Investigation of NI Outbreak: VRE

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Background

- Endemic ESBL-producing organism
- Endemic XDR- *Acinetobacter baumannii*
- Emergence of CRE
Surveillance System

- Targeted MDRO
- WARD
  - Isolation precautions
- ICN
  - Co-ordination
- ID Team
  - Q/A
At 7NW

- 5 มิย. ผู้ป่วยรายหนึ่งในหอผู้ป่วยมีไข้หลังจากเข้ารับการรักษาในรพ.แล้วประมาณ 2 สัปดาห์
- แพทย์ส่งตรวจทางห้องปฏิบัติการเพื่อหาสาเหตุ
- แพทย์ส่งตรวจทางห้องปฏิบัติการเพื่อหาสาเหตุ
- 10 มิย. urine culture report VRE
  - Perianal surveillance culture in 5 contact cases, all HCWs at 7NW
Vancomycin-resistant enterococci

- Both *E. faecalis* and *E. faecium* can be R to vanc.

- But *E. faecium* are more problematic
  - They also R to amp, while *E. faecalis* are S to amp
  - So, VRE *faecalis* can be treated by ampicillin
<table>
<thead>
<tr>
<th>Type (the ligase gene)</th>
<th>Species $^{15-19}$</th>
<th>Origin of gene</th>
<th>MIC of vancomycin (µg/ml)</th>
<th>MIC of teicoplanin (µg/ml)</th>
<th>% Identity of deduced amino acid of ligase enzyme $^{9,11,14}$</th>
<th>Terminus of peptidoglycan precursor</th>
</tr>
</thead>
<tbody>
<tr>
<td>VanA (vanA)</td>
<td><em>E. faecium</em></td>
<td>Acquired</td>
<td>64 $\rightarrow$ 1000</td>
<td>16–512</td>
<td></td>
<td>D-Ala-D-Lac</td>
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<td></td>
<td><em>E. faecalis</em></td>
<td></td>
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<tr>
<td></td>
<td><em>E. durans</em></td>
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<tr>
<td></td>
<td><em>E. gallinarum</em></td>
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<tr>
<td>VanB (vanB)</td>
<td><em>E. faecalis</em></td>
<td>Acquired</td>
<td>4 $\rightarrow$ 1000</td>
<td>0.5–32 $^a$</td>
<td>77% with VanA</td>
<td>D-Ala-D-Lac</td>
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<tr>
<td></td>
<td><em>E. faecium</em></td>
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<td></td>
<td><em>E. casseliflavus</em></td>
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<tr>
<td></td>
<td><em>E. gallinarum</em></td>
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<td></td>
<td><em>S. galloyticus</em></td>
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<td></td>
<td><em>S. bovis</em></td>
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<td>VanC (vanC-1, vanC-2/vanC-3)</td>
<td><em>E. gallinarum</em> and <em>E. casseliflavus</em></td>
<td>Intrinsic</td>
<td>2–32</td>
<td>0.5–1</td>
<td>VanC-1, VanC-2/VanC-3: 37% with VanA, 38% with VanB</td>
<td>D-Ala-D-Ser</td>
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<td><em>E. flavescens</em></td>
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<td>VanC-1: 73% with VanC-2/VanC-3, 98% with VanC-3</td>
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</tbody>
</table>

$^a$ Indicates a footnote or additional information.
Transferable Vancomycin Resistance in a Community-Associated MRSA Lineage

VRE, hospital environment, and HCWs

- 46% of 13 HCWs who touched bedrails and bedside tables of VRE patients contaminated their gloves
- 20% of volunteers who touched bedrails and bedside tables contaminated their hands with VRE

Boyce JM, Journal of Hospital Infection (2007) 65(S2) 50–54
In a careful study by Duckro et al., 25 HCWs touched VRE-positive sites, then touched 151 VRE-negative sites. VRE were transferred to 16 (10.6%) of negative sites.

