

Det Sundhedsvidenskabelige Fakultet



Management of Biofilm

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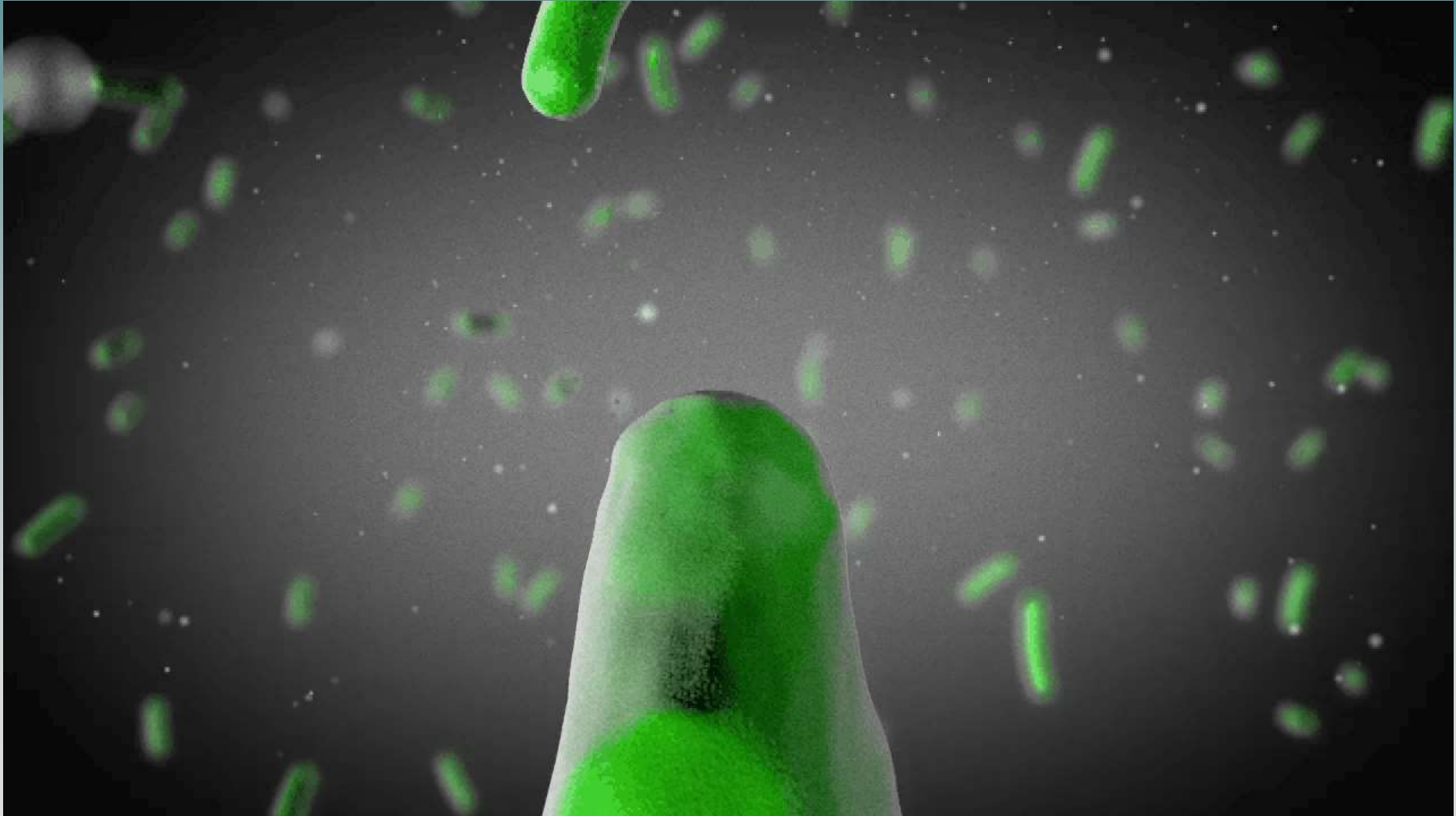
@TBjarnsholt



