VRE - “old foe-new troubles”

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[iprevent]

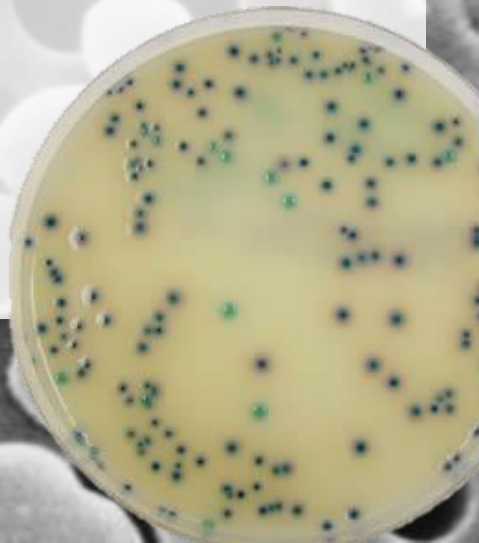
Enterococci

- Gram-positive coc
- We all have enterococci in our guts
- Most frequent species: *E. faecalis*
- Low virulent m.o.
  - **UTI**
  - Abdominal infections
  - CR-BSI to endocarditis
- Intrinsically resistant for cephalosporin's

True for all enterococci

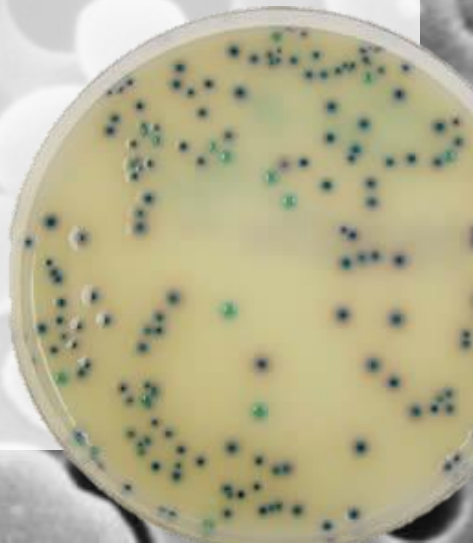
E. faecium/ARE

- "Big/resistant brother" van *E. faecalis*
  - Amoxicillin/ampicillin-resistant
  - Recent shift: *E. f*aecalis → *E. faecium*
- Location (GI tract) "unchanged"
- Virulence "unchanged"
- Susceptible to vancomycin

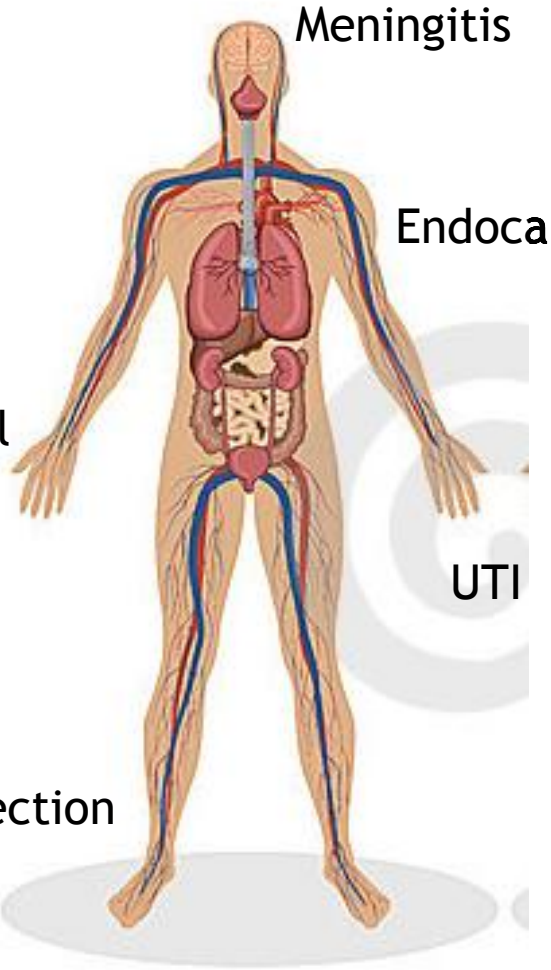


VRE

- Clinically mainly *E. faecium,* less common *E. faecalis* - *other* enterococcal species are not really relevant
- vanA and vanB are what we follow, other van-genes not presently of interest for IC
- Certain CC's (clonal complex) cause more transmission than other, e.g. CC17, but shift may have started



