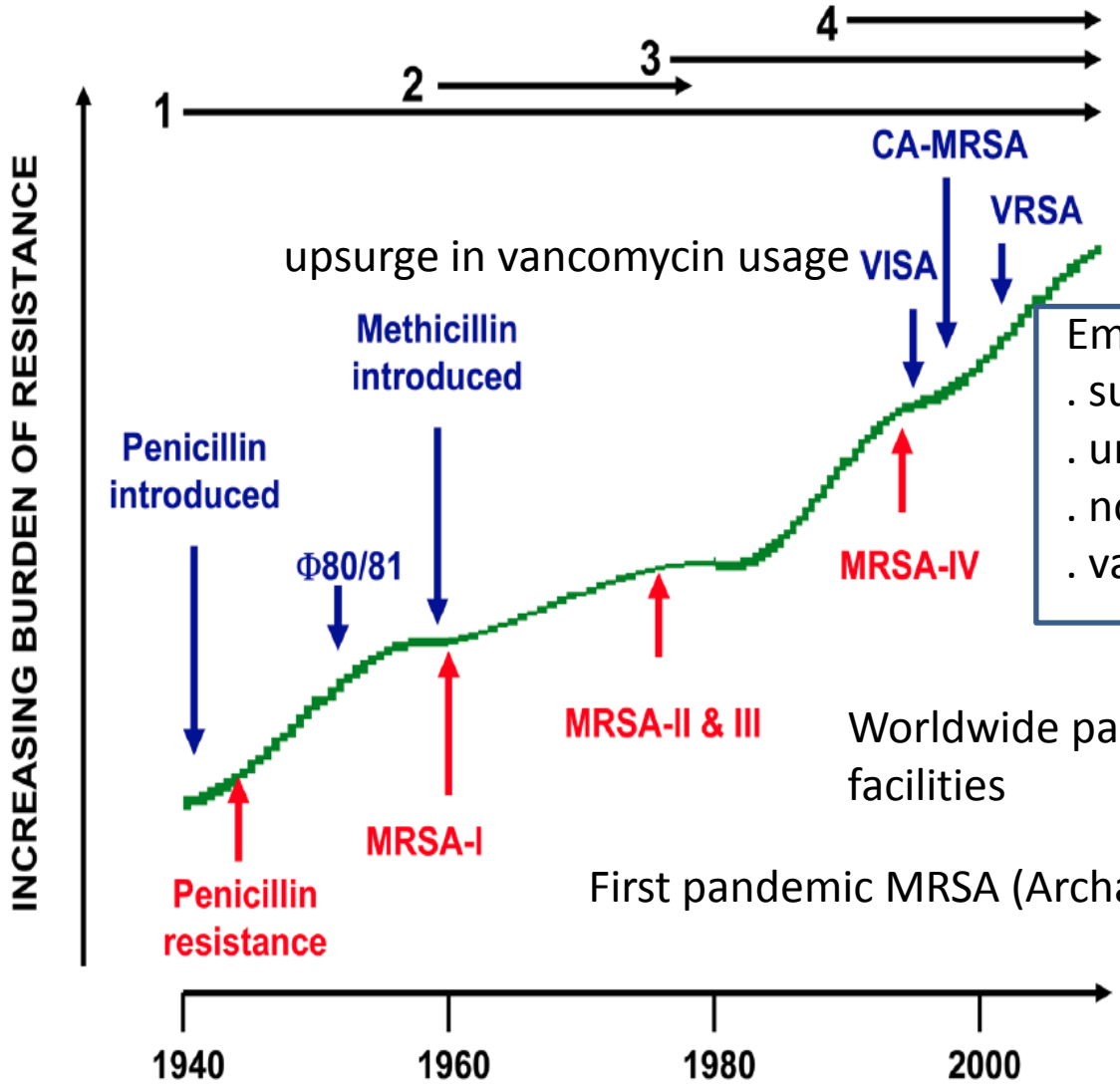
Molecular Characterisation of PVL+ community acquired meticillin-resistant *Staphylococcus aureus* and therapeutic impact

Nadjia Ramdani-Bouguessa, Kenza Antri, Mohamed Tazir.

