Overview

- What is PVL and how does it work?
- What is the situation in the SW of England?
- Experiences of managing this in the real world.
- What about MRSA?
- Are we all doomed?

Virulence Factors

*Products that enable a bug to establish itself on or within a host, and enhance its potential to cause disease.*
Staphylococcal Toxins
- Help to modulate pathogenicity
- Wide selection that do different things:
  - Enterotoxins: Food Poisoning
  - TSST: Toxic Shock Syndrome
  - Haemolysins: Enable bug to feed off host (and others) (haemolysis)
  - PVL: Toxic to leucocytes

Panton–Valentine Leucocidin
- Synergohymenotrophic toxin
- Gamma hemolysin (~100% strains)
- PVL (2–5% strains)
- Bi-component toxin, can share subunits with Gamma hemolysin
- Spectrum of hybrid toxins

PVL – Haemolysin Hybrids

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<tr>
<th>Gamma hemolysin</th>
<th>Hlg-A</th>
<th>Hlg-B</th>
<th>LUK-F</th>
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<td>Hlg-B</td>
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Hlg-A + Hlg-B = Most haemolytic
Hlg-C + Hlg-B = Less haemolytic, more leucotoxic
Luk-F + Luk-S = Most leucotoxic, not haemolytic
The rest are somewhere in-between

Clinical Implications
- Kills polymorphs & macrophages
- Causes tissue necrosis – skin, lungs, soft tissue
- 2–5% of all isolates.
- % by type of infection:
  - Furunculosis: 93%
  - Cellulitis: 55%
  - Cutaneous Abscess: 50%
  - Osteomyelitis: 23%
  - Finger-pulp infection: 13%

Clinical Implications
- Can rapidly cause fulminant infection
- Severe necrotic haemorrhagic pneumonia
  - Usually community acquired
  - Usually young & fit
  - Mortality >75%
  - It is the toxin that does the damage

Clinical Implications
- Lancet 2002; 359: 753
  - 8 cases of CAP due to PVL+ve Staph aureus
  - 6 fatal
  - Young healthy children & adults

- J Clin Micro 2001; 39(2): 728
  - Infant, breastfed
  - Mum had furunculosis
  - Baby -> periorbital cellulitis -> pneumonia
  - Survived after partial lung resection
Pneumonia – Case Study

• 30 yr old woman

• Fit & Well

• Flu like symptoms

• Rapid onset pyrexia, hypoxia, shock, haemoptysis, tachycardia, dyspnoea

• High CRP, low WCC

Pneumonia – Case Study

• Sputum grew *Staph aureus*

• So did blood cultures

So...

• Heroic antibiotics & pan-European input!

• Immunoglobulin 2g/kg

• Intensive Care

Hosted by Maria Bennallick  maria@webbertraining.com
www.webbertraining.com
Pneumonia – Case Study

- Apyrexial
- Culture negative (sputum, blood) at 24hrs
- Stabilised for several days
- Deteriorated, harder to ventilate
- RIP

PVL in SW England

- Marine Camp:
  - Sensitive strain
  - Lots of soft tissue infection (often trauma related)
  - One fatality

- The ‘Plymouth Strain’
- Multiresistant (NOT MRSA!):
  - Methicillin sensitive
  - No evidence of Mec
  - Always resistant to gentamicin
  - Majority resistant to trimethoprim
  - Usually resistant to macrolides
  - Many resistant to quinolones and fusidic acid
  - Some resistant to tetracyclines

PVL in SW England

- Plymouth (April 1997 – Nov 2004):
  - 315 patients (some with many samples)
  - 2d – 99yrs
    - 134 from GPs
    - 16 from Surgical Assessment Unit
    - 21 from A&E
    - 18 from CCDC
    - Remaining from surgical wards

- Boils & abscesses
- 10 sputum +ve
- 5 cystic fibrosis – well
- 4 pneumonia (3 fatal, all elderly)
- Outbreak of mastitis in Derriford Hospital (the only nosocomial cases)
PVL Producing *Staphylococcus aureus*

Brenda Dale & Adam Brown
A Webber Training Teleclass

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### PVL in SW England

- Likes nursing homes.
- 27 different nursing homes!
- 10 Nursing homes with 2+ cases.
- 2 of these notified as outbreak.

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### Outbreaks in care homes in Plymouth

4 Outbreaks (1 home treated twice)
- Review of state of hygiene and infection control measures
- Mass decolonisation treatment
- Screening for carriage
- Liaison with Microbiologists, PCT, GPs
- National guidance

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### Outbreak 1

- Care Home 1 2003/2004
- Mass treatment
- All swabbed
- Decolonised
- Positives from initial screening re-swabbed
- Swabs done by NH staff
Outbreak 2

Residential home September 2005
1 death from PVL Pneumonia
Enquiries revealed cases with boils
Swabbed by HPU nurse 90 +
Mass decolonisation treatment
Those still colonised at first screen retreated
Problems - some EMI clients non compliant with treatment
No further cases to date

Outbreak 3

January 2006
Care home 1 – further cases
1 staff member and 2 clients confirmed PVL
decolonised and treated
Re-swabbed by NH staff and MSSA identified no further PVL

Outbreak 4

Nursing/Residential Home
2 year history of boils/abscesses in staff and clients
Recognised by DN
Index case linked with Derriford Hospital mastitis outbreak 03
Mass decolonisation then screening – in progress
results awaited

Isolated cases in care homes

Information regarding organism
Transmission
Cleaning
Linen
Equipment

Families

At least four families affected
Treatment
Surgical and drug therapy
Information for families
Support

Issues with care homes

Poor standard of infection control measures
Environmental hygiene is generally poor
Not recognising outbreaks
Lack of compliance with PPE
Issues for HPU

Increasing problem in the region
Particularly Devon? Or better recognised (‘Plymouth strain’)?
GP newsletter/ care homes
Recent national guidance – welcome, but needs development
Regional Microbiology Forum -> working group
Burden on resources
lab staff, microbiologist
HPU
Care home

What’s this got to do with MRSA?

• PVL +ve MRSA strains exist.
• Community strain(s)
• Not related to hospital strains.
• On the increase –
  - USA
  - Canada
  - France
  - Germany
  - United Kingdom

PVL +ve MRSA

• CID 2005; 40: 100–7
  - 4 patients
  - 20–52 yrs
  - 25% mortality

  - Los Angeles 2003–4
  - 14 cases of nec. Community-acquired pneumonia
  - 28–68 yrs, 71% male, 43% current or past IVDU
  - No deaths!

• France 20001,2 – >14 cases
  - Also Germany, Norway

• Alaska 20003 – 34 cases linked to sauna
  - Soft tissue infections

PVL Producing *Staphylococcus aureus*
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**PVL +ve MRSA**

- Steam Rooms of California
- San Francisco jail outbreaks (2001)
- University athletes of LA

**CA MRSA – not the same pedigree as HA MRSA**

- Descended from 80/81 strain
- Scourge of 50’s – 60’s
- Eliminated by use of methicillin & fluclox
- Subsequently found to be PVL+ve

**Are we all Doomed?**

- Undoubtedly a successful strain
- Ecology of MRSA is always changing
- Be aware
- Watch this space – pandemic influenza

(I am a pessimist by the way)

**Further Reading**

UK – Department of Health Interim Guidelines:
http://www.dh.gov.uk/en/Aboutus/MinistersandDepartmentLeaders/ChiefMedicalOfficer/Features/DH_413376

Canada – Guidelines for management of Community-acquired MRSA:
http://www.cmaj.ca/cgi/content/full/176/1/54

adam.brown@dbh.nhs.uk

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