Infections caused by enterococci



Neonatal infections

BSI

Pneumonia

UTI

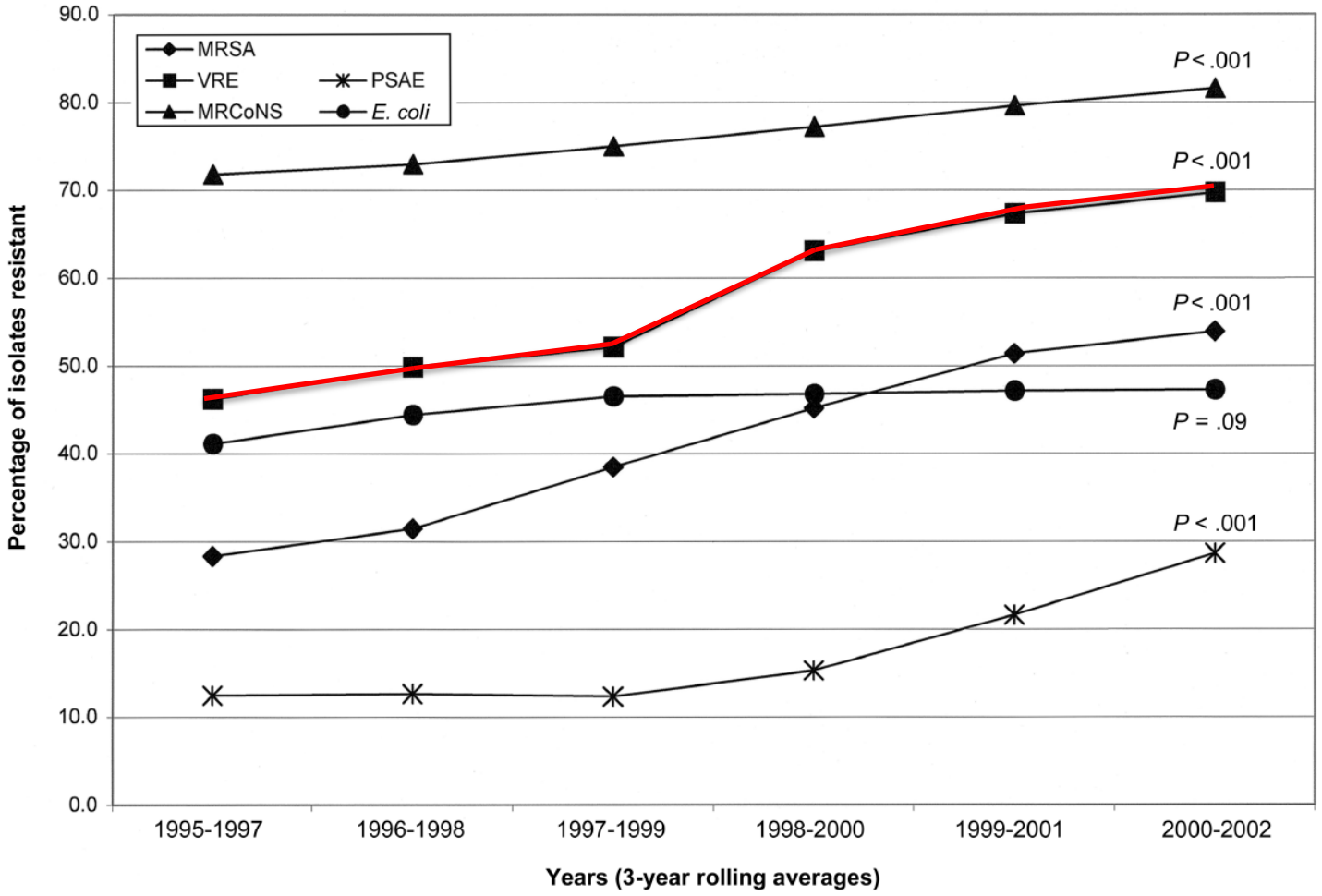
Surgical infections

Patient: low immunity, many AB, high co-morbidity

Epidemiology (USA)

- **Enterococci** are the second most common cause of nosocomial infections in the US, responsible for 10 to 20% of all such infections in the US and for approximately 8% of all nosocomial bloodstream infections.
- Concern about **VRE** is related to the potential for nosocomial transmission, the lack of antibiotics to treat infections caused by this organism, and the possibility that the vancomycin-resistant genes present in VRE can be transferred to other gram-positive microorganisms such as *Staphylococcus aureus*.

VRE in blood cultures (USA)



VRE

[iprevent] Wisplinghoff et al. Clinical Infectious Diseases 2004; 39:309–17

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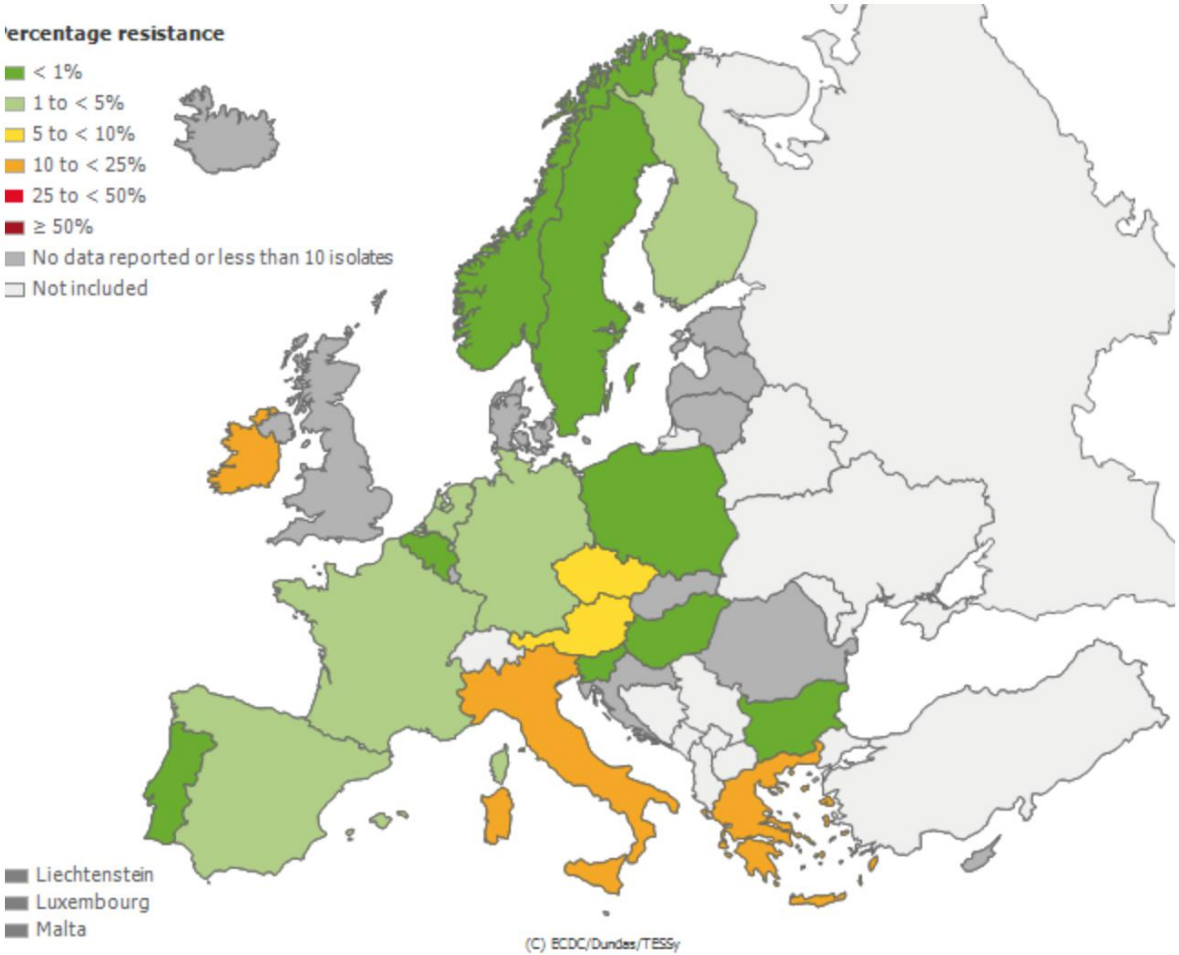
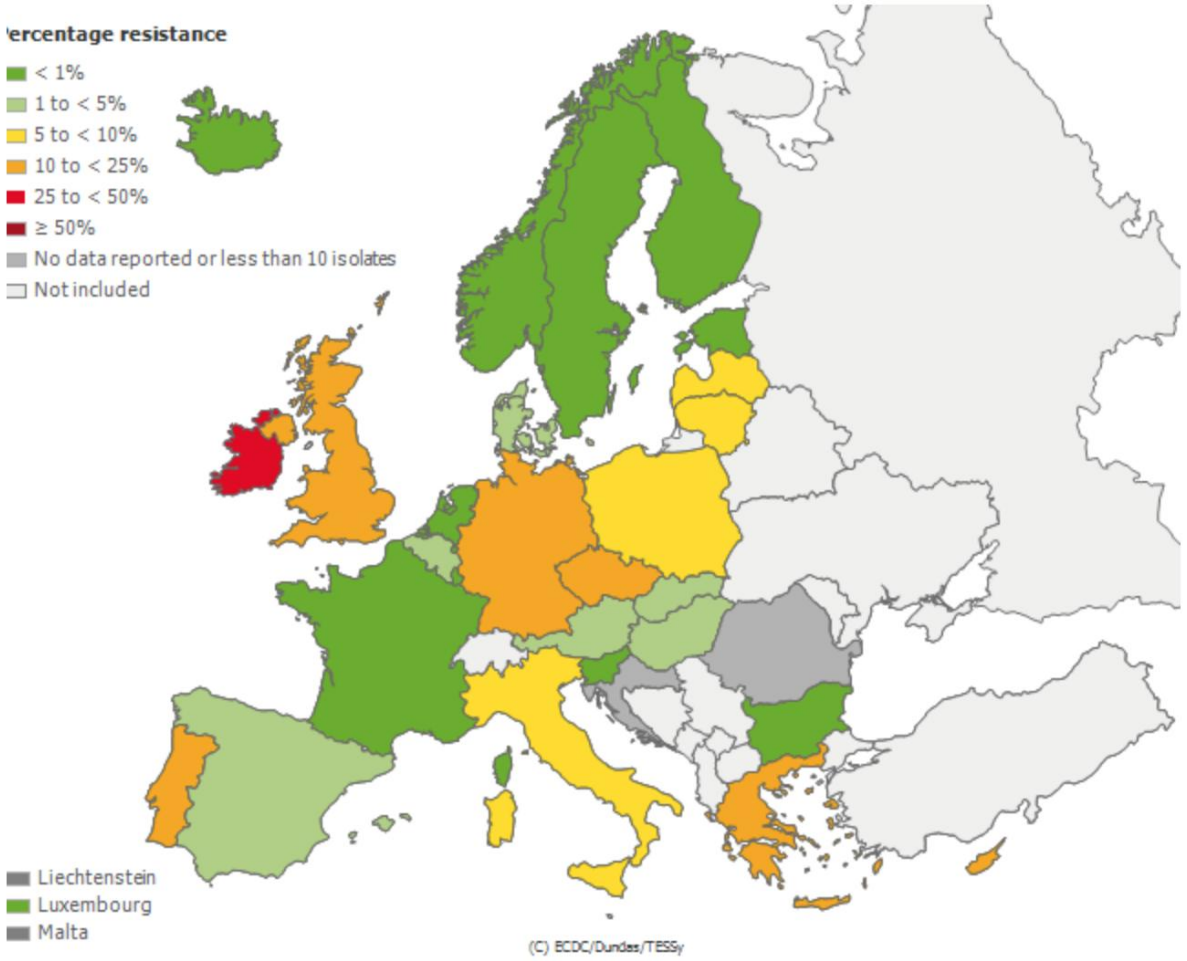
VRE Europe

