


# Outbreak of Invasive Group A Streptococcus

Julianne Toop, Canterbury District Health Board  
A Webber Training Teleclass

**Friday the Thirteenth**




**An Outbreak of iGAS**

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Hosted by Jane Barnett  
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**The Princess Margaret Hospital**



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**Objectives**

- Describe an outbreak of invasive Group A Streptococcus (iGAS)
- Discuss the “Swiss Cheese Model” of system accidents
- Outline a root cause analysis process
- Identify errors in patient safety
- Hypothesize on the spread of infection
- Review the outbreak management

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**Group A Streptococcus (GAS)**

- *Streptococcus pyogenes*
- Gram +ve cocci
- $\beta$  haemolytic group
- Common human pathogen
  - 15-20%
- Transmission
  - Droplet spread
  - Direct contact

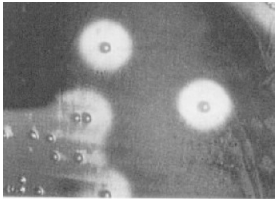


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- **Complete  $\beta$  haemolysis on blood agar plate**

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## Manifestation of GAS

- **Asymptomatic carriage**
- **Superficial infections**
  - Estimated that more than 10 million mild infections throat and skin occur every year
  - Strep Throat
  - Impetigo
  - Cellulitis
  - Erysipelas
  - Scarlet fever

Group A Streptococcus  
[clinical features]

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## Manifestation of GAS cont'd

- **Post-streptococcal immunological sequelae**
  - Acute rheumatic fever
  - Acute glomerulonephritis
- **Severe Invasive Disease (iGAS)**

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## iGAS

**Severe, life-threatening**

- **isolation of GAS from a normally sterile body site**
- **10 to 15% mortality**
- **3 categories:**
- **Streptococcal toxic shock syndrome (STSS)**
- **Necrotizing fasciitis**
- **Other**
  - Bacteraemia
  - Puerperal Sepsis
  - Pneumonia

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## Group A Streptococcus [clinical features]



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**GAS virulence factors**

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- **M Proteins - major cell wall constituent**
  - >120 M protein serotypes
  - M types [emm] 1 and 3 especially virulent
- **Evade phagocytosis**
- **Induce tissue destruction**
- **Trigger host cytokines release Streptolysins**
- **Pyrogenic exotoxins( superantigens)**

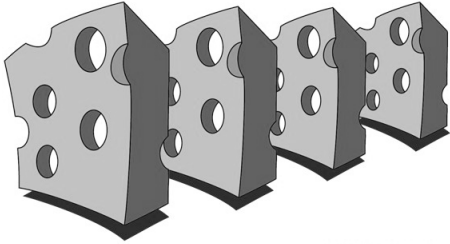
**Emm 1**

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- **Emm typing**
- **New Zealand situation**
  - 2004 – 7.6%
  - 2005 – 7.3%
  - 2006 – 18.4%
  - 2007 – 15.1%
- **Outbreak strain – emm 1**

**Swiss Cheese model of system accidents**

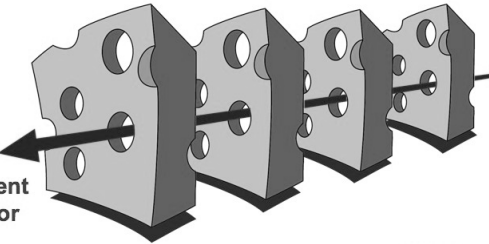
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Reason, J. BMJ 2000;320:768-770

**Swiss Cheese model of system accidents**

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Reason, J. BMJ 2000;320:768-770

**Sentinel Event**

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- **Root Cause Analysis**
- **Reported to Ministry of Health**

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Pt	Sex	26.9.06	27.9.06	28.9.06	29.9.06	30.9.06	1.10.06	2.10.06	3.10.06	4.10.06	5.10.06	6.10.06	7.10.06	8.10.06	9.10.06	10.10.06	11.10.06	12.10.06	13.10.06	
1	F																			
2	M																			
3	F																			

Inpatient admission  
 Deceased Grp A Strep

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**Patient 1 Possible Index Case**

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**5 Leg Ulcers**

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- Not present at previous admission
  - Low to mod exudate
  - “slough”, “necrotic”, “fragile”
  - No wound swabs
  - Braden Risk Assessment Tool not completed
  - No medical review of wounds
  - Dress every 2 day