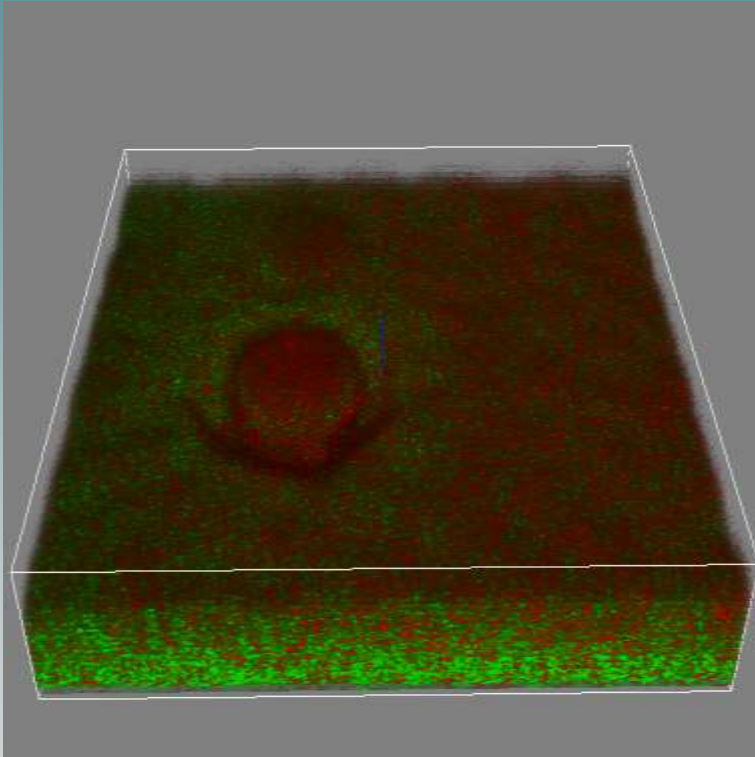
Rigshospitalet



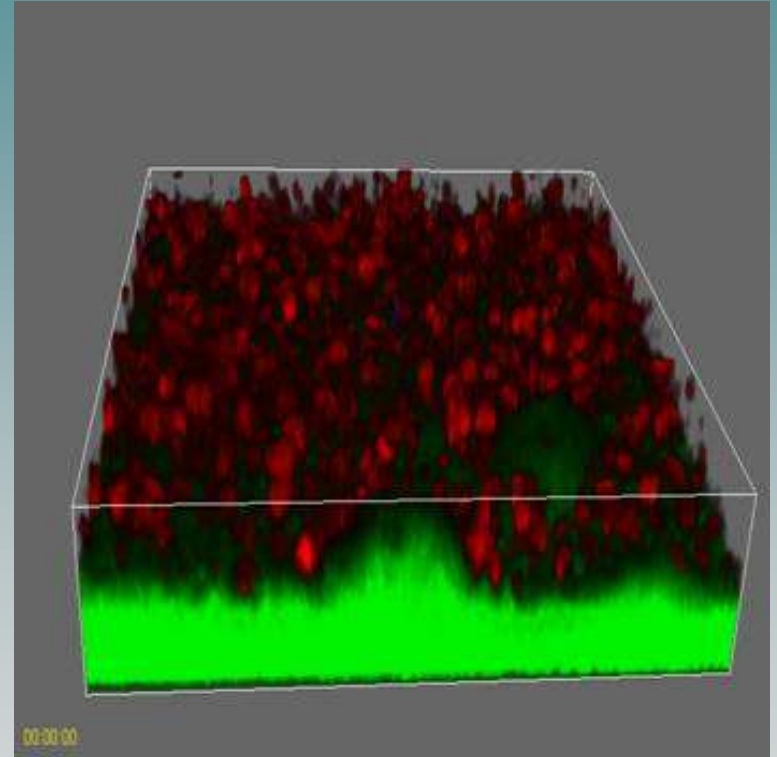
The problem



Why can biofilms not be removed? Because they are extremely tolerant

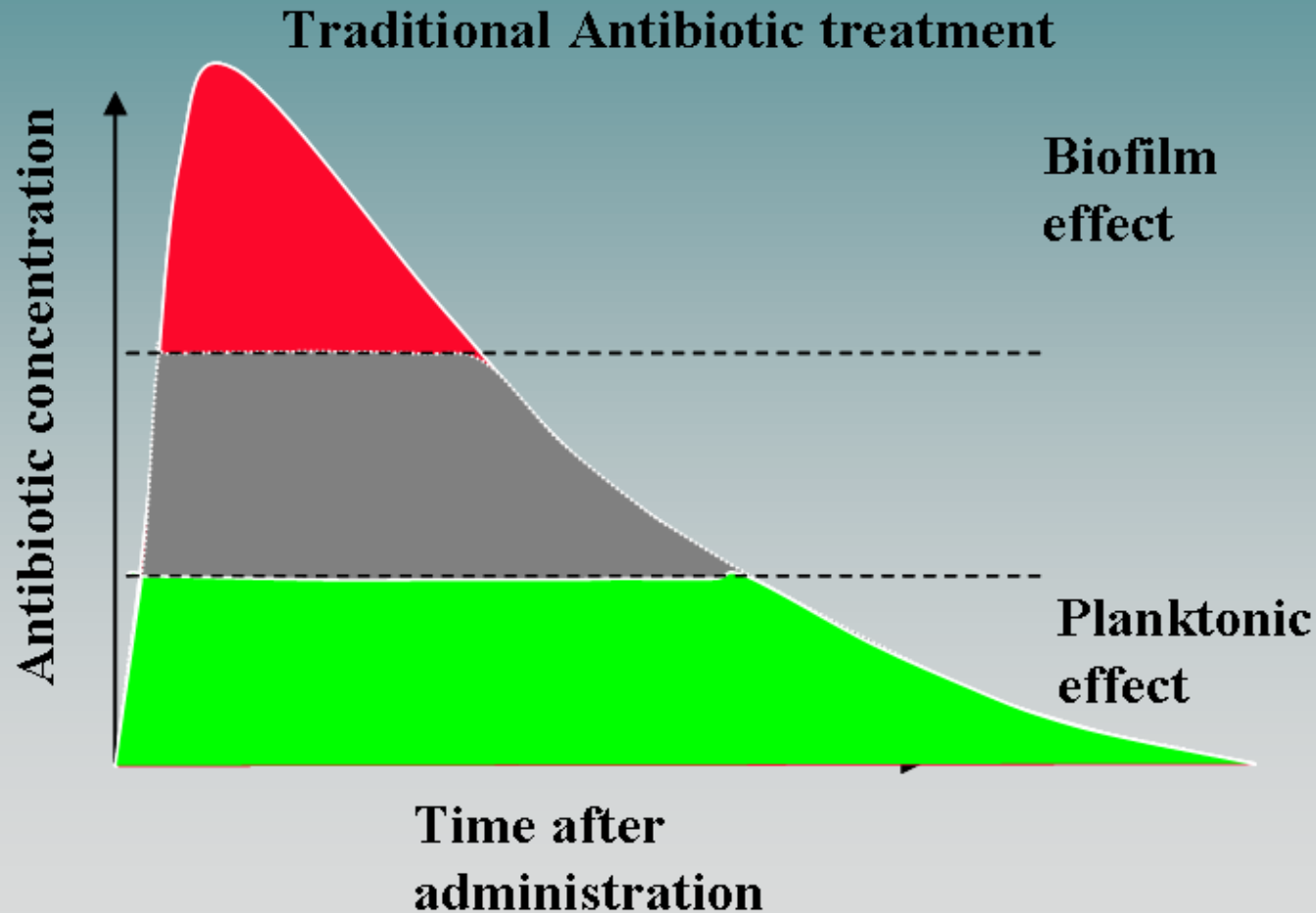


Live/dead stain of antibiotic treated biofilm



Paralysis of neutrophils
(white blood cells)

Biofilms and antibiotics



Biofilm cells tolerate high doses of antibiotics

Review

Høiby et al.

Table I. Susceptibility in vitro of planktonic and biofilm cells of non-mucoid and mucoid *P. aeruginosa* to piperacillin and tobramycin¹.

