

Herlev and Gentofte Hospital

REGION

# Vancomycin-Resistant Enterococci - an update

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NordicAST workshop Göteborg, 25.5.2022

# Agenda

- Geno- and phenotypes
- Diagnostic principles
- Epidemiology: Global - Nordic - Local

# VRE: a short introduction

## Enterococci

gastrointestinal colonization → (opportunistic) clinical infection

Human pathogens: mainly *E. faecalis* and *E. faecium*

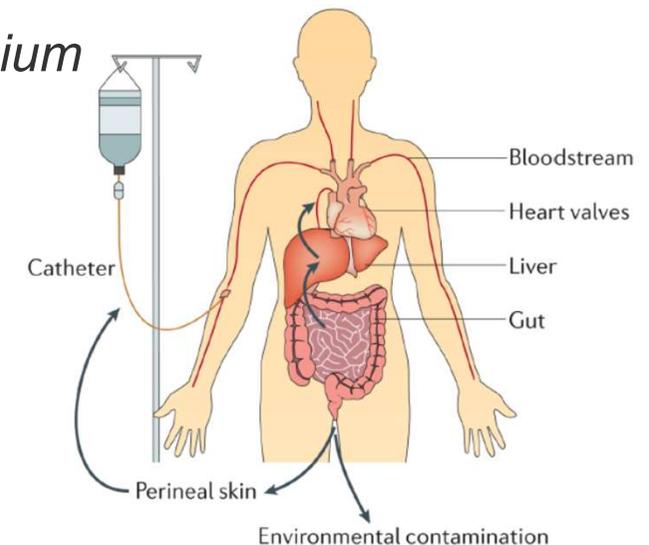
*E. faecium* mainly nosocomial pathogen

## VRE

first detected in 1986

main player *E. faecium*

ratio VRE in clinical / screening samples: 1 / 5-10



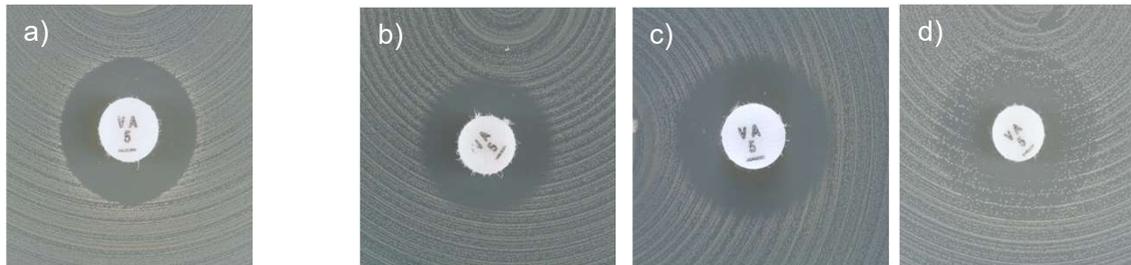
. The crucial role of the gastrointestinal tract in enterococcal infection and spread

# VRE geno- and phenotypes

	Genotype	Phenotype
<b>vanA VRE</b>	vanA positive	Vancomycin high level R Teicoplanin R
 <i>in vivo / in vitro</i> <b>VVE</b> Vancomycin- <b>Variable</b> Enterococci	vanA positive	 Vancomycin <b>S</b>
<b>vanB VRE</b>	 <i>presence in other species</i> vanB positive	 Vancomycin <b>low/high</b> level R Teicoplanin <b>S</b>