**48 to 79 hours**

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- “Seems to be improving”
- Painful legs = Morphine prescribed
- “Slept well”
- 0800 “unrousable”
- Haematoma L)leg
  - midcalf to back of knee - ruptured
- Sacral pressure area – new

**48 to 79 hours**

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- Transferred to single room
- No Contact Precautions
- Deceased-1730
- Subsequent blood cultures – GAS

**Patient 2 - Admit 2200**

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**Hx**

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- L) hip hemiarthroplasty
- Dx to LTCF
- ED - 3 days after Dx
  - Increasing confusion
  - Febrile
  - ↑ Raised WBC & neutrophils
  - ↓ BSL
  - Creps R) base
  - Skin tear L) & R) arm & elbow
    - cleaned and steri strip

# Outbreak of Invasive Group A Streptococcus

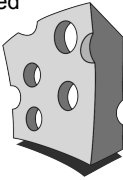
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## Patient 2

- **On admission - Overnight**
  - Trying to get out of bed repeatedly
  - Pulling at dressings & bandages
  - Fall – existing skin tear reopened
- **Day 1 - improved**
- **Wounds**
  - oozing noted - limited details
- **Day 2/3 - Obs not done**



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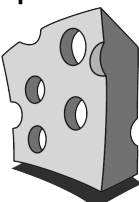
## Day 4

**1030**

- “Pt looks unwell”
- Temp 37.5

**1120**

- Haematoma L) arm
- Painful arms
- Transfer to single room
- No Contact Precautions
- Deceased 2020
- Subsequent blood cultures – GAS



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Pt 1

Pt 2

19.9.06

20.9.06

21.9.06

22.9.06

23.9.06

24.9.06

25.9.06

26.9.06

27.9.06

28.9.06

29.9.06

30.9.06

1.10.06

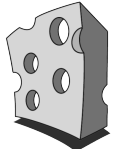
2.10.06

3.10.06

4.10.06

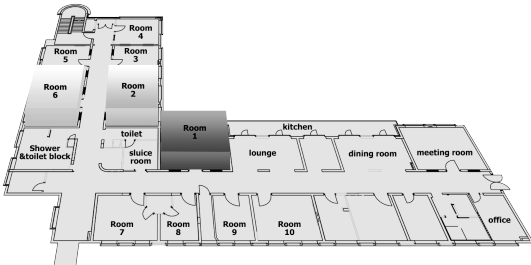
■ Inpatient admission

■ Deceased Grp A Strep



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## Friday the Thirteenth Patient 3



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## Friday the Thirteenth

- **#L Neck of Femur**
- **#L distal radius**
- **Rehabilitation outcome - excellent**
  - Independent
  - Cognitively competent

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- **Day 15**
- **0900 Ward Round**
  - T 37.8
  - B/P 80/60
  - P 110
  - O<sub>2</sub> saturation 70%
- **Skin integrity**
  - copious dishwater discharge
- **Moved to single room**
- **Deceased 1730**

# Outbreak of Invasive Group A Streptococcus

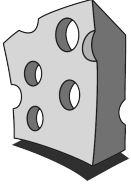
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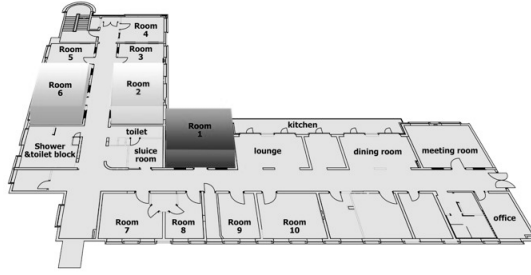
## Day 12 to 14

- **Marked pitting oedema**
- **Day 12**
  - leg lesion
- **Day 13**
  - T 37.3
  - R) leg skin
    - “break down”
    - increased serous ooze
  - Morphine
  - “Otherwise well”
- **Day 14**
  - R) leg haematoma

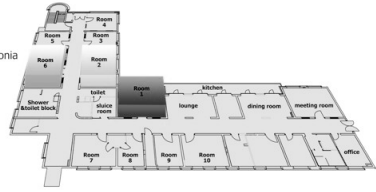


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## Friday the Thirteenth Patient