Service de microbiologie, Centre Hospitalo-Universitaire Mustapha Bacha, Alger

Waves of β-lactams resistance

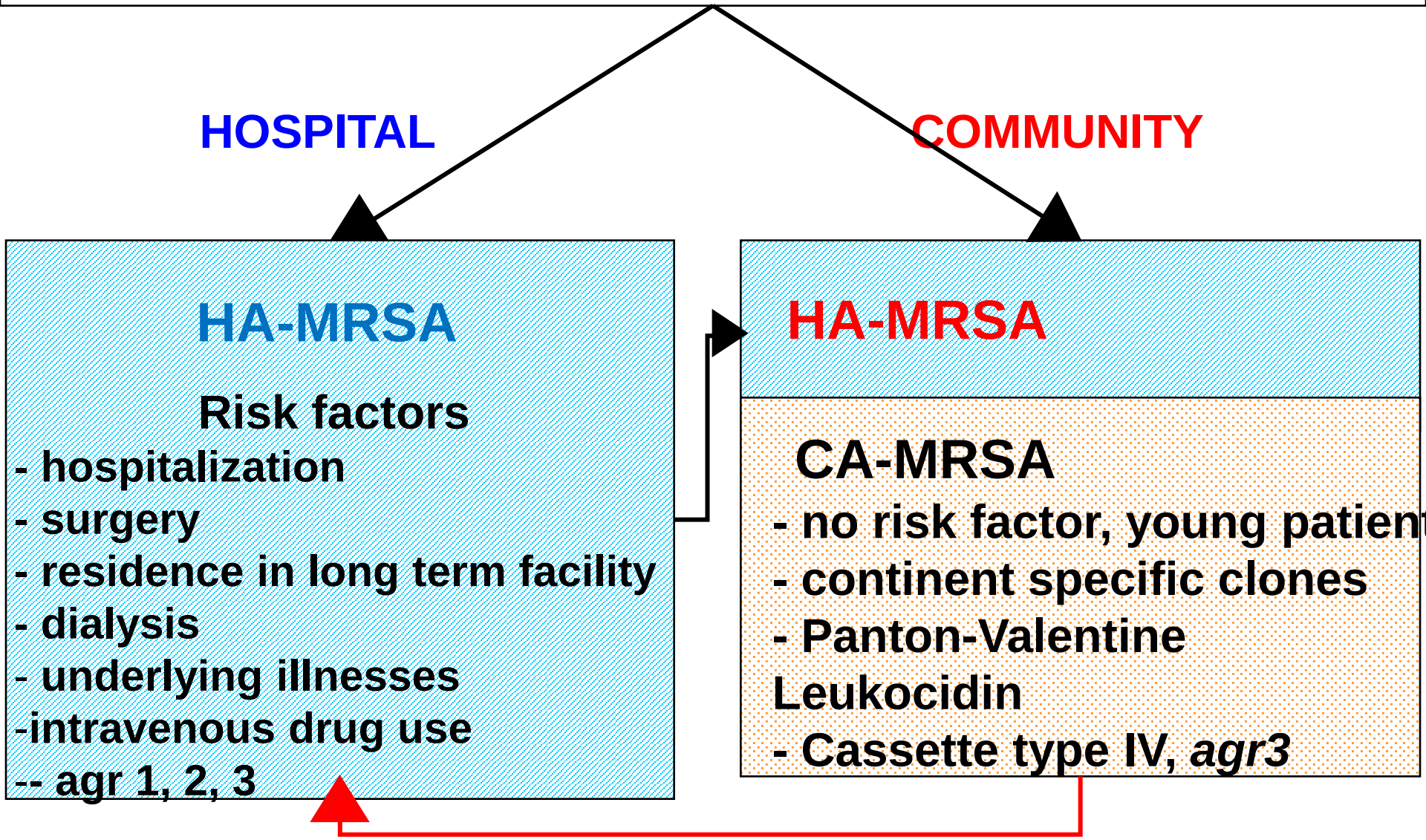


Emergence of CA- MRSA
. susceptible to most antibiotics
. unrelated to hospital strains
. novel, smaller, more mobile SCCmec (IV)
. variety of virulence factors, including PVL