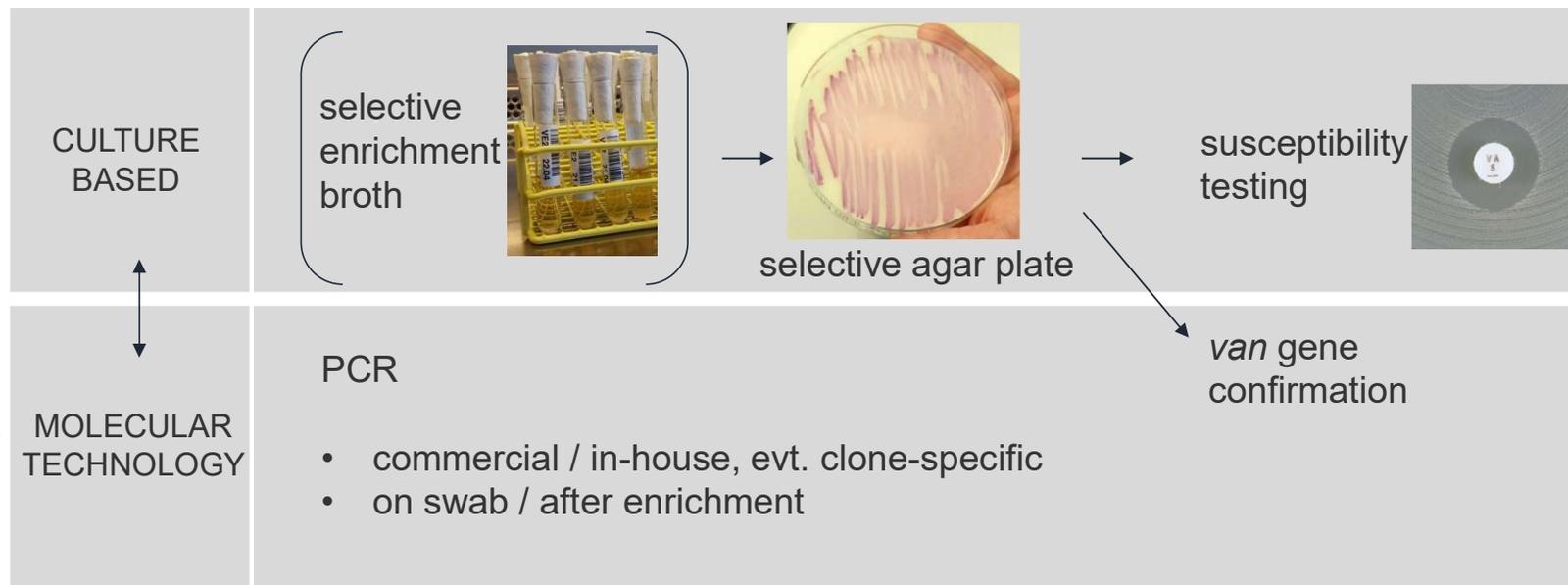
## Vancomycin susceptibility testing / disk diffusion

Examine the zone edge:



# How to screen for asymptomatic VRE carriage?

rectal swab



# VRE diagnostics: principles and pitfalls

## *vanA*

- Phenotypically easy to detect
- PCR specific for VRE, can be performed directly on rectal screening sample
- VVE: diagnosis of VVE dependend on molecular methods

## *vanB*

- Low-level resistance difficult to detect
- Direct PCR on rectal screening sample is unspecific

## Further reading: NordicAST method documents

- Detection of glycopeptide-resistance in enterococcal isolates
- Screening for Vancomycin-resistant Enterococci (VRE) carriage

**NordicAST** Nordic Committee on Antimicrobial Susceptibility Testing

NordicAST Organisation **Methods** Quality control Breakpoints and Dosages AST report panels FAQ National committees Workshops

RSS

Methods

EUCASTs disk diffusion method

**Explanatory methods document**

Method development

**Method document in quality control**

Method documents in quality control are available [here](#).

**Explanatory methods documents**

Visa 50 rader

Kod	Titel
Anaerobes	Anaerobic bacteria and resistance

## ***E. faecium* genetics: Genome plasticity**

Horizontal gene transfer of mobile genetic elements (plasmids, transposons, ...)