- In Europe, an important community reservoir of VRE existed in the 1980s and 1990s which has been associated with the massive use of avoparcin as growth promotor in animal husbandry.
- The Europe-wide ban on the use of avoparcin in April 1997 resulted in a substantial reduction in the prevalence of VRE colonization in farm animals and non-hospitalized persons .

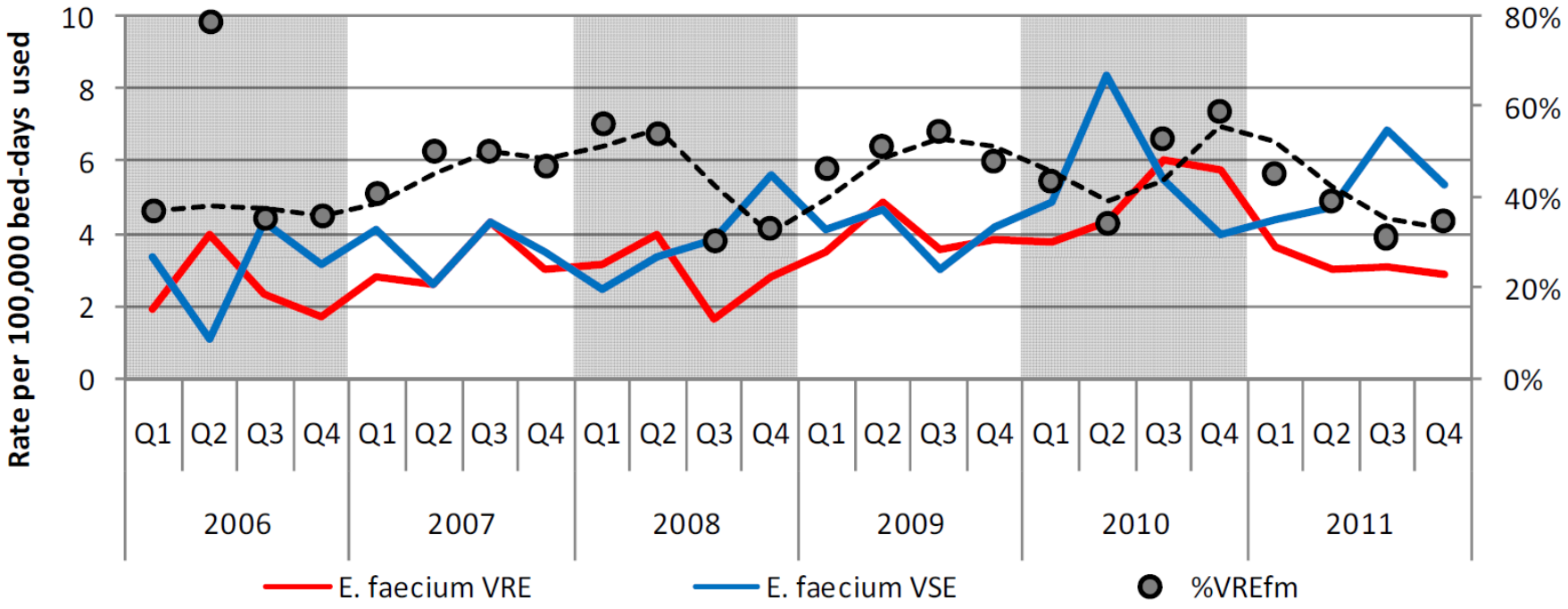
Proportion of Vancomycin Resistant (R) *Enterococcus faecium* Isolates in Participating Countries in 2002