Worldwide pandemic clone in Hospital and care facilities

First pandemic MRSA (Archaic clone, iberian clone)

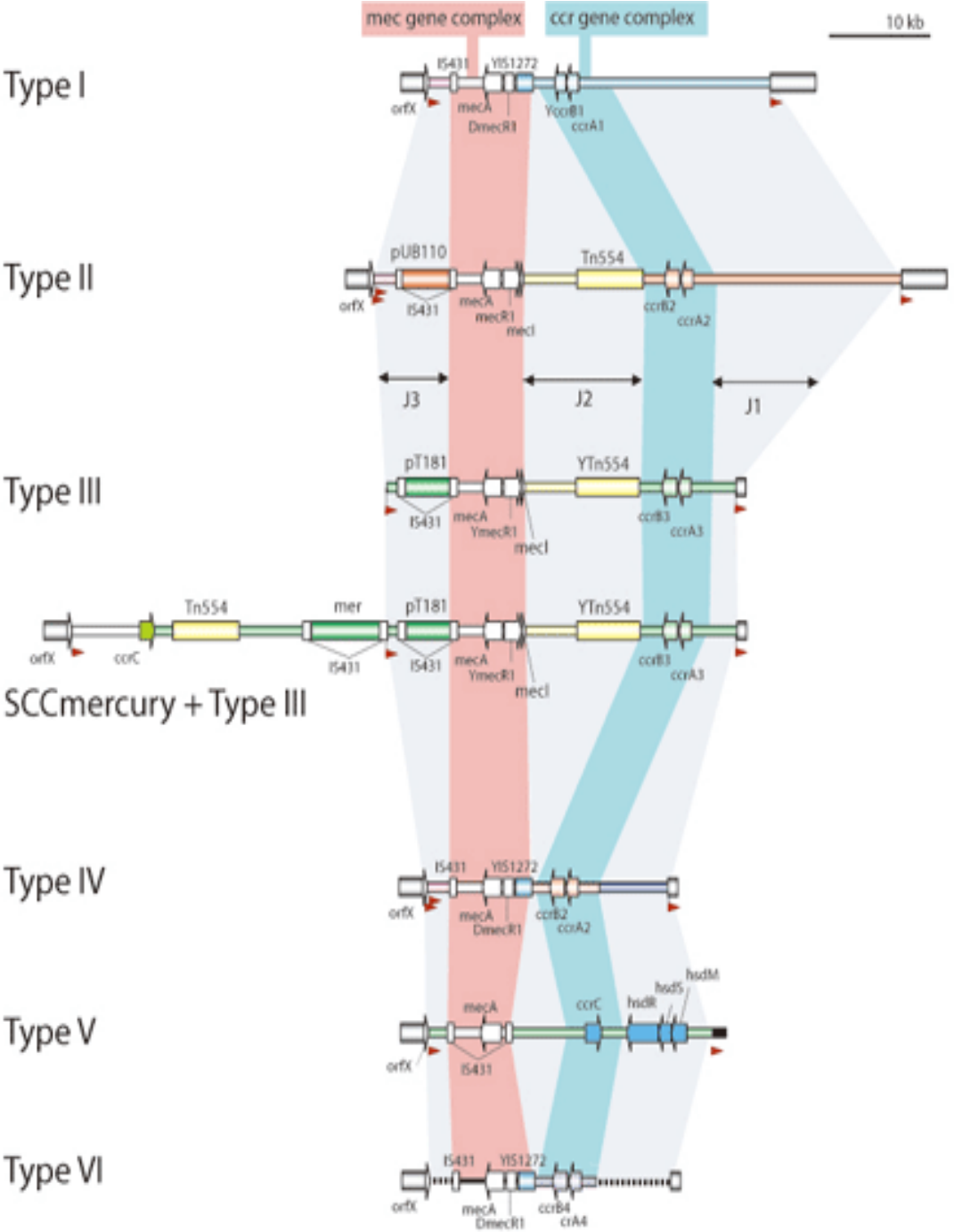
Epidemiology of methicillin-resistant *Staphylococcus aureus* (MRSA)



SCC*mec* type 20 to 67 kb.