+

Homologous recombination of the core genome

=

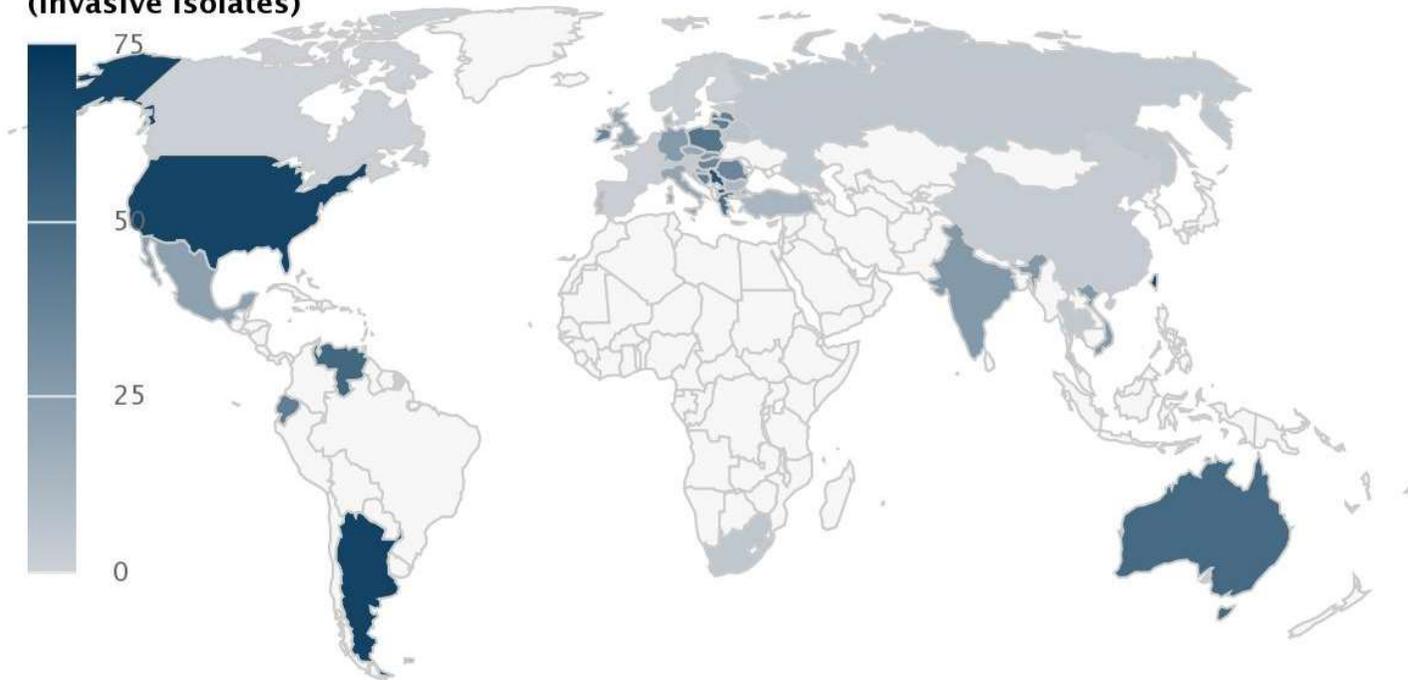
Adaptation to the healthcare environment through accumulation of resistance and virulence genes

Hospital-associated clade A1 emerged in recent decades

Gorrie et al. *Microb Genom.* 2019;5(7):e000283; Cattoir et al. *Curr Opin Microbiol* 2022, 65:73–80  
Lebreton et al. *mBio* 2013; 20;4(4):e00534-13; van Hal et al. *Genome Med* 2021; 30;13(1):52.

# Global VRE epidemiology

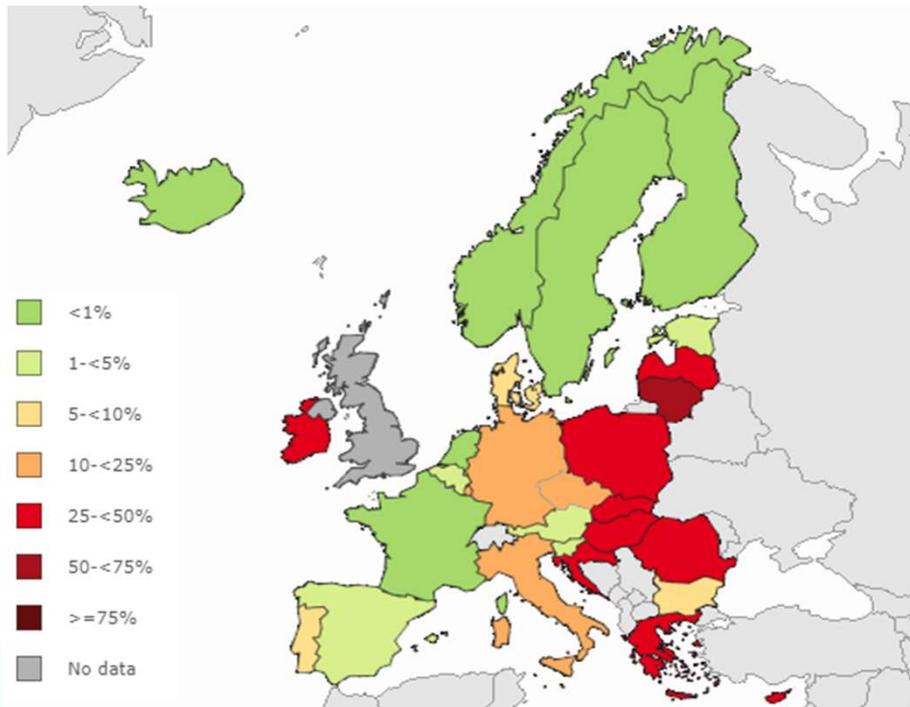
**% Resistant (invasive isolates)**      ***E. faecium*, vancomycin**



