MRSA Pneumonia

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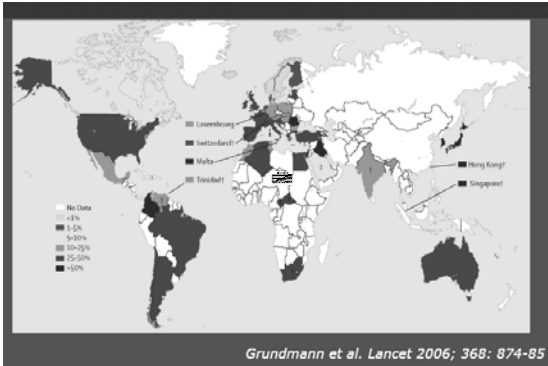**University of Toronto**

Disclosures

None

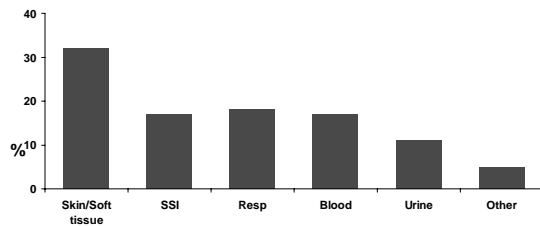## OBJECTIVES

- Describe the epidemiology & pathogenesis of MRSA pneumonia
- Present preliminary results of The Canadian MRSA Pneumonia Outcome Study (CaMPOS)

Worldwide burden of MRSA

Grundmann et al. Lancet 2006; 368: 874-85

MRSA Infections, 2008-10 (30%)

Canadian Nosocomial Infection Surveillance Program
Slide Courtesy of Dr. A. Simor

Epidemiology of MRSA pneumonia

- MRSA causes about 20%-40% of hospital-acquired pneumonia (HAP/HCAP) and ventilator-associated pneumonia (VAP) in US and other countries
- 1%-5% of Community associated pneumonia (CAP)
- Special concern about CA-MRSA strains: US 300/CMRSA-10

Mandell and Wundernik CID 2012:54;1134-36

Epidemiology of MRSA pneumonia cont.

- **US300/CMRSA-10 reported to cause severe pneumonia: high fever, cavitary lung lesions hypotension, and hemoptysis followed by rapid progression to septic shock and requirement for ventilator support**
- **High mortality rate (50%) was initially reported[1]**
- **MR 37% in recent reports[2]**

1 Dufour et al CID 2002
2 Haque et al JCM 2012

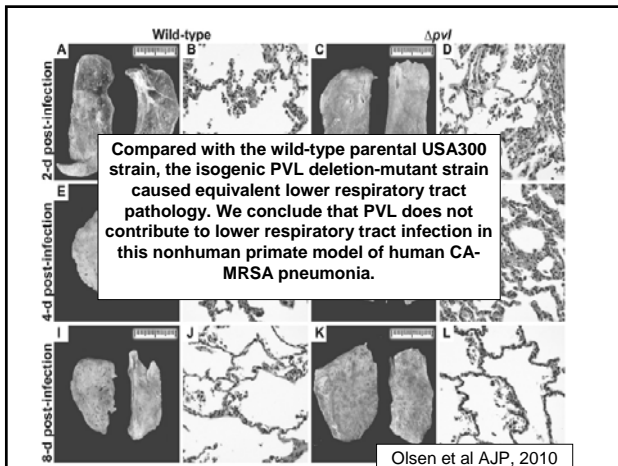
Pathogenesis of MRSA Pneumonia
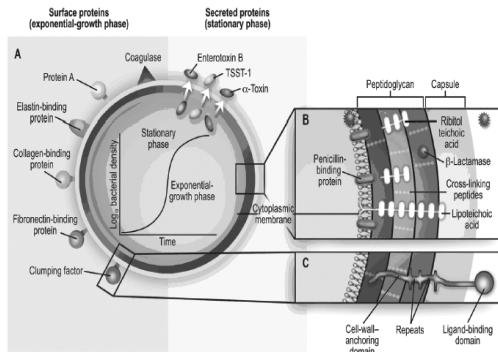
Panton- Valentine Leukocidin
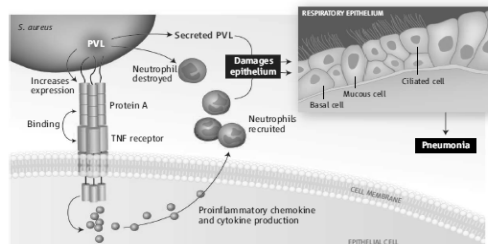
Kahl BC, Peters G. Microbiology: mayhem in the lung. Science 2007; 315:182-1083

