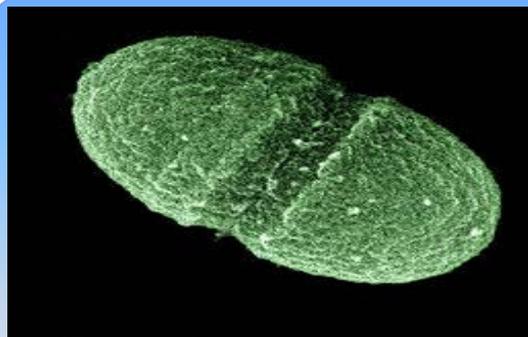


Hand Hygiene Product

Issues with alcohol?

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Learning Objectives

- Review the role of alcohol based handrubs for healthcare workers
- Consider products formulations and presentation
- Review a key new Australian research article and its potential impact for HH practice
- Consider questions and opportunities for future research and development

Issues with alcohol

- Alcohol based hand rubs have been broadly adopted as the main stay of all well developed HH programs globally
 - General convenience with access at point of patient care;
 - Efficacy against a range of common healthcare pathogens (superior to soap and water in most circumstances);
 - Time saving nature when used (speed of action);
 - Less skin irritation versus soap and water if used appropriately
- Their use has resulted in reductions of important healthcare associated infections such as methicillin-resistant *Staphylococcus aureus*

Issues with alcohol

- Alcohol formulations have been recommended by the WHO
 - Routine hand hygiene products are required to meet the following criteria:
 - contains alcohol concentration in the range 60 – 80% (v/v)
 - complies with EN1500 testing standard for bactericidal effect
 - registered with the Therapeutic Goods Administration as a medicine (in Australia)
 - contains an emollient to minimise the risk of contact dermatitis.
 - Liquid formulations are generally accepted as more effective
 - Volume of product for optimal contact time for disinfection is recognised as critical (approx. 30 seconds is widely recognised as optimal)
 - Residual efficacy of an agent is regarded as important in some settings and chlorhexidine gluconate 0.5% is commonly added to products

Issues with alcohol

- It is well recognised that alcohol hand rub formulations are largely ineffective against a range of pathogens
 - *Clostridium difficile* (including its spores)
 - Non-enveloped viruses such as Norovirus
- Following any unprotected skin exposure to these agents, hand hygiene is best achieved with the use of soap and water or medicated soap and water
- Alcohol hand rub is best used on hands that are not visibly soiled and with the application of a product for sufficient time and dose
- It has long been known that alcohol tolerance of growth in different microorganisms appears to result in large part from adaptive and evolutionary changes in cell membrane composition.

Issues with alcohol

INFECTIOUS DISEASE

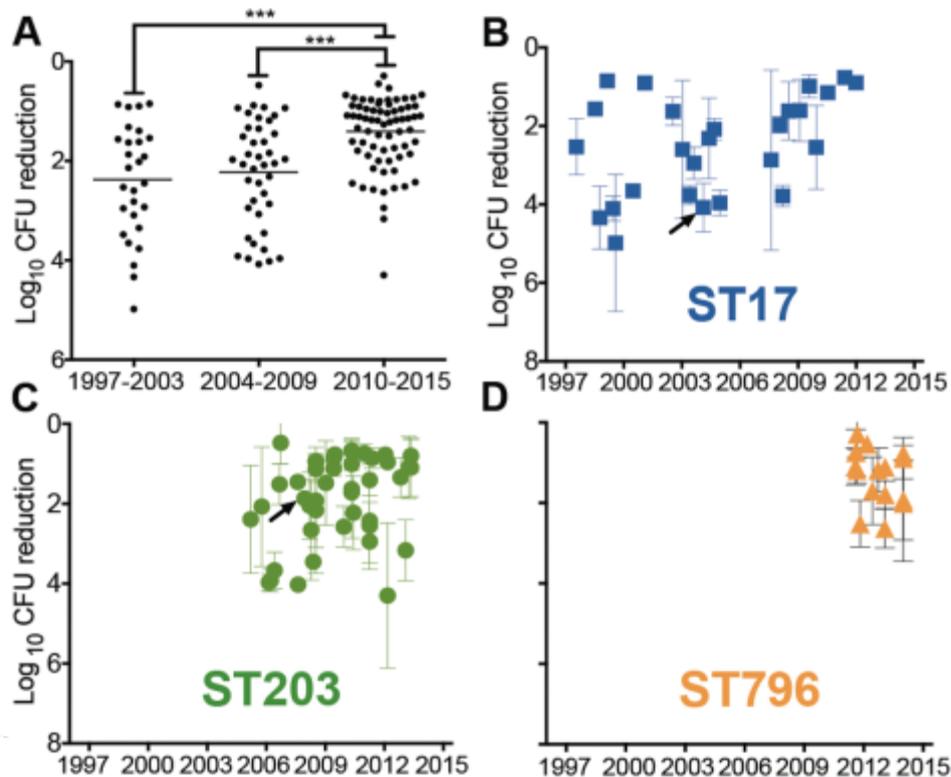
Increasing tolerance of hospital *Enterococcus faecium* to handwash alcohols