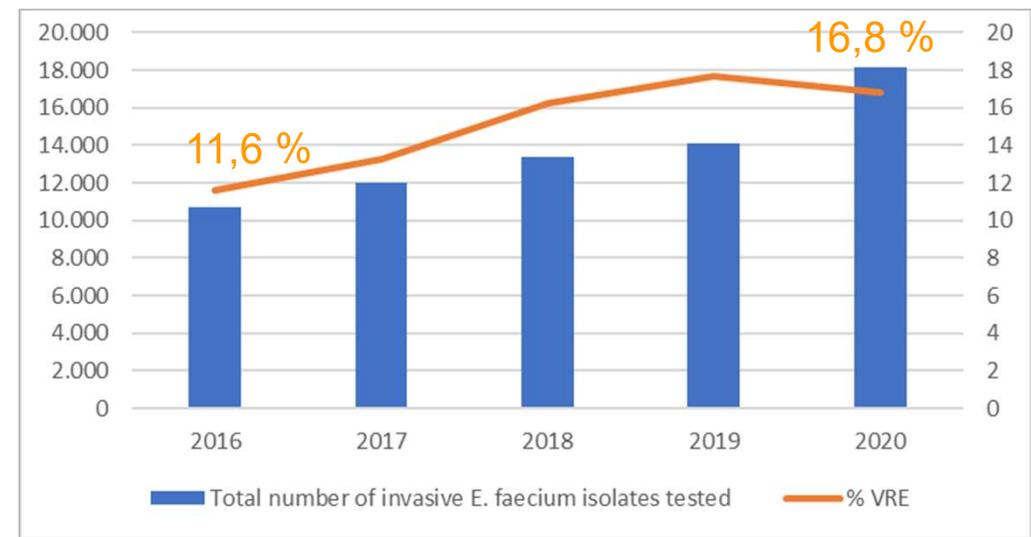
Center for Disease Dynamics, Economics & Policy (cddep.org) © Natural Earth