Pt	Sex	10/9/06	20/9/06	21/9/06	22/9/06	23/9/06	24/9/06	25/9/06	26/9/06	27/9/06	28/9/06	29/9/06	30/9/06	1/10/06	2/10/06	3/10/06	4/10/06	5/10/06	6/10/06	7/10/06	8/10/06	9/10/06	10/10/06	11/10/06	12/10/06	13/10/06	14/10/06	15/10/06	16/10/06	17/10/06	18/10/06	19/10/06	20/10/06	21/10/06		
1	F																																			
2	M																																			
3	F																																			
4	F																																			



■ Inpatient admission  
 ■ Readmit Grp A strept pneumonia  
 ■ Deceased Grp A Strep  
 \* Sharing with pt 3

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### Management Plan 1

- **Screening**
  - Pharyngeal swabs
  - Wound swabs
- **Chemoprophylaxis**

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- **Pharyngeal swabs**
  - All hands on staff
  - All patients
  - Relatives of positive patients
- **Wounds swabs**
  - All inpatient
  - All staff wounds

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## Chemoprophylaxis

- **For all exposed staff**
  - Including all on call and casual staff
- **For all patients**
- **Penicillin 500 mg qid 10 days**

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**Two Ontario outbreaks**

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**LTCF 1**

- **3 outbreaks**
- **First two outbreaks**
  - Screening possible contact with positive cases
  - Treat positive cases
- **3<sup>rd</sup> outbreak**
  - All staff and residents screened and treated
  - Screening 1 month later
  - No further cases

Smith A et al. Mass Antibiotic Treatment for Group A Streptococcus Outbreaks in Two Long-Term Care Facilities. Emerging Infectious Diseases 2003; 9(10):1260-1265

**LTCF 2**

- All staff and pts screened
- Mass antibiotic treatment
- Repeat screening 1 month later
- No further cases

Smith A et al. Mass Antibiotic Treatment for Group A Streptococcus Outbreaks in Two Long-Term Care Facilities. Emerging Infectious Diseases 2003; 9(10):1260-1265

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**Management Plan 2**

- **Infection Control**
- **Based on transmission**
  - Contact
  - Droplet
  - Fomite (rare)

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**Norovirus outbreak**

**Friday the Thirteenth**

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**Wound care**

- Strict aseptic technique
- Gloves and aprons
- **Masks**
- Disinfection of dressing trolleys
- No shared tape
- Alert - Treat as suspicious and seek medical advise for any wound with rapidly progressing cellulitis especially with skin blistering and/or necrosis

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**Management Plan 3**

- **Communication**
  - Relatives
  - Ward Staff
  - LTCF's
  - General Practitioners
  - Canterbury District Health Board staff
- **Media**

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**Headlines**

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## Flesh-eating bug kills 3

**Screening outcome**

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- 112 swabs
- 76 [68%] Staff
- 34 [45%] Nursing staff
- 4 [12%] Positive
  - 3 pharyngeal carriage
  - 1 wound infection

**Staff Positive results**

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- Repeat screening
  - 72 hrs post A/B
  - 1 month post A/B
- Family screening
- Positive wound swab

**Prevalence of infection or colonization**

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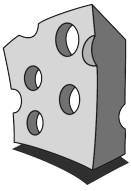
- Smith A et al.
  - LTCF 1 outbreak 3
    - Residents 2.8%
    - Staff 1.5%
  - LTCF 2
    - Residents 4.7%
    - Staff 1.3%
- TPMH
  - 8.7% Patients
  - 12% or 3.5%

•Smith A et al. Mass Antibiotic Treatment for Group A Streptococcus outbreaks in Two Long-Term Care Facilities. Emerging Infectious Diseases 2003; 9(10):1260-1265

**Spread of Infection**

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- Patient 1
- Staff 1
- Patient 2
- Staff 2, 3, 4
- Patient 3
- Patient 4