Lack of a Major Role of *Staphylococcus aureus* Panton-Valentine Leukocidin in Lower Respiratory Tract Infection in Nonhuman Primates

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Wild-type   Δ*pvl*

Compared with the wild-type parental USA300 strain, the isogenic PVL deletion-mutant strain caused equivalent lower respiratory tract pathology. We conclude that PVL does not contribute to lower respiratory tract infection in this nonhuman primate model of human CA-MRSA pneumonia.

Olsen et al AJP, 2010

Other Virulence Factors

- Alpha-Hemolysin[1]
- Arginine Catabolic Mobile element[2]
- Accessory Gene Regulator[3]

1 Wardenburg et al Nat Med, 2007
2 Diep et al, JID,2008
3 Schewizer et al AAC, 2010

The Canadian MRSA Pneumonia Study (CaMPOS)

Study Objective:

- **To determine the epidemiology, incidence, and outcome of MRSA pneumonia in adult patients admitted to Canadian hospitals**

Sites:

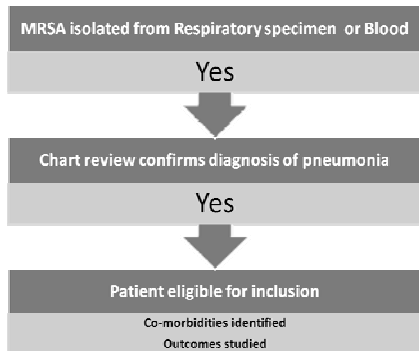- **1 year surveillance in eleven hospital sites from different areas across Canada.**

- **Funding:**

 Sponsored by Pfizer

PI

- **Dr. A. E. Simor**

Study Algorithm

MRSA isolated from Respiratory specimen or Blood

Yes

Chart review confirms diagnosis of pneumonia

Yes

Patient eligible for inclusion

Co-morbidities identified

Outcomes studied

Laboratory Investigations

The initial clinical (respiratory) or blood isolate of MRSA from each patient was analyzed for:
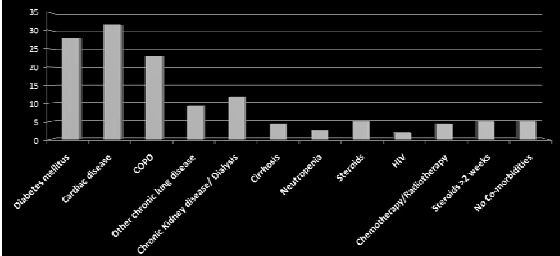
- Antimicrobial susceptibilities,

- molecular type by PFGE, SCC_{mec} type

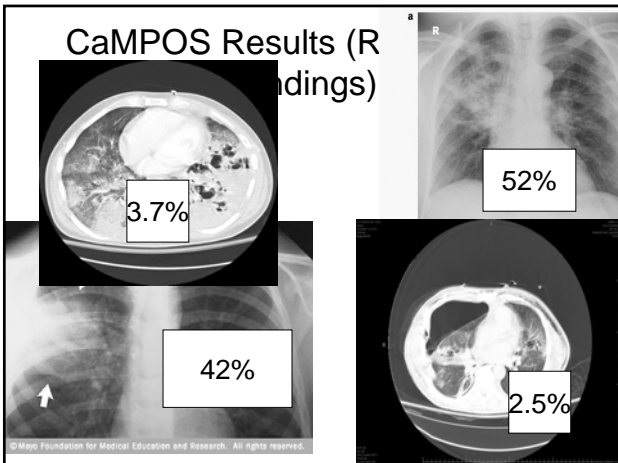- PVL gene detection.