Boyce JM, Journal of Hospital Infection (2007) 65(S2) 50–54
Duration of colonization with VRE

Median = 5.57 weeks
(range, 0 – 50.14)

Risk factors for prolonged colonization

- Antibiotic use during admission ($p = 0.001$)
- Fluoroquinolone use during admission ($p = 0.048$)
- Patient discharge to another institution ($p = 0.038$)
- Dialysis ($p = 0.034$)
- Immunosuppression in the outpatient clinic ($p = 0.002$)

Clinical presentation

- Bacteremia (device-associated)
- Urinary tract infection
- Co-pathogen in intra-abdominal infection
- Meningitis
- Surgical site infection
Importance of VRE

- Difficult-to-treat due to lack of effective agents and COSTLY (4,000-7,000 Bht/day as compare to 400 Bht/D for vanc)
- Potential to spread their resistant gene to other bacteria especially Staphylococcus aureus
Impact of VRE

- Risk of death among patients with VRE BSI ≥ 2-fold compared to VSE BSI (DiazGranados CA Clin Infect Dis 2005;41:327–33.)

- In a multivariate model, acquisition of VRE was associated with prolonged post-ICU LOS (Huang SS, et al. 2006;166:1945–51.)
Who will be affected

- Patients with Hemodialysis
- Immunocompromised, esp. hematologic malignancy and organ/hematopoietic stem cell, bone marrow transplanted
- Prolonged ICU stay
VRE IN THAILAND
The 3 VRE isolates were all VanA and were obtained from patients who had been abroad (Thailand, Spain, France)
ANTIBIOTIC RESISTANCE OF ENTEROCOCCI ISOLATED FROM FROZEN FOODS AND ENVIRONMENTAL WATER

Abstract

- 239 isolates of enterococci (113, frozen foods; 126, environmental water)

- Vancomycin resistant enterococci (VRE) were isolated from 9.7% of food isolates and 10.3% of water isolates

VANCOMYCIN-RESISTANT ENTEROCOCCI IN KING CHULALONGKORN MEMORIAL HOSPITAL: A 5-YEAR STUDY.

Finding

- 1854 isolates from clinical specimens between 1995 and 1999
- 15 (0.81%) VRE were isolated (14 *E. faecium*, 1 *E. faecalis*); All carried VanB phenotype
- Surveillance of 5 years study demonstrated a gradual increase rate of VRE

Vancomycin overuse in Siriraj Hospital

- 6-week prospective observational study
- Inappropriate prescription 59.5%
- Inappropriate use was significantly correlated with
  - Department (Pediatrics, Surgery, Ophthalmology)
  - No consultation with an infectious disease specialist

Vancomycin overuse in Siriraj Hospital

- A substantial rate of inappropriate use of vancomycin was found in Siriraj Hospital.
- The overuse did not improve the clinical outcome.

VANCOMYCIN-RESISTANT ENTEROCOCCI (VRE) ISOLATES ISOLATED IN RAJAVITHI HOSPITAL BETWEEN 1999 AND 2009

Findings

- From 1999 to 2009, 201 VRE (199 *E. faecium* and 2 *E. faecalis*) were found.

- Place: Medical (33.7%), ICUs (15.6%) and surgical (15.1%) wards.

- Site: urine, 64.2%, followed by pus, blood, genital and sputum specimens, 21.9%, 9.0%, 3.5% and 1.4%, respectively.

Rate of vancomycin resistant enterococci (28 hospitals, 1998-2012; NARST Data)
Standard Precautions

- Hand hygiene
- Use of personal protective equipment
  - Gloves
  - Gown
  - Mask
  - Eye protection
  - Face shield
Post-outbreak management

- Continuing surveillance
  - Arbitrary criteria
  - Culture
  - Clinical prediction
- Enhancement of isolation precaution practice compliance
- Establishment and refinement of antimicrobial stewardship program
Distribution of most common strain types of vancomycin-resistant enterococci over time

Strain differentiation by molecular technique
What we’ve learned?

- Almost all VRE isolates belong to the same clone by RAPD identification
- Prolonged mechanical ventilation was a predictive factor of acquiring VRE
- Antibiotics might have some role but not definite in this outbreak
  - Increased use of pip/tazobactam
THANK YOU
FOR YOUR ATTENTION

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