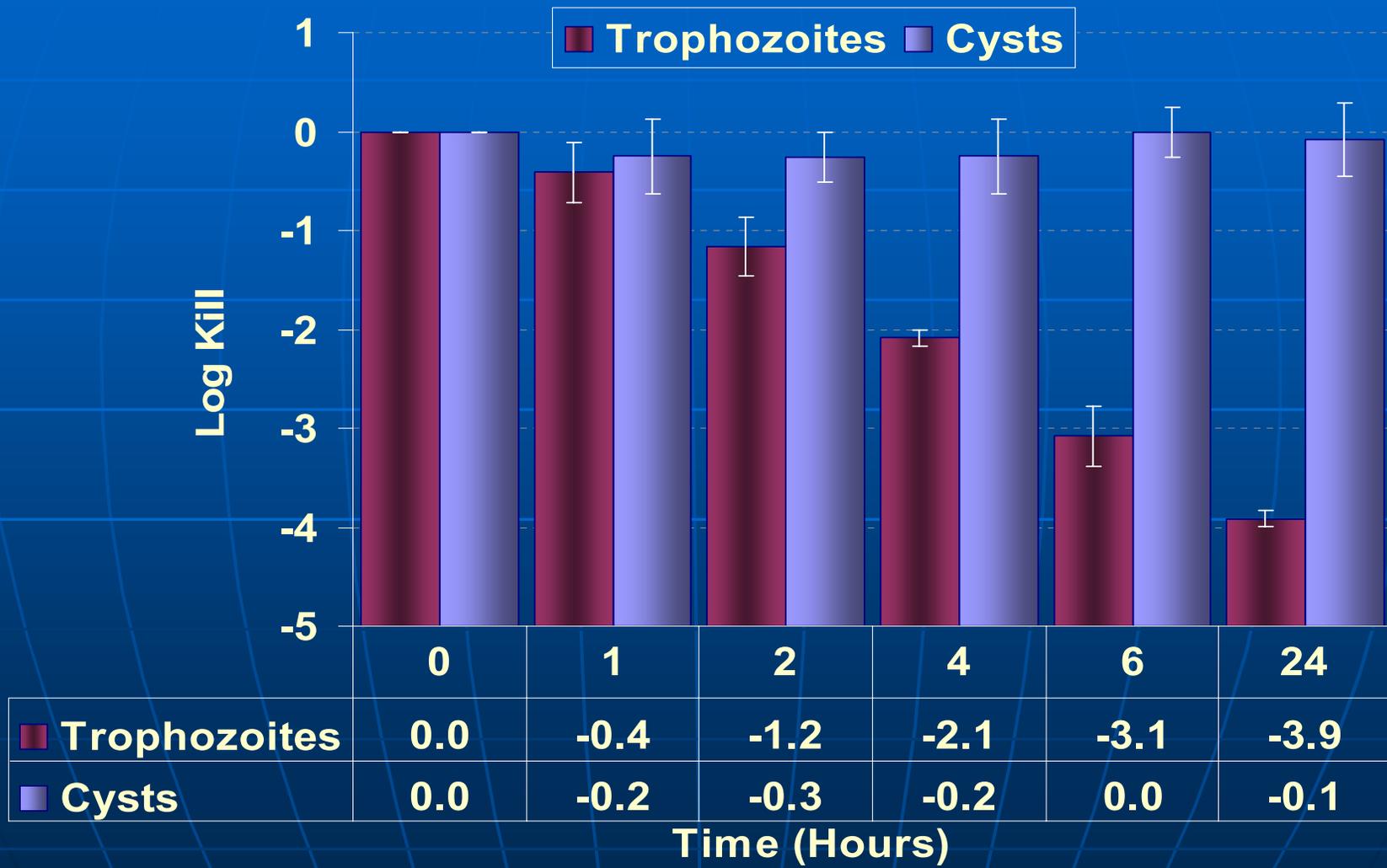
Test solution	Active component	<i>A. polyphaga</i> (CCAP 1501/3G)	
		Neff cysts	NNA cysts
A	PHMB (1 ppm)	-/-/-	+/+/+
C	PHMB (1 ppm)	-/-/-	+/+/+
E	PHMB (1 ppm)	-/-/-	+/+/+
M	3% peroxide (2-step)	-/-/-	-/-/-

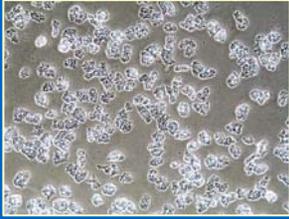
2. Efficacy of CL Solutions Against *Acanthamoeba* (Screening Method)

100 trophozoites or cysts and 6 hour exposure

		<i>A. polyphaga</i> (CCAP 1501/3G)					
		Trophozoites			Cysts		
Test solution	Active component	1	2	3	1	2	3
A	PHMB (1 ppm)	-	-	-	+	-	-
B	PHMB (1 ppm)	-	-	-	+	+	+
C	PHMB (1 ppm)	+	-	-	+	+	+
E	PHMB (1 ppm)	-	-	-	-	-	-
F	PHMB (1 ppm)	+	+	+	+	+	+
G	PHMB (1 ppm)	-	-	-	+	+	+
I	PHMB (2 ppm)	+	-	-	+	+	-
J	PHMB (1 ppm)	+	+	-	+	+	+
D	MAPD (5 ppm)	-	-	-	+	+	+
L	3% peroxide (1-step)	-	-	-	+	+	+
M	3% peroxide (2-step)	-	-	-	-	-	-

3. Efficacy Against *A. polyphaga*: Biocidal Assay





4. *Acanthamoeba* Regimen Test Per Labelling



Test solution	Labelled Regimen	Air Optix		Oasys	
		<i>A. castellanii</i> trophozoites	<i>A. castellanii</i> cysts	<i>A. castellanii</i> trophozoites	<i>A. castellanii</i> cysts
C	Rub & Rinse	Pass	Pass	Pass	Pass
D	No Rub but Rinse	Fail	Fail	Pass	Fail
A	Rub & Rinse	Pass	Pass	Pass	Pass
	No Rub but Rinse	Fail	Fail	Fail	Fail
	No Rub & No Rinse	Fail	Fail	Fail	Fail
E	No Rub & No Rinse	Fail	Fail	Fail	Fail

Pass = average of ≤ 10 viable organisms recovered from lenses and soaking solution

Conclusions

- ❑ Acanthamoeba keratitis is a rare but serious condition amongst contact lens wearers
- ❑ Contact lens industry needs to address the risk from Acanthamoeba keratitis (education, promotion of rub step and extended disinfection times)
 - ❑ Development of standardised methods (**physiological, biocidal and regimen**) to assess effectiveness against both trophozoites and cysts
 - ❑ Address significant variables of test species and strain, method of trophozoite culture and cyst production, and assay method