CaMPOS Results

- 161 cases of MRSA pneumonia
- CAP= 45 (28%)
- HCAP=116 (72%)
      36 ICU associated,   23 VAP
- Mean age was 64, SD 17.2
- Overall MRSA pneumonia rate was 0.47/10,000 patient-days
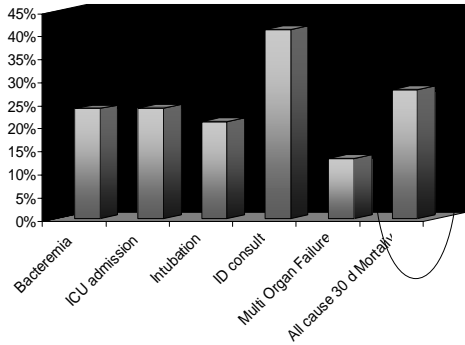- HA- MRSA pneumonia rate was 0.33/10,000 patient days

MRSA Pneumonia Patients
Percent Co-morbidities

CaMPOS Results (Radiographic Findings)

3.7%

52%

42%

2.5%

MRSA Pneumonia Outcomes/Complications

Bacteremia • ICU admission • Intubation • ID consult • Multi Organ Failure • All cause 30 d Mortality

Co-variates	Died at 30 d n=45	Survived at 30 d n=116	Univariate anlysis			Multivariate analysis		
			OR	95%CI	*p*value	OR	95%CI	*p*value
Age >65 n(%)	27(60)	57(49)	1.5	0.7-3.1	0.2	0.9	0.9-1.0	0.747
Males n (%)	30(66.7)	78(67.2)	0.9	0.4-2.0	1			
MRSA bacteremia n (%)	18(40)	20(17.2)	3.4	1.5-7.4	0.003	1.5	0.4-5.5	0.4
HCAP n (%)	36(80)	80(68.9)	1.8	0.7-4.1	0.17	1.4	0.3-7.0	0.6
CAP n (%)	9(20)	36(31.0)	0.5	0.2-1.2	0.17			
MRSA VAP n(%)	5(11.1)	18(15.5)	0.6	0.2-1.9	0.6			
ID consulted n(%)	17(37.8)	49 (42.2)	0.8	0.4-1.7	0.7			
COPD n(%)	14 (31.1)	23 (19.2)	1.8	0.8-3.9	0.14			
DM n (%)	14 (31.1)	31(26.7)	1.2	0.5-2.6	0.5			
Cirrhosis n(%)	5 (11.1)	2 (1.7)	7.1	1.3-38.1	0.01			
Steroids >2 weeks n(%)	2(4.4)	6(5.1)	0.8	0.1-4.3	1			
Multi-organ failure	16(35.5)	5(4.3)	12.2	4.1-36.2	<0.001	8.2	1.7-38.6	0.008
Appropriate empiric therapy used n(%) (Vanco/Linezolid)	15(33.3)	36 (31)	1.1	0.5-2.3	0.8			
Mean Vanco troughs (SD)	14.5(6.7)	14.3 (10.1)			0.9			
PFGE type CMRSA 10 n(%)	11(27)	29(28)	0.8	0.36-1.9	0.6			
PFGE type CMRSA 2 n(%)	26(63.4)	57(54.8)	1.4	0.6-3.0	0.3			
PVL +	11(27)	30(29)	0.9	0.4-2.0	1	2.4	0.5-10.7	0.2

Conclusions

❖ MRSA pneumonia rates in Canadian hospitals are relatively low

❖ This infection was associated with 28% 30-day mortality. Variables associated with increased mortality included the presence of bacteremia or cirrhosis.

❖ Microbial factors (such as PFGE type, PVL gene,) were not associated with increased mortality

THANK YOU

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