Surveillance cultures

Introduced

Australia - 1995

USA - 2016

in response to MDRO outbreaks

Surveillance cultures

Culture

Flush/brush/flush

Samples from all channels pooled

Duodenoscopes/bronchoscopes - 4 weekly

Other endoscopes - 12 weekly

AERs - 4 weekly

Investigate positive cultures

Surveillance cultures

Quality Control

Reprocessing protocols

Endoscopes

Structural integrity

AER

Structural integrity

Quality of water supply

Infection Control in Endoscopy

Clinical Update Feb 2008 – Microbiological testing of gastrointestinal endoscopes and respiratory endoscopes and AERs

- Rationale for testing
- Testing protocols
- Interpretation of culture results
- Algorithms for management of culture results

Download - www.GESA.org.au

MDRO outbreaks

Epidemiology

biofilm is the problem

Surveillance cultures

detect problems increasing biofilm formation before outbreaks occur

a measure of success of recent changes to reprocessing

MDRO outbreaks

France	1997(B), 2008, 2009, 2012 (G), 2013 (G)
Netherlands	2002, 2008, 2012
Germany	2012, 2013
Italy	2006(G & ERCP), 2011, 2012 (G & B)
USA	1998(B), 2002, 2008, 2014, 2015,2015

Outbreaks

Publications in peer reviewed journals generate most publicity

But – Under reporting

failure to diagnose

failure to report

Maude reports to FDA

	1998	2002	2008	2010	2012	2013	2014	2015
Peer Rev Journals	1(B)	1	1				1	2
FDA Maude			4	3	8	15	60	**4.5/wk**

Outbreak reports

Confirm a problem exists

Are not a measure of extent

Outbreaks

Publications in peer reviewed journals generate most publicity

But – Under reporting

failure to diagnose

failure to report

- Discovery bias

CPE is a marker, underestimates extent of transmission of other antibiotic sensitive bacteria

CPE Outbreaks

Begin 1-3 years after CPE first identified in a country

Patients colonised initially

Subsequent clinical infections 3-6 months later high mortality

Timing

	First reported culture	First outbreak post endoscopy
USA	1996	1997 Pseudomonas/bronchoscopy 2004 Pseudomonas/ERCP 2008 K pneumoniae/ERCP
France	2005	2009 K pneumoniae/ERCP
Italy	2008	2008 K pneumoniae/gastroscopy and bronchoscopy