Proportion of Vancomycin Resistant (R) *Enterococcus faecium* Isolates in Participating Countries in 2012



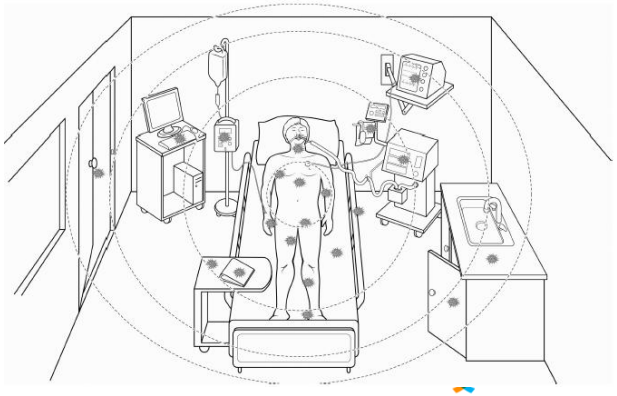
VRE in Europa



EARS June 2011

Infection Control & VRE

- Contact isolation
  - Single room !!!!!
    - personal toilet/bathroom, …
  - Gown & gloves
  - Hand hygiene
  - Cleaning & disinfection of environment !!!!!!



VRE outbreaks….

VRE-rise in NL

- This first episode of VRE outbreaks (2011-12) in Dutch hospitals was followed by a period of 10 years in which there were cases of hospital-acquired infections by VRE, but no large hospital outbreaks.

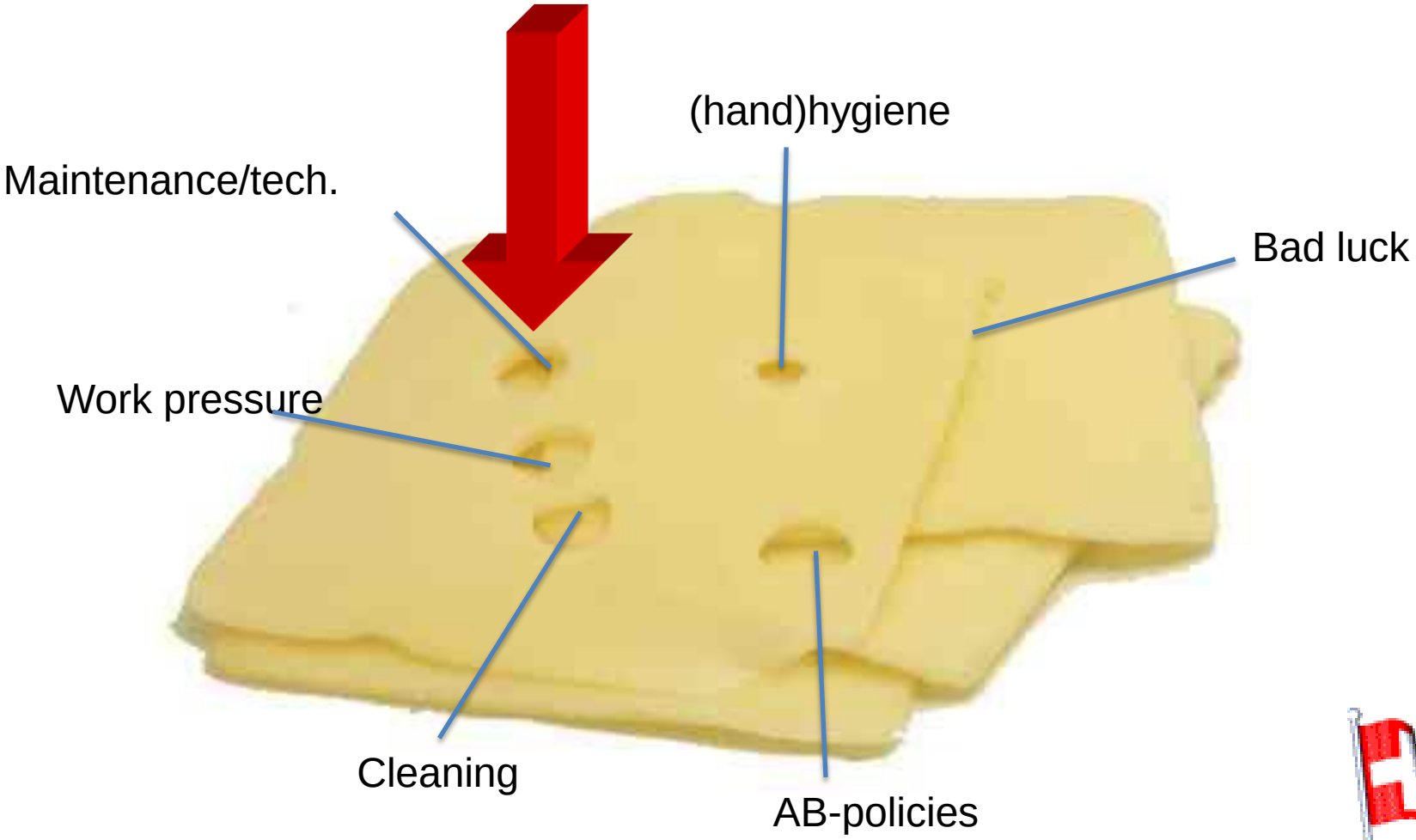
- During this period, however, colonization rates with ampicillin-resistant, vancomycin-susceptible *E. faecium* belonging to the HA-*E.faecium* subpopulation substantially increased, as did nosocomial infections with these clones, indicating both enhanced capabilities of cross-transmission and pathogenicity