Sacha J. Pidot^{1*}, Wei Gao^{1*}, Andrew H. Bultjens^{1*}, Ian R. Monk¹, Romain Guerillot¹, Glen P. Carter¹, Jean Y. H. Lee¹, Margaret M. C. Lam¹, M. Lindsay Grayson^{2,3,4}, Susan A. Ballard⁵, Andrew A. Mahony², Elizabeth A. Grabsch², Despina Kotsanas⁶, Tony M. Korman⁶, Geoffrey W. Coombs^{7,8}, J. Owen Robinson^{7,8}, Anders Gonçalves da Silva⁵, Torsten Seemann⁹, Benjamin P. Howden^{1,2,3,5}, Paul D. R. Johnson^{1,2,3†}, Timothy P. Stinear^{1†}

- It has been recognised that there has also been an increase during this period in VREfm *vanA* and *vanB* within acute care hospitals across Australia
- This publication identifies an important finding relating to a number of widely distributed phenotypes of VREfm *vanA*

• Over the last decade in Australia at the same time as there has been a remarkable increase in HH compliance (National average compliance now >80%)

Issues with alcohol



- There was genetic diversity noted between isolates examined
- A number of new clones were identified, but each clone demonstrated incremental increases in resistance over time
- Similar tolerance patterns were noted when isolates were exposed to ethanol

Isopropanol tolerance variation amongst *E. faecium* isolates; changing tolerance of three dominant clones

Issues with alcohol

- The clinical relevance of this increasing alcohol tolerance was further tested with assessment of contaminated surfaces in the transmission of *E. Faecium* in mice.
- Mice guts were colonised with varying isolates and clones of *E. Faecium* then assessments were made of the efficacy of cleaning of the floor of the mouse cage with water and isopropanol 70%
- This demonstrated that the alcohol tolerant *E. Faecium* isolate was less susceptible to the isopropanol and was able to readily colonise the mouse gut

Issues with alcohol

- Another important finding in this paper was that the alcohol tolerant clones were gradually displacing the sensitive clones, despite significant genetic diversity
- Efforts were also made in this research to identify if there was a specific genetic basis for this increase in alcohol tolerance
- Mutations in the region of the *rpoB* gene are known to lead to the development of resistance to the antibiotic rifampicin, despite this gene being linked to specific mutations, it was felt appropriate to use the *rpoB* mutations to assist in the detection of mutations associated with alcohol tolerance phenotype
- This led to the assessment that there may well be a genetic basis for the alcohol tolerance phenotype.

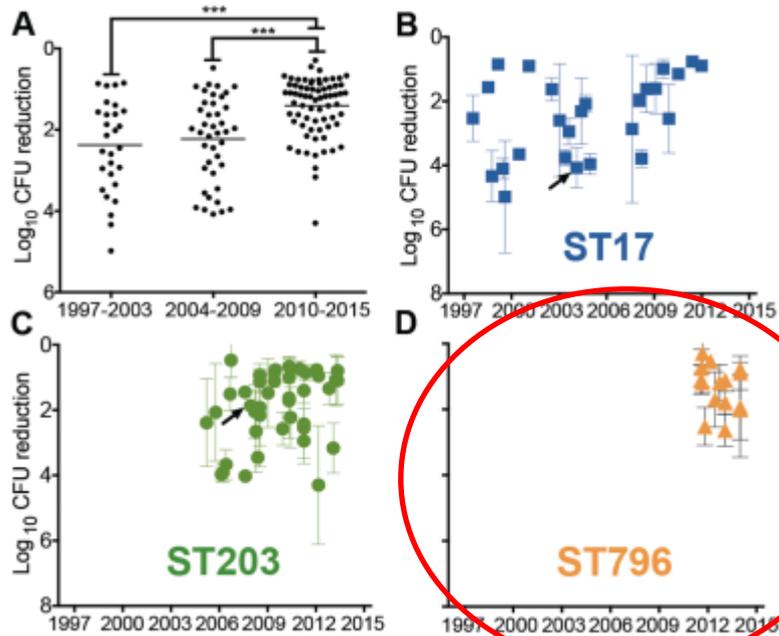
Issues with alcohol

- Control of VRE remains a priority for most healthcare facilities in Australia
- The increasing burden of VRE has seen an emergence of difficult to treat sepsis events
- Hospital strains of VRE encode resistance to a large number of antibiotics which can treat other Gram negative infections
- The genome of these organisms contain a high number of mobile genetic components.
- They contain genes encoded to alter carbohydrate metabolism and have other distinguishing features from community strains making them more pathogenic