**Sentinel Event Findings**

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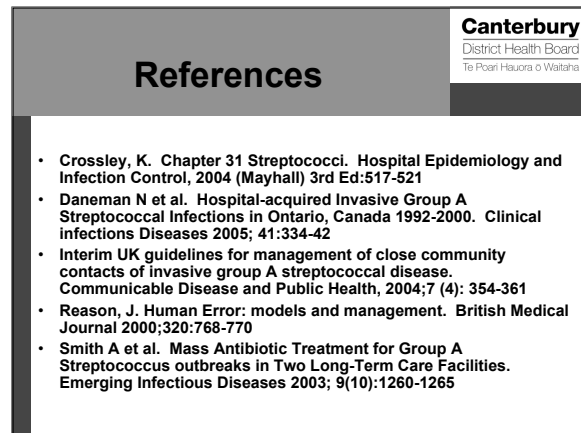
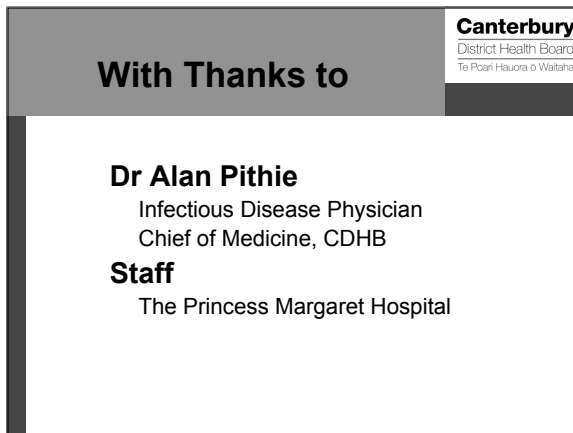
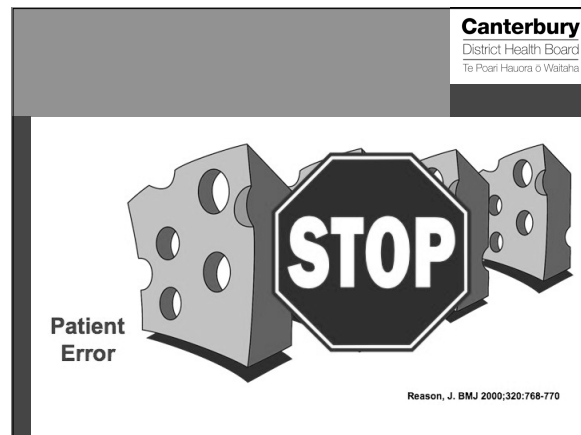
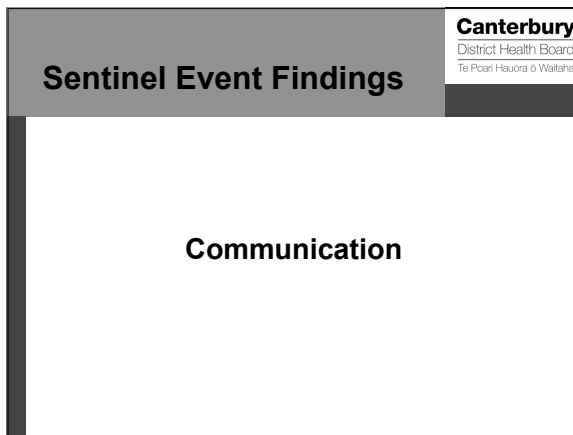
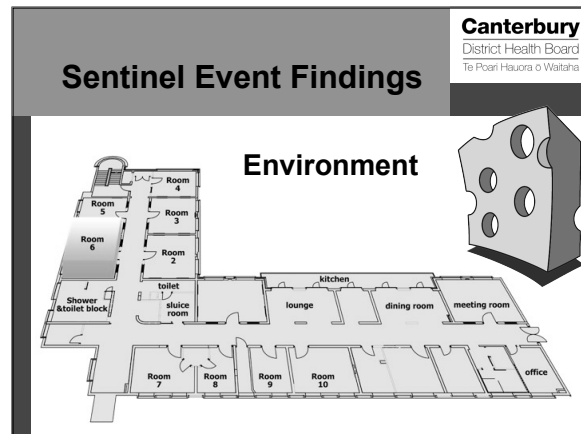
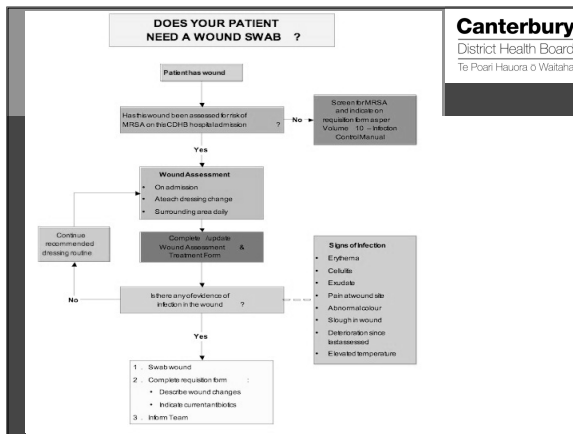
### Clinical practice and knowledge



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