Outbreak CWZ

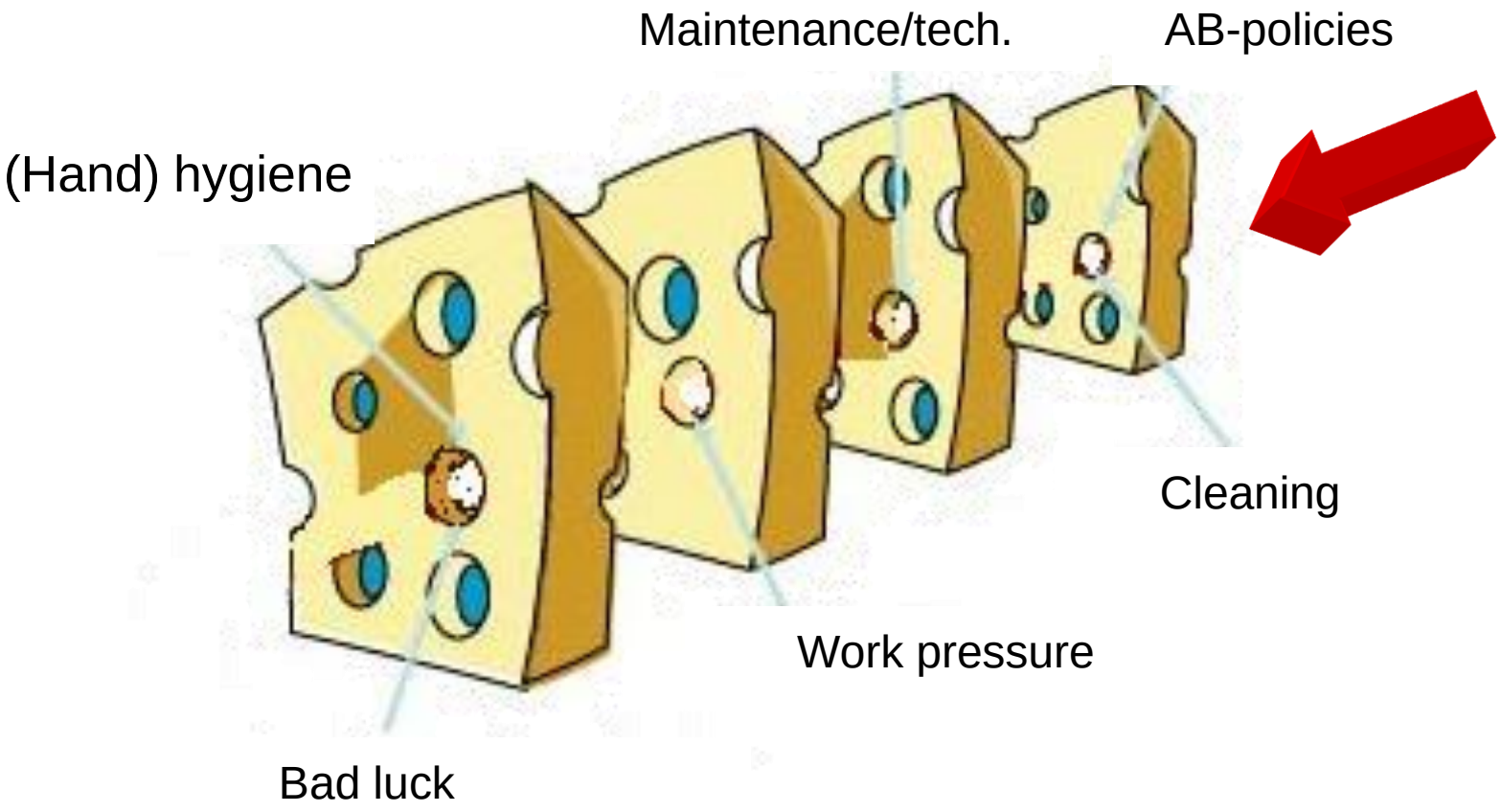
- Not one cause, but multiple “wrongs” at the same time

→ Swiss-Cheese-Accident Model

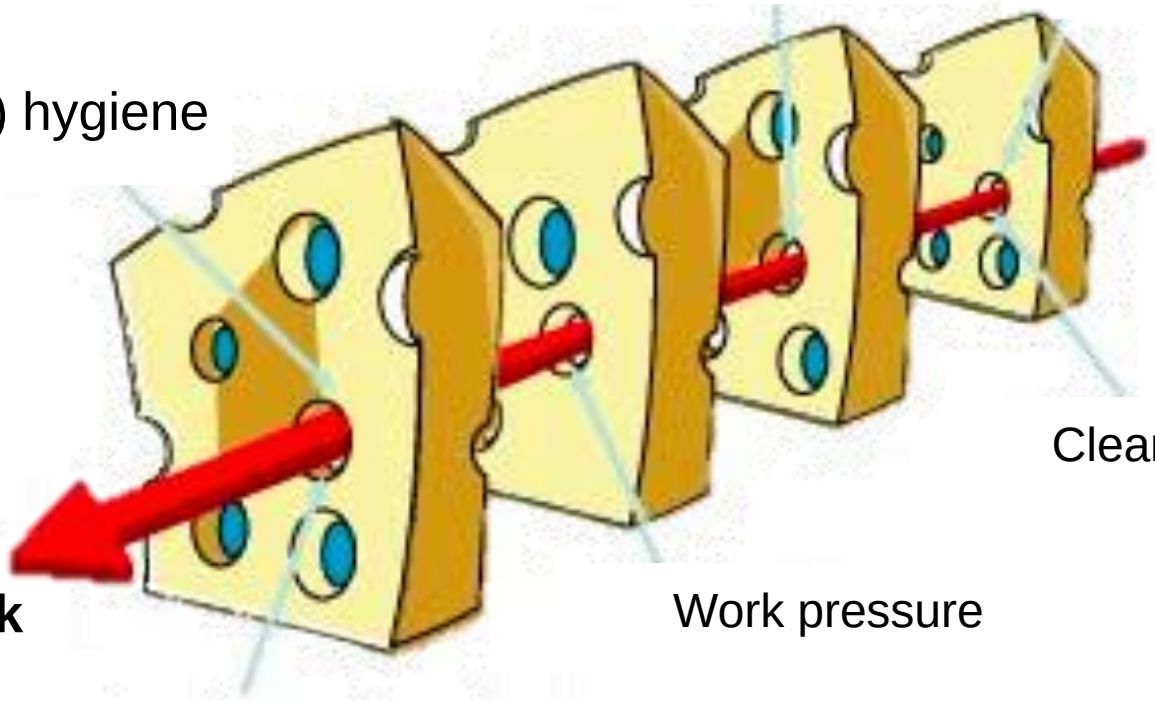
Swiss Cheese Accident Model



Swiss Cheese Accident Model



Swiss Cheese Accident Model



Outbreak CWZ

- Bad luck
  - virulent clone
- Amount of work
  - integration of departments in one location, additional “flexibility”, ..
- Cleaning & disinfection
  - vacant responsibilities
- Maintenance/technik
  - bed-pan washers
- Discipline & behavior
  - White coats & watches
  - hand hygiene

What to do?