	% survival after 4–5 h				
	Planktonic cells		Young biofilm (2 days)		Old biofilm (7 days) NM and M
	NM*	M**	NM	M	
Piperacillin 200 µg/mL	4%	4%	5–10%	5–10%	31%
Tobramycin 10 µg/mL	0.001%	0.001%	0.001%	2%	50% (50 µg/mL tobramycin)
Piperacillin 200 µg/mL + Tobramycin 10 µg/mL	< 0.001%	< 0.001%	< 0.001%	0.1–0.01%	10% (25 µg/mL tobramycin)

¹ Inoculum, 10⁸ CFU/mL. MIC tobramycin: 1 µg/mL, MIC piperacillin: 16 µg/mL. Modified from [126]. * NM: non-mucoid. ** M: mucoid.

Silver sulfadiazine (SSD)

Wild type

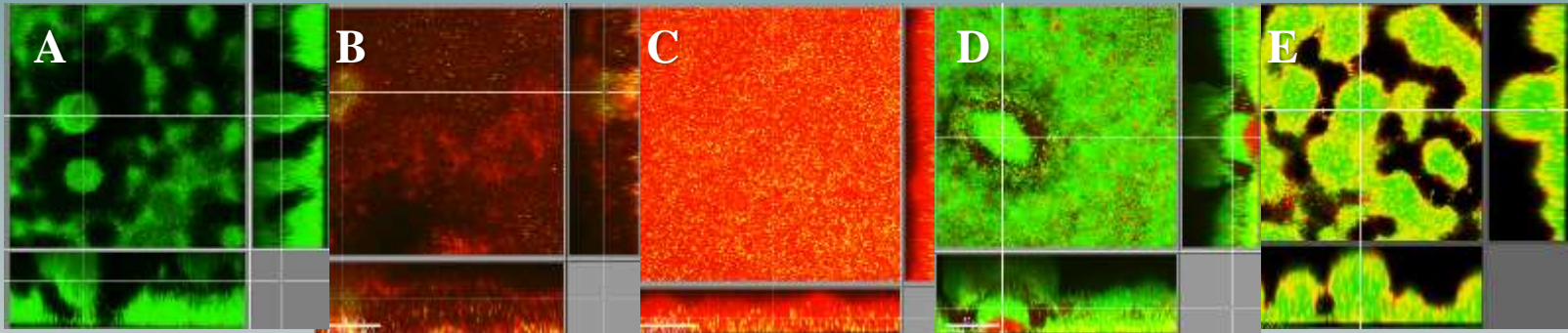
No treatment

10 μ g/ml SSD

5 μ g/ml SSD

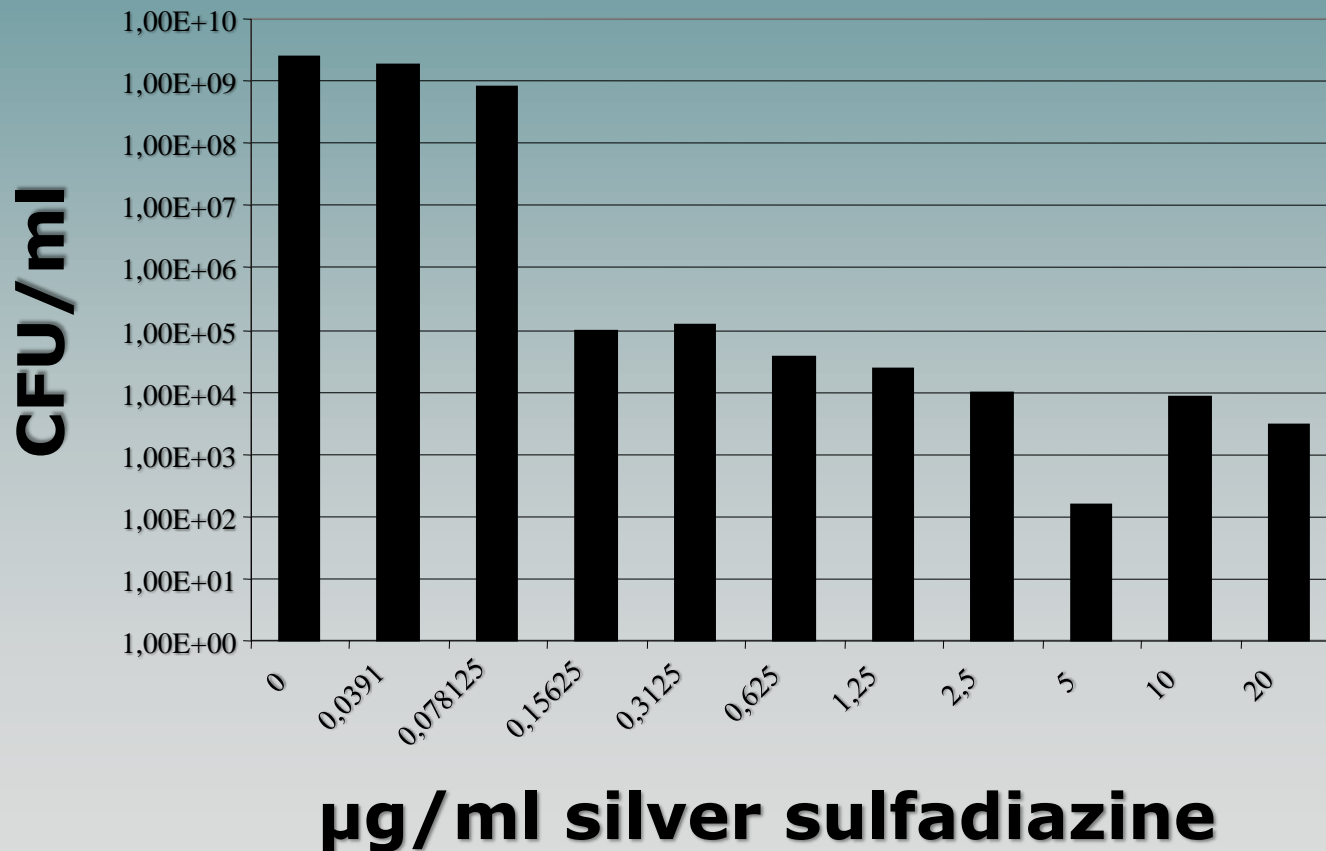
1 μ g/ml SSD

340 μ g/ml Tobramycin



Silver sulfadiazine (SSD)