# VRE epidemiology: EU/EEA

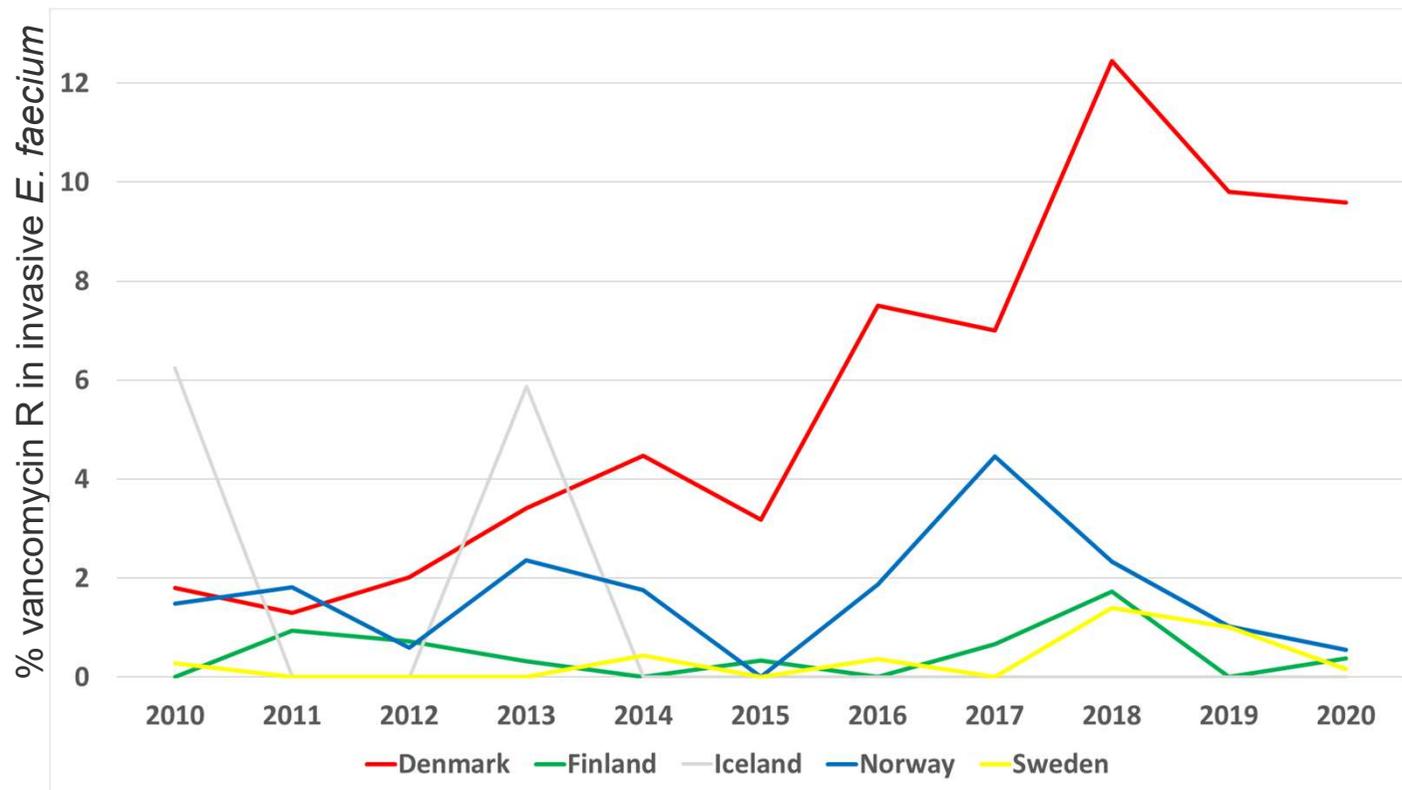
Invasive *E. faecium* isolates, % vancomycin R; 2020



Population-weighted EU/EEA mean:



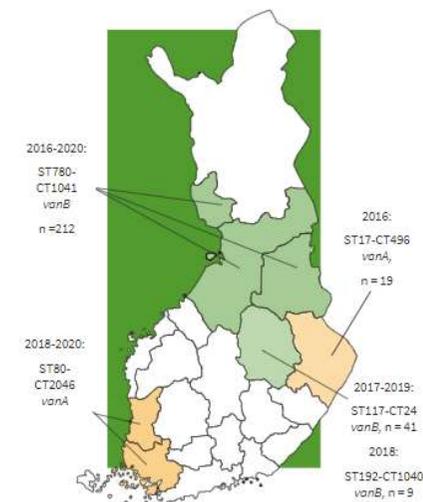
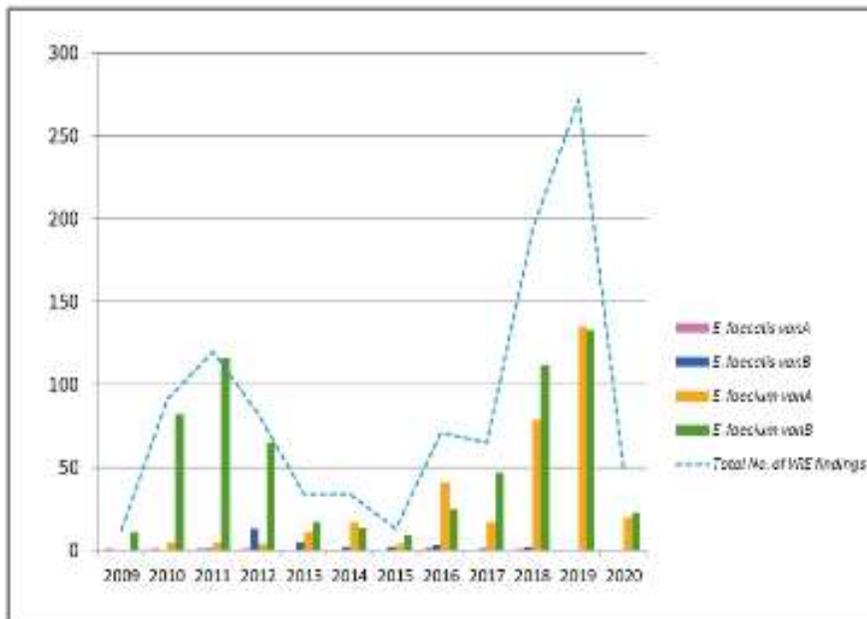
## VRE-epidemiology: Nordic countries