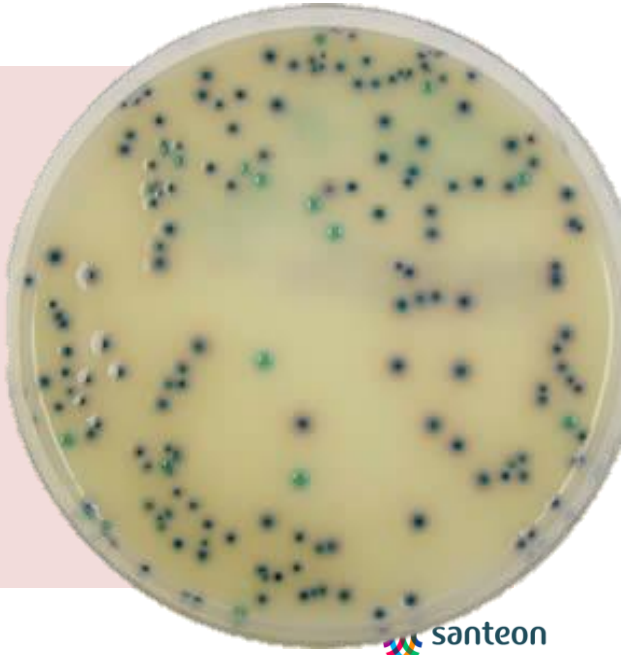
- Microbiology
- Epidemiology
- Infection Control
- Politics
- Antibiotic stewardship
- Decolonization

Microbiology

Chromeagar versus standard agar

- Sensitivity and specificty of the different agars
- Impact of selective enrichment
- Comparison of different chromeagars

- Problem during outbreak
  - takes to long (2 days)
  - too much hands-on time
  - availibility



PCR

- Detection of *E. faecium*, CC17, van A and van B
- Outbreak = great opportunity for validation

- ProblemPCR
  - validation= double effort/work
  - alleen CC17, terwijl inmiddels ook andere CC's
  - detectie "faecium" minder gevoelig

Comparison of typing methods

- AFLP
  - CWZ standard, (>3 different AFLP protocols)
- MLST

- Problem typing
  - AFLP: 3 methods = 3 different clusters
  - MLST: money & time, differentiation
  - Malditof for typing

A0-value

- = factor combining temperature and time

$$A_0 = \sum 10^{\left[(T-80)/z\right]} \times \Delta t$$

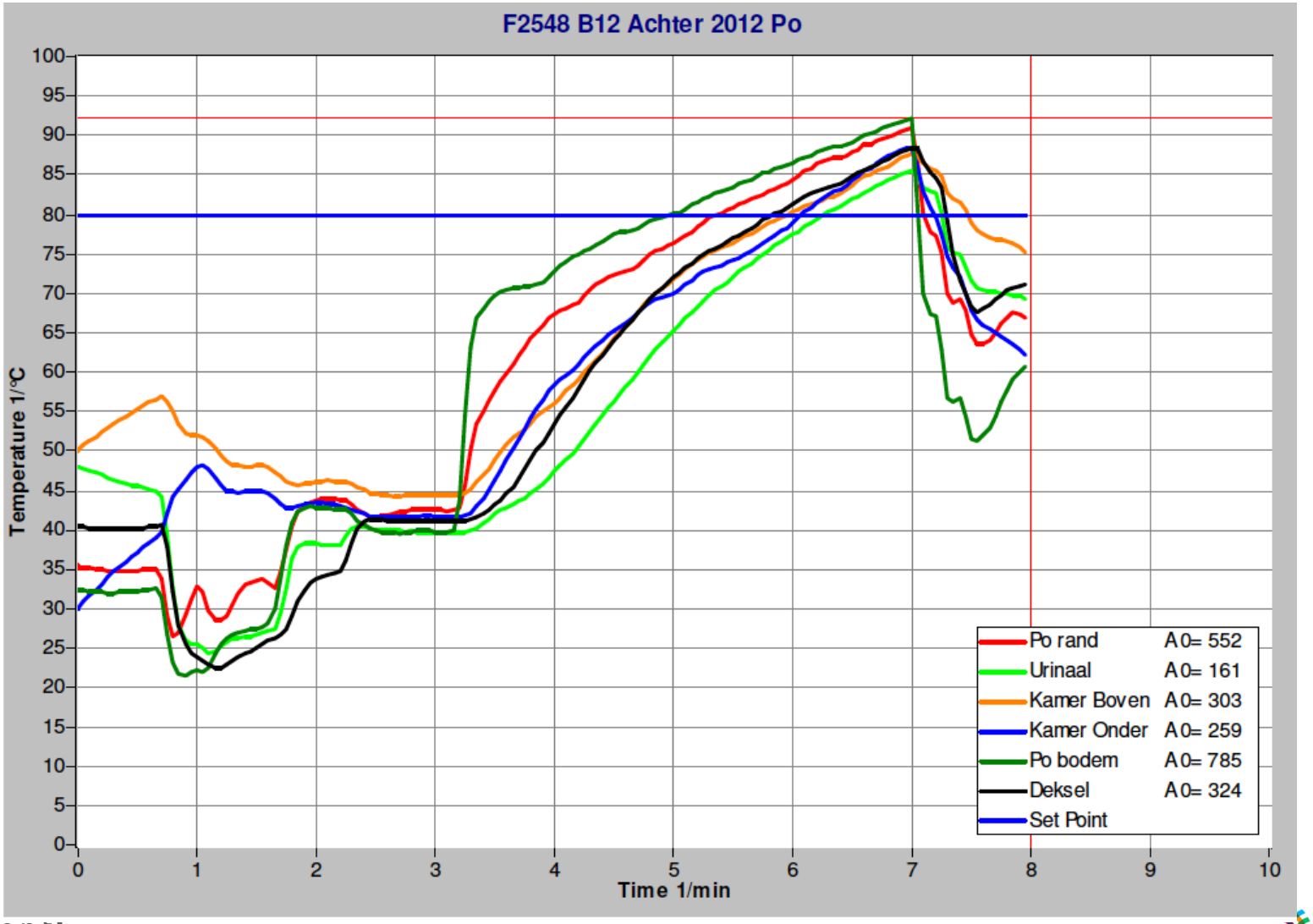
Waarbij:
Z = 10 ℃ (thermische vernietigingsfactor)
T = vastgestelde temperatuur
Δt = tijdsduur ontsmetting (seconden)

A0-value

- Bed-pan washers were validated according to European Norm volgens
  - A60 = the effect of 1 min 80°C

- A0 values
  - >60 cleaning, contact with healthy skin
  - >600 semi-critical, in contact with broken skin or mucouse membrances
  - >3000 critical, in contact with sterile tissue

Bed-pan washers CWZ



TD: All A0>60 = okay!