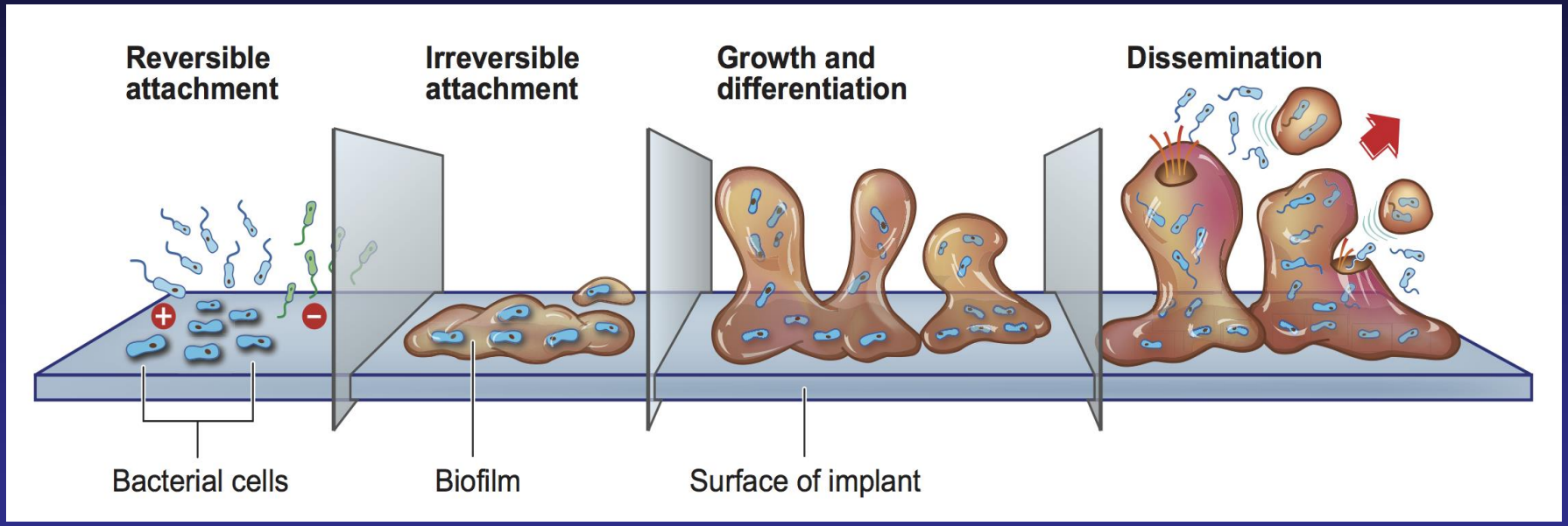
Epidemiology

Initial outbreaks occur after introduction of CPE into a country, has not coincided with new endoscope designs

Single species transmitted on multiple occasions despite reprocessing

Outbreaks usually traced back to a single endoscope

Biofilm


Reversible attachment
Irreversible attachment
Growth and differentiation
Dissemination
Bacterial cells
Biofilm
Surface of implant

Positive cultures

Bisset & Vickery 2006

Patient ready endoscopes

	Positive cultures
Gastroscopes n=1376	1.8%
Colonoscopes n=987	1.9%

Coliform DNA on 40% suggesting biofilm

Biofilm on endoscopes

Scanning electron microscopy - patient ready endoscopes

	Pajkos 2004	Ren-Pei 2014
Biopsy channels	5/13	36/66
Air/water channels	12/12	10/13