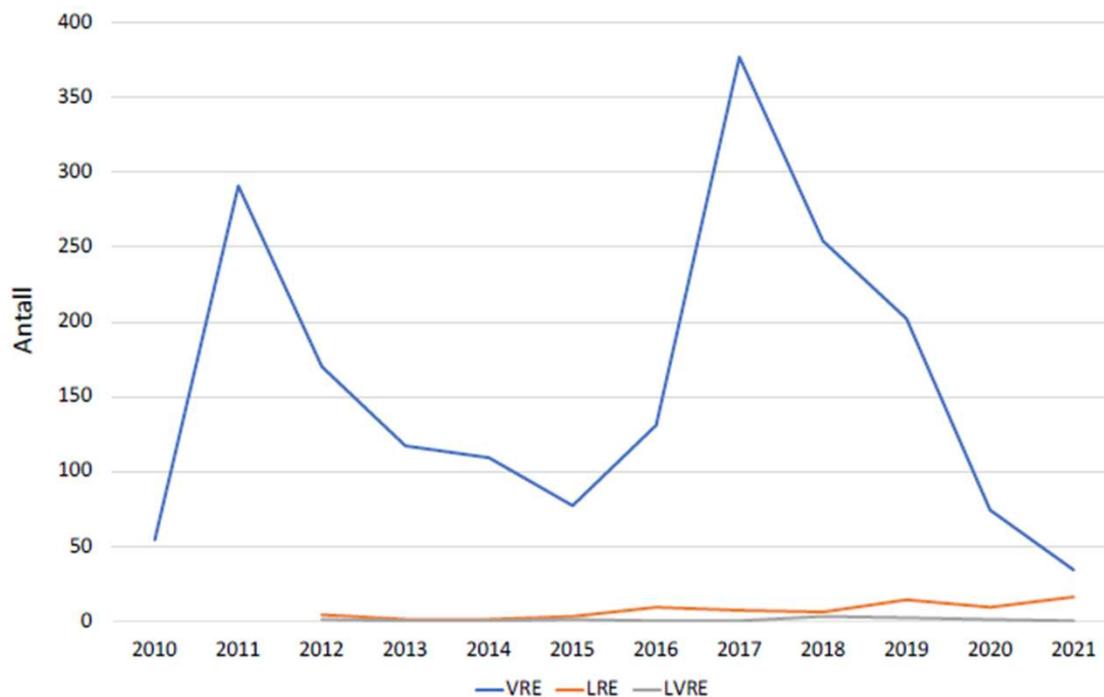
## VRE epidemiology: Finland

Increased incidence in 2010-12 due to *vanB*,

2016-19 both *vanA* and *vanB*, 5 outbreaks in different regions



## VRE epidemiology: Norway



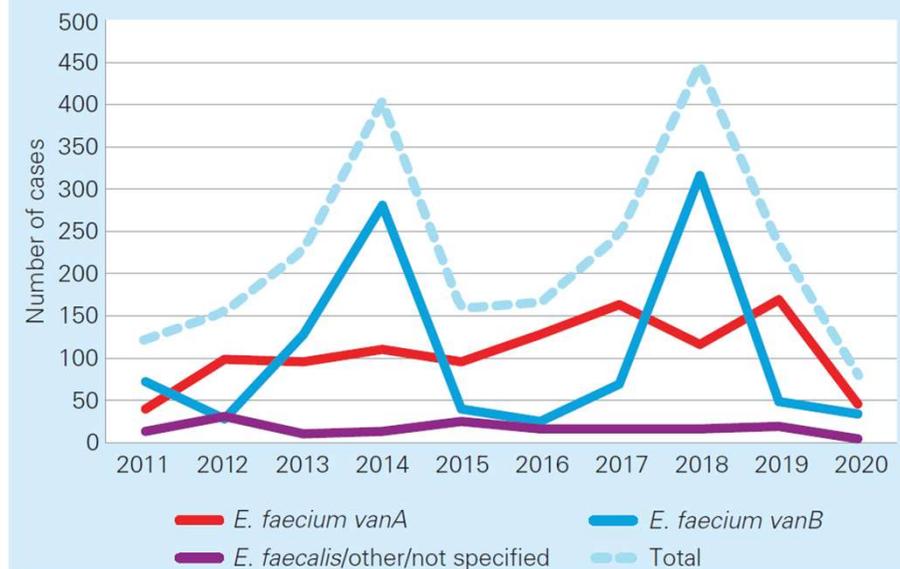
Helse region	Antall VRE	Antall VRE med HGS
Helse Sør-Øst	21	4
Helse Vest	11	1
Helse Midt	2	0
Helse Nord	0	0