	F2548			F2546		
	b12 achter po	b12 achter uri	b12 achter int	b12 voor po	b12 "achter" uri	b12 voor int
Po rand	552	481	638	380	582	604
Urinaal	161	169	146	90	139	156
Po bodem	785	673	1202	656	1209	755
Deksel	324	332	419	318	344	311

	H1175			H1166		
	b14 achter po	b14 achter uri	b14 achter int	b14 voor po	b14 voor uri	b14 voor int
Po rand	409	576	578	743	956	935
Urinaal	139	157	253	2997	4703	3933
Po bodem	767	1032	907	1340	1244	1704
Deksel	222	325	387	451	510	543

	H1186			H1168		
	b44 achter po	b44 achter uri	B44 achter int	b44 voor po	b44 voor uri	b44 voor int
Po rand	515	580	1090	857	751	725
Urinaal	274	201	263	2085	2259	2242
Po bodem	1047	1018	1124	1290	1290	1258
Deksel	321	470	419	647	515	688

Yes, >60 but okay?

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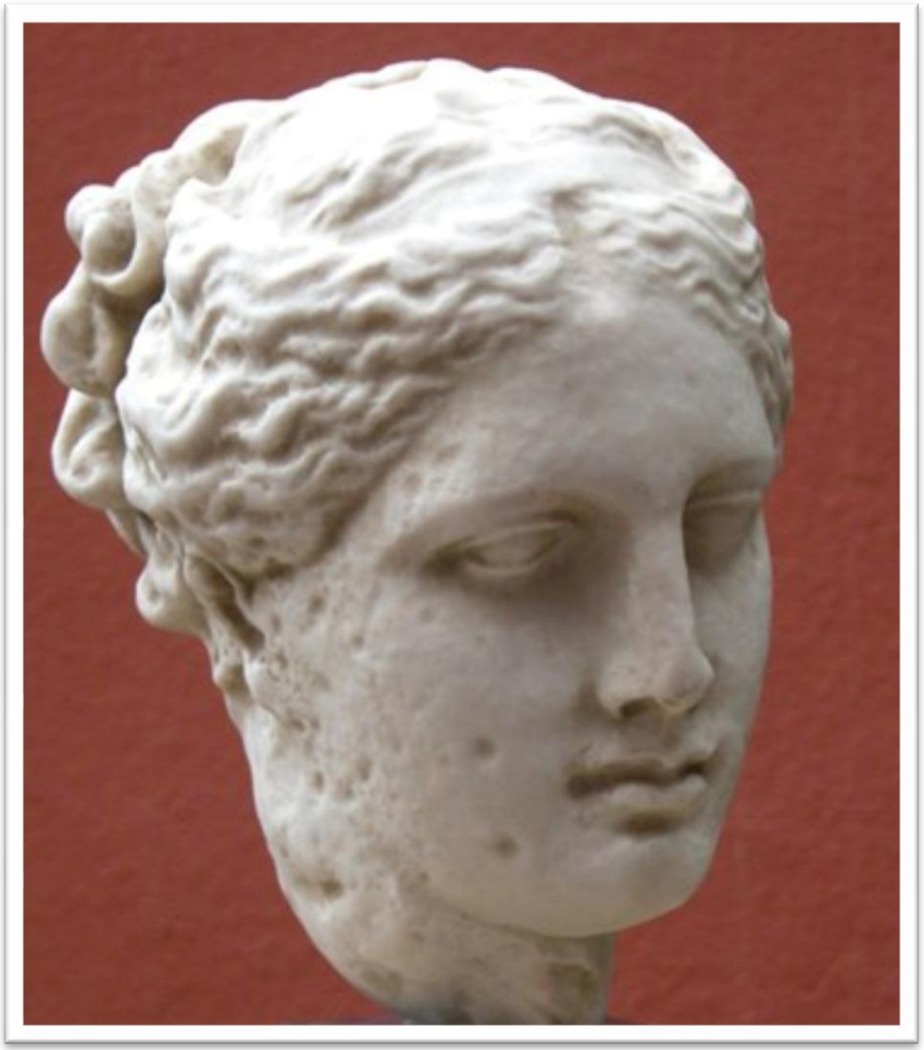
A0-value

Problem: A0-value “norm” okay, but bed-pans still VRE+

- in-vitro experiment to determine A0 value: Outbreak strain = 160
- In addition bed-pans visibly soiled = A0-value says nothing about how “clean” something is

Infection Control



Infection control questions

- How many culture (sets) to say that someone is a VRE carrier?
  - at least 5 sets
- How long does a patient stays VRE+
  - cohort study VRE+ patients
  - at least a year (nat. guidelines), longer?

- Cleaning & vacant responsibilities
- Improving hand hygiene

Who is cleaning this in your hospital?

Vacant responsibilities

- Roomservice
- Roomservice-plus
- Nurses
- Nurse-assistents
- Housekeeping

Thus, who does it after the merge?

If they do it, are they doing it well?

Audits, audits, audits …

Whom to trust?

- External certified company validated bed-pan washers according to EN
- When checking – their methods they were not okay.

- Who is resposnible?

VRE & antibiotic use

Antibiotic stewardship

- Is the VRE outbreak related to the local use of antibiotics
- The ICU uses SDD – any effect?