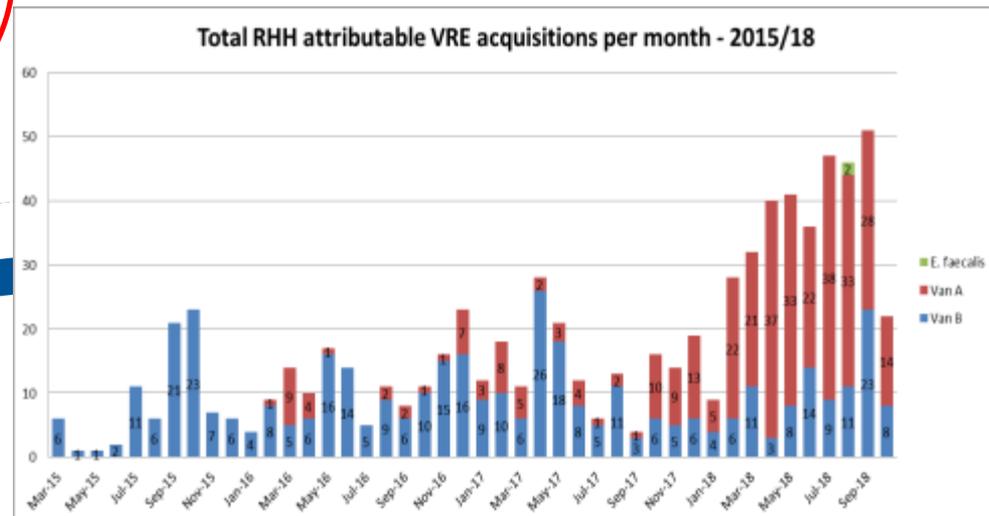
Issues with alcohol

- In Australia the Australian Group on Antimicrobial Resistance (AGAR) published a report on enterococcal sepsis outcomes.
- Key findings were;
 - *E. Faecium* were responsible for one third of enterococcal sepsis events
 - 90% were resistant to ampicillin
 - 50% were resistant to vancomycin
- Treatment of invasive VRE infections require more expensive antibiotics with increased risks of side effects and treatment failure due to additional antibiotic resistance often seen in these patients

Issues with alcohol



- At the RHH we have detected a change in local epidemiology with increased VRE since 2015
- We have recently completed a whole genome sequencing analysis, demonstrating the introduction of the ST796 along with the ST80 strain



Issues with alcohol

- This has led to recognition that whilst VRE may now be endemic in our facility, its spread is not uniform and control actions can still be successful
 - Increased focus on transmission-based precautions
 - Increased focus on environmental; hygiene
 - Increased surveillance in affected and high-risk units

Issues with alcohol

Unlocking the Sporicidal Potential of Ethanol: Induced Sporicidal Activity of Ethanol against *Clostridium difficile* and *Bacillus* Spores under Altered Physical and Chemical Conditions

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- On skin, sporicidal ethanol formulations were as effective as soap and water hand washing in reducing levels of *C. difficile* spores.

- Work has been undertaken in a number of centres to attempt to modify
- Acidification, alkalization, and heating of ethanol induced rapid sporicidal activity against *C. Difficile*
- The sporicidal activity of acidified ethanol was enhanced by increasing ionic strength and mild elevations in temperature.

Issues with alcohol

- In 2016 the Australasian Society for Infectious Diseases published updated guidelines for the management of *Clostridium difficile*.
- The general infection prevention and control management measures included the following;
 - Hand hygiene with soap and water or alcohol hand rub
 - Patient isolation (contact precautions with gown and gloves for each patient contact)
 - Environmental hygiene with a sporicidal disinfectant

Issues with alcohol

- A paper was published by D'Antonio et al in AJIC in 2010
- This examined the role of disinfectant hand wipes for effective hand hygiene versus the traditional liquid product
- Previously sanitising hand wipes have been regarded as inferior for healthcare worker hand hygiene, due to a range of factors including;
 - Low concentration of alcohol in the wipes
 - No sporicidal activity
- This paper identified that new disinfectant hand wipes available were as effective and in some cases more effective than alcohol

Issues with alcohol

Questions raised

- Is alcohol still the best option for HH?
- If it is, what formulation would be best?
- Is there a role for hand 'wipes' for patients with soiled hands ?
- What does this mean for standard precautions?
- What does this mean for contact precautions?
- What does this mean for hospital design and patient care models?
- And...

Summary

- Point of care hand hygiene remains a key feature of successful infection prevention and control
- It is important that as part of education, training and other core elements of hand hygiene training that staff are aware that alcohol handrub is not and may not be effective against all key pathogens commonly encountered in healthcare
- To rely on good healthcare worker (HCW) hand hygiene alone is unlikely to be successful in reducing the risk of acquisition of important hospital pathogens
- In relation to HCW HH this will lead us to the next phase of HH programs
- In relation to patient HH...what products will we use?

Questions