Forekomst og molekylære genetiske analyser av bakterier med spesielle resistensmønstre i Norge 2021 – rapport fra nasjonalt referanselaboratorium

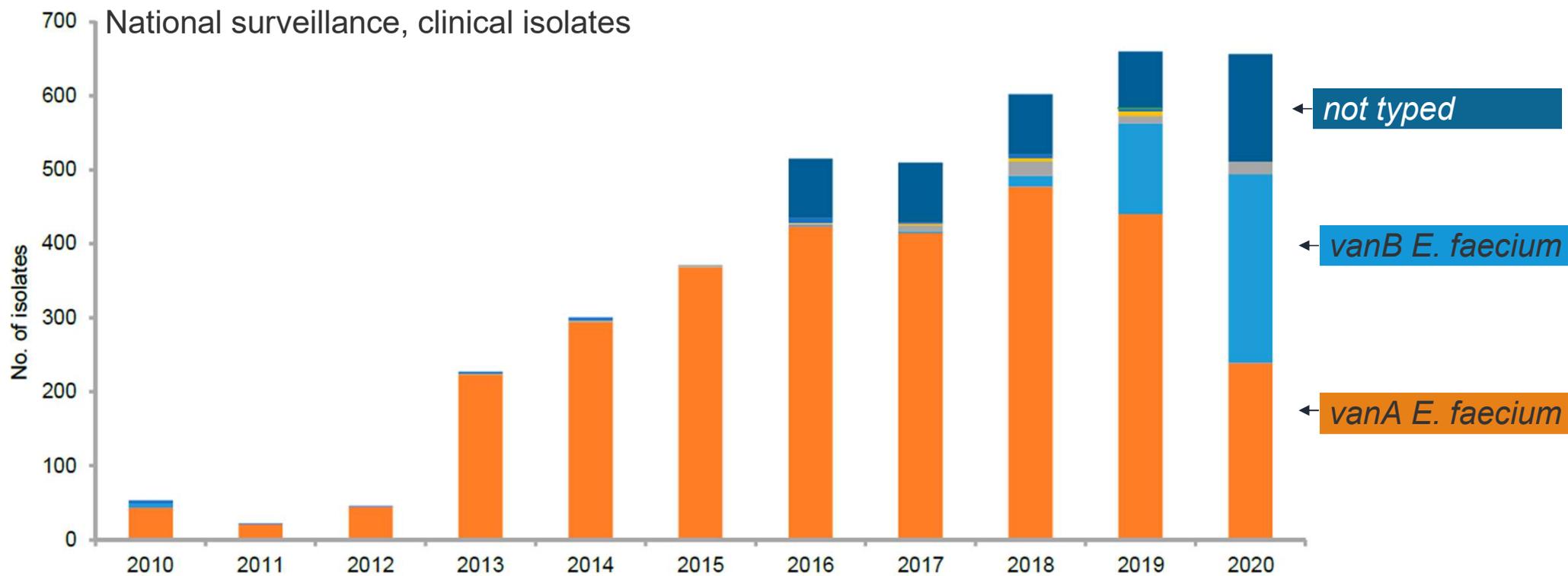
## VRE epidemiology: Sweden

- Large national *vanB* ST80 outbreak in 2018, total 279 cases
- 16 / 21 regions reported VRE during 2020
- Total number of reported cases in 2020: -66%