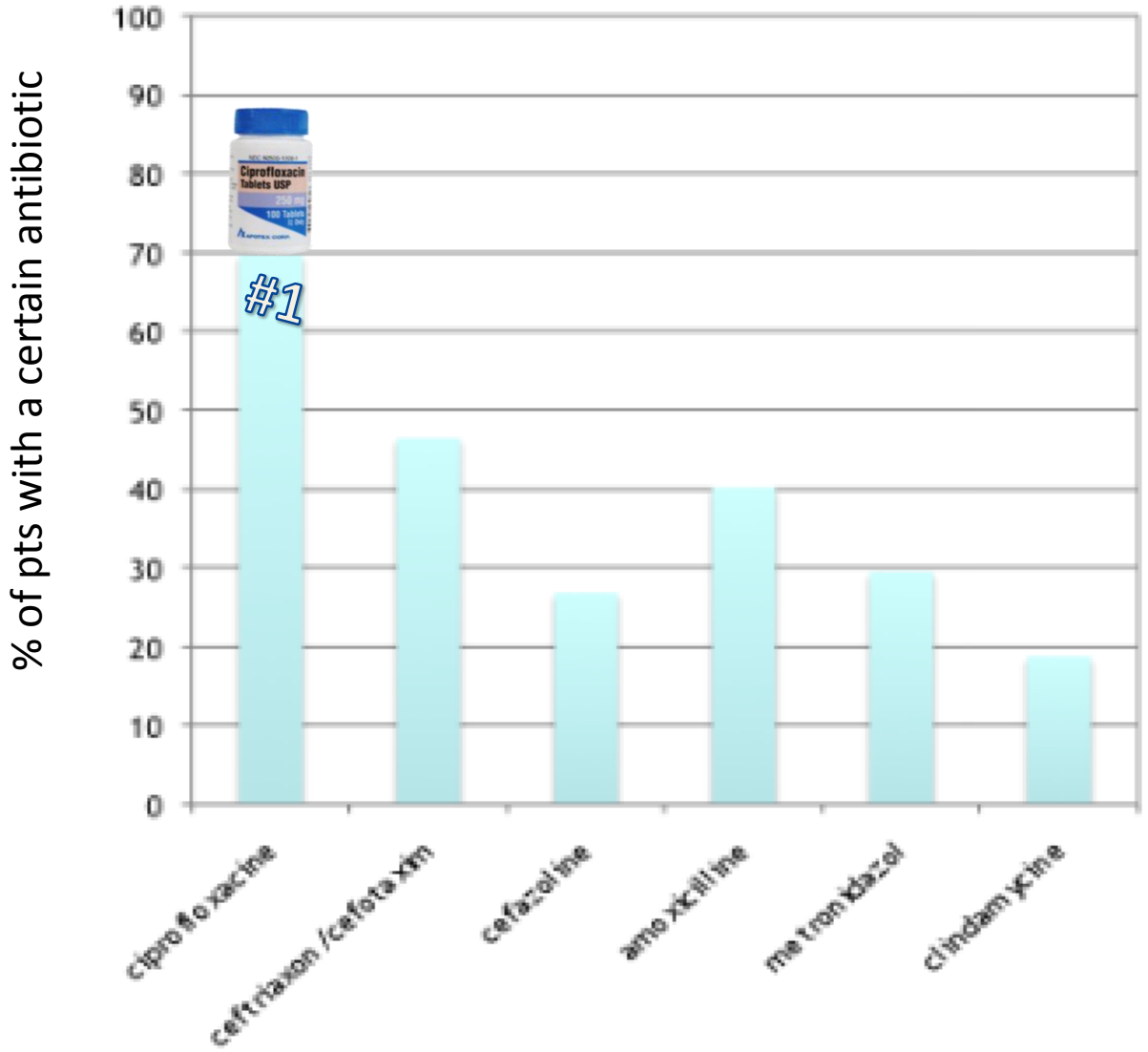
SDD & VRE

- No proof that SDD or SOD increases chance of VRE colonization (but most trials in countries with low VRE prevalence)
- We do know that cephalosporin use (including in ICU) selects for enterococci and VRE
- In the Netherlands: of the 15 hospitals with VRE problems 10 (71%) used SDD compared to about 50% in general

CWZ: antibiotics in VRE+ pts

- 93% of the patients received antibiotics in the last 3 months before the first pos VRE culture
  - versus <50% of VRE- patients
- 54% had antibiotics at the moment of their first pos VRE culture
- On average patients had 2.85 different antibiotics before their first pos VRE culture (range 0-10)
- Only 0.9% had previously received vancomycin

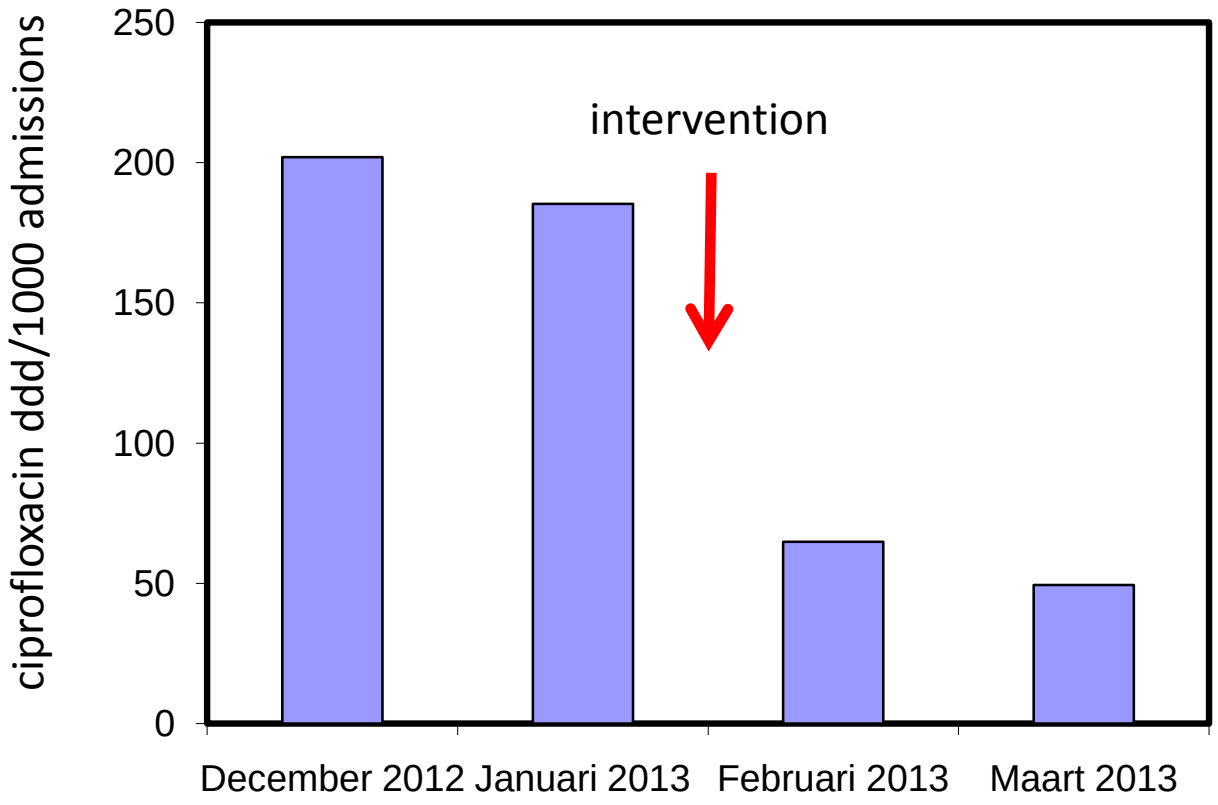
If not vanco, what did they get ?



Reduction of cipro-use

- Change of (empiric) treatment regiments
- Change treatment guideline
  - implementation of new guidelines
  - lunch meetings
- Monitoring of ciprofloxacin-use after the implemntation

Ciprofloxacin-use in CWZ



VRE take home message

- If you thing you are out of trouble – things might change surprisingly quickly
  - look at you *E. faecium* epidemiology
- Basic infection control and environmental cleaning are of up-most importance
  - prevent vacant responsibilities
  - check your disinfection procedures