Recent outbreaks - Buss 2008, Verfaillie 2015

Reported causes

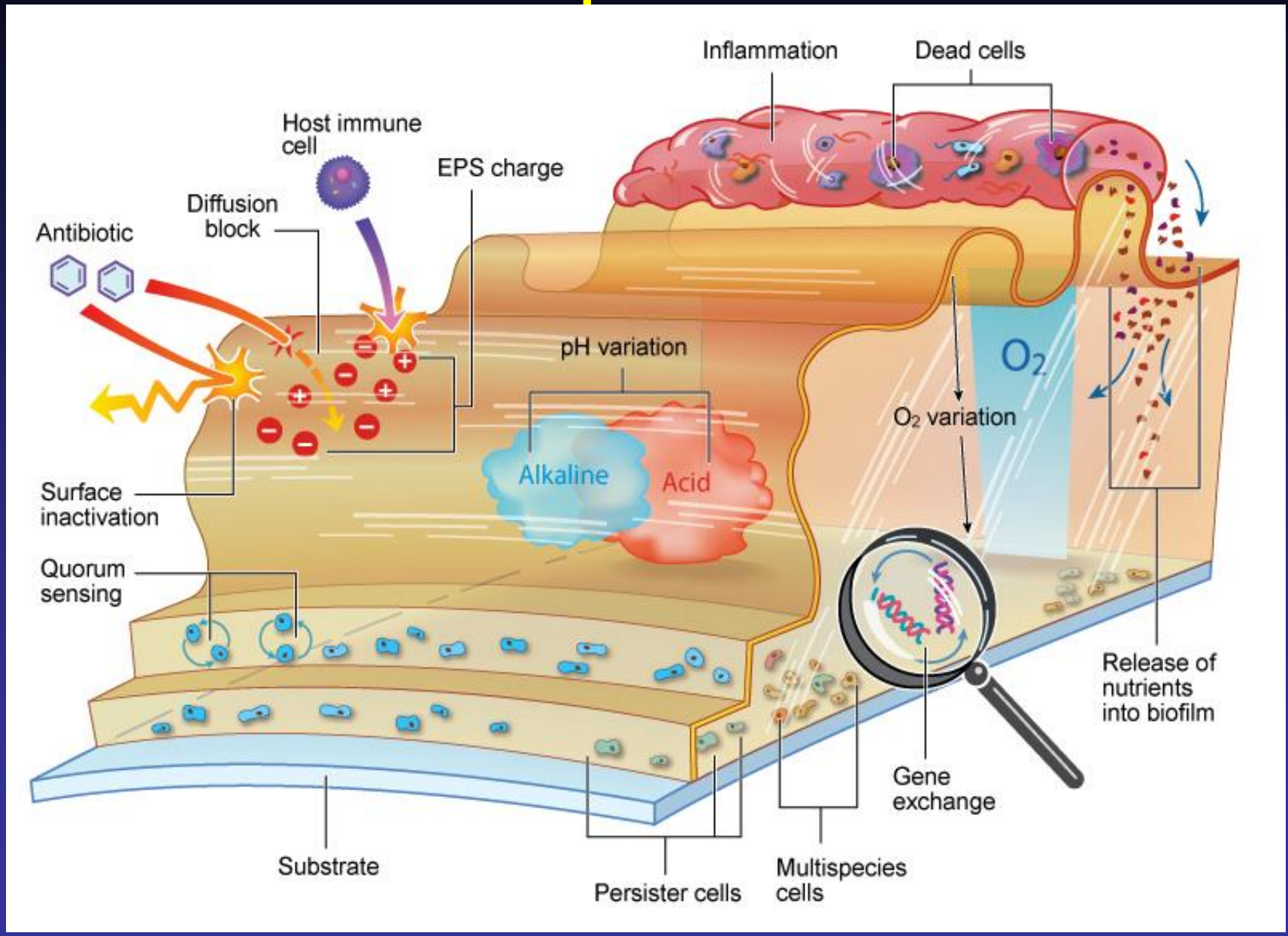
Occult endoscope defects

Breaches of reprocessing protocols

Failure to dry

These findings all increase the risk of biofilm attaching and growing

Properties


Inflammation
Dead cells
Host immune cell
EPS charge
Diffusion block
Antibiotic
pH variation
Alkaline
Acid
O_2
O_2 variation
Surface inactivation
Quorum sensing
Release of nutrients into biofilm
Gene exchange
Substrate
Persister cells
Multispecies cells

Biofilm

Difficult to clean

disinfect

culture

Current brush and flush culture techniques do not reliably detect biofilm on endoscopes

The Problem

Biofilm in channel/on tip

CPE is incorporated into a multispecies biofilm

Biofilm acts as a reservoir of CPE and protects bacteria from cleaning and disinfection

Surveillance cultures

	Positive
Moses 2003 G/C/D 1990-1999	42/312 - 13%
New Zealand G/C/D	95/7176 –1.3%
Australia D 2010-2015	291/6664 - 4.4%

Surveillance cultures

	Positive	Quality control
Moses 2003 G/C/D 1990-1999	42/312- 13%	occult defect breach reprocessing contam water bottle
New Zealand G/C/D	95/7176 –1.3%	9 occult defects breach reprocess
Australia D 2010-2015	291/6664 - 4.4%	3 occult defects AER defect

FDA Investigation

May 2015

Tip of duodenoscope is complex and difficult to clean

Current cleaning and disinfectant protocols are difficult to implement (100 pages) and prone to human error

Current protocols cannot guarantee adequate disinfection

Benefits of ERCP & associated intervention outweigh the risk of infection

FDA Supplemental Measures

4 August 2015

Adhere to manufacturers reprocessing instructions

Implement a comprehensive quality control program

Consider

- Surveillance cultures
- ETO, longer disinfection times
- Double disinfection or culture and quarantine

The future

Redesign endoscopes to facilitate reprocessing

Research to develop new cleaning and disinfection technology

Improve drying

Eliminate occult defects – preventative maintenance

Response to outbreaks so far

New reprocessing guidelines

Olympus recalls duodenoscopes to adjust tips

Have changes worked?

No published evidence to support new reprocessing guidelines or duodenoscope tip modification

Surveillance cultures post changes not improved

Cultures post new reprocessing

		Positive
Rawers 71 Dutch hospitals 2015, duodenoscopes		12%
Ross Seattle 2015 duodenoscopes	156/1200	1.3%
Brandabur Washington 2015 duodenoscopes & echo endoscopes	189/2238	8.4%
Chapman Chicago 2015 echo endoscopes	23/540	4.2%

Cultures post new reprocessing

		Positive	Quality control
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No breaches of reprocessing protocols, but occult defects unchanged

Conclusions

Biofilm found on most endoscopes is the problem

Endoscopes have been transmitting small numbers of bacteria for years with no recognised clinical consequences

Colonisation and clinical infection are more likely after bronchoscopy and ERCP due to the nature of the procedure and patients

Outbreaks of CPE are an indicator of a failure in reprocessing that is relevant for all endoscopes

Surveillance cultures

Quality control

reprocessing protocols

structural integrity endoscopes & AERs

Detect failures that facilitate biofilm before clinical problems develop

Download

Infection Control in Endoscopy

Clinical Update 2008 Surveillance cultures

www.GESA.org.au