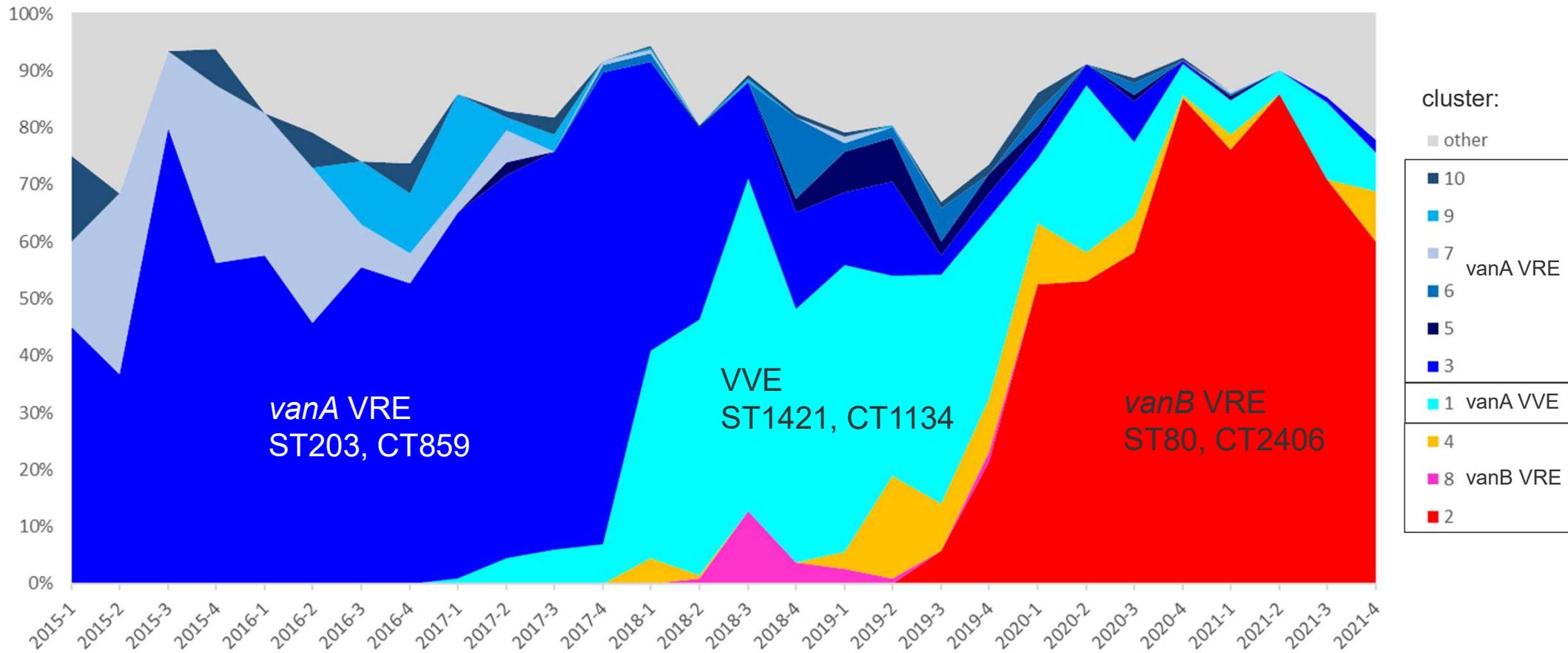
**Figure 3.23.** Number of VRE cases and their corresponding *van*-type.



## VRE epidemiology: Denmark



# Local molecular epidemiology: temporal changes



## Conclusions

*E. faecium*: dynamic genome → constantly changing epidemiology

Diagnostic pitfalls:

low-level resistant *vanB*

vancomycin-variable Enterococci (*vanA*)

Adapt your laboratory methods to local epidemiology

But: Be aware of new clones with different pheno-/genotypic characteristics