Planktonic silver sulfadiazine kill



Physical disruption revert the tolerance

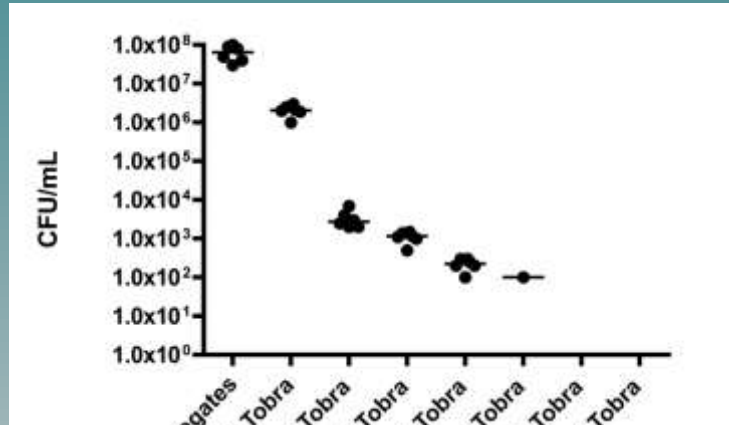
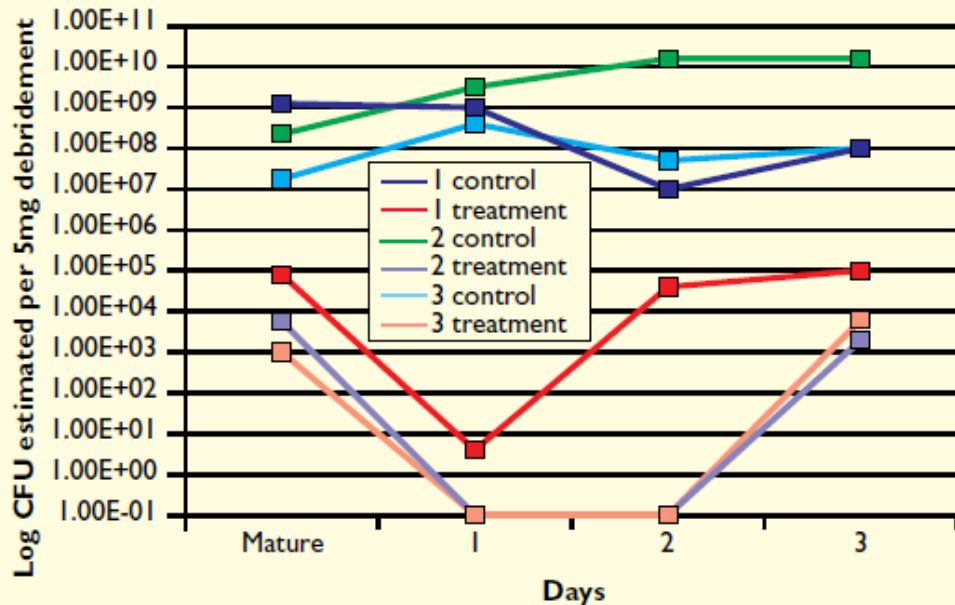
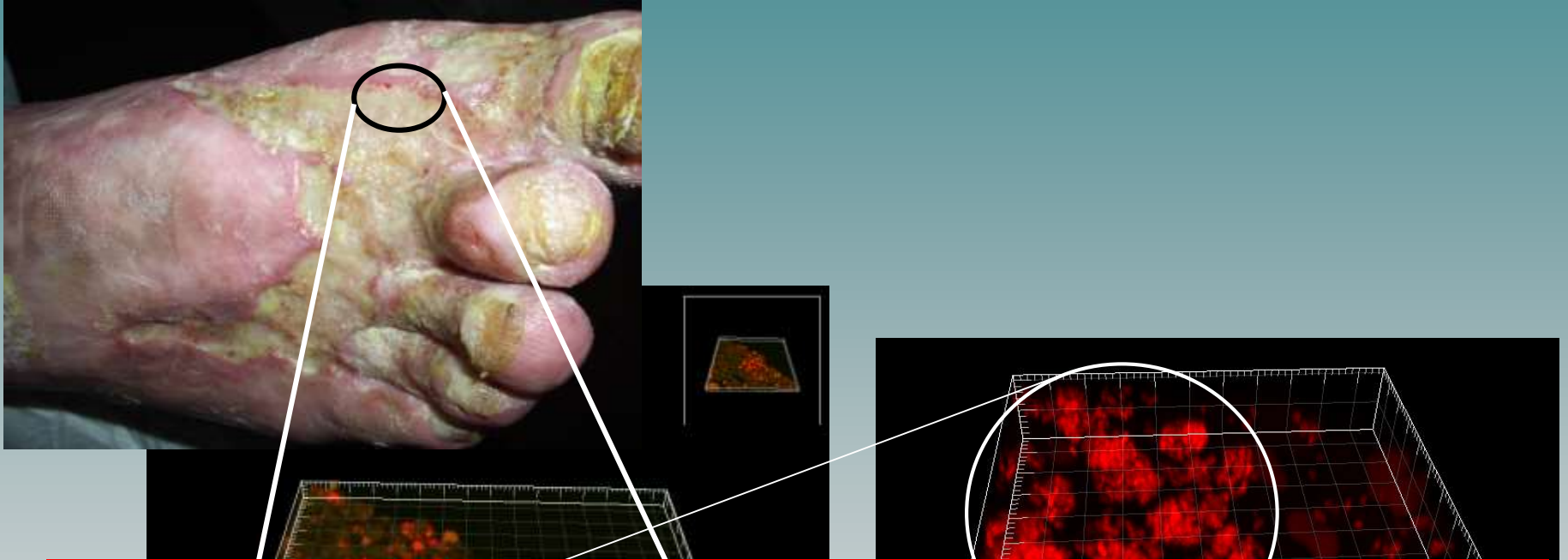


Fig 7. The results of clinical biofilm treatment with antibiotics



- increasing tolerance to antibiotics by 24 h - become resistant by 48/72 h
- Treatment window with antibiotics up to 24h following debridement
- Antibiotic failure against mature (>48 h) biofilms
- Factor into treatment regimes and test model interpretation

Biofilms in chronic wounds



NB biofilms CANNOT be observed macroscopically



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- www.coursera.org/course/bacteria