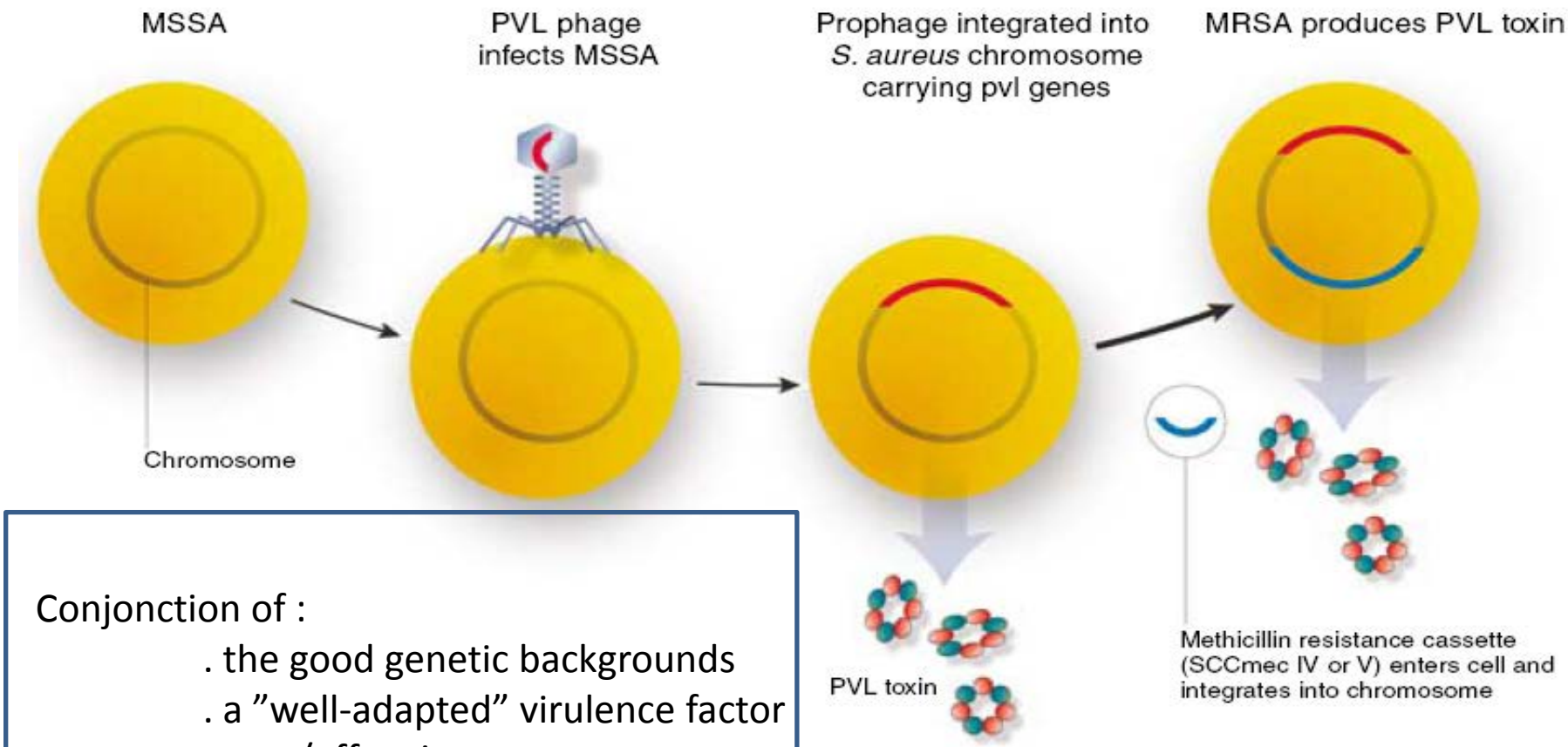
types I, II, III: HA-MRSA

types IV, V, VI: CA-MRSA, small



Kondo Y et al AAC 2007;51:264-274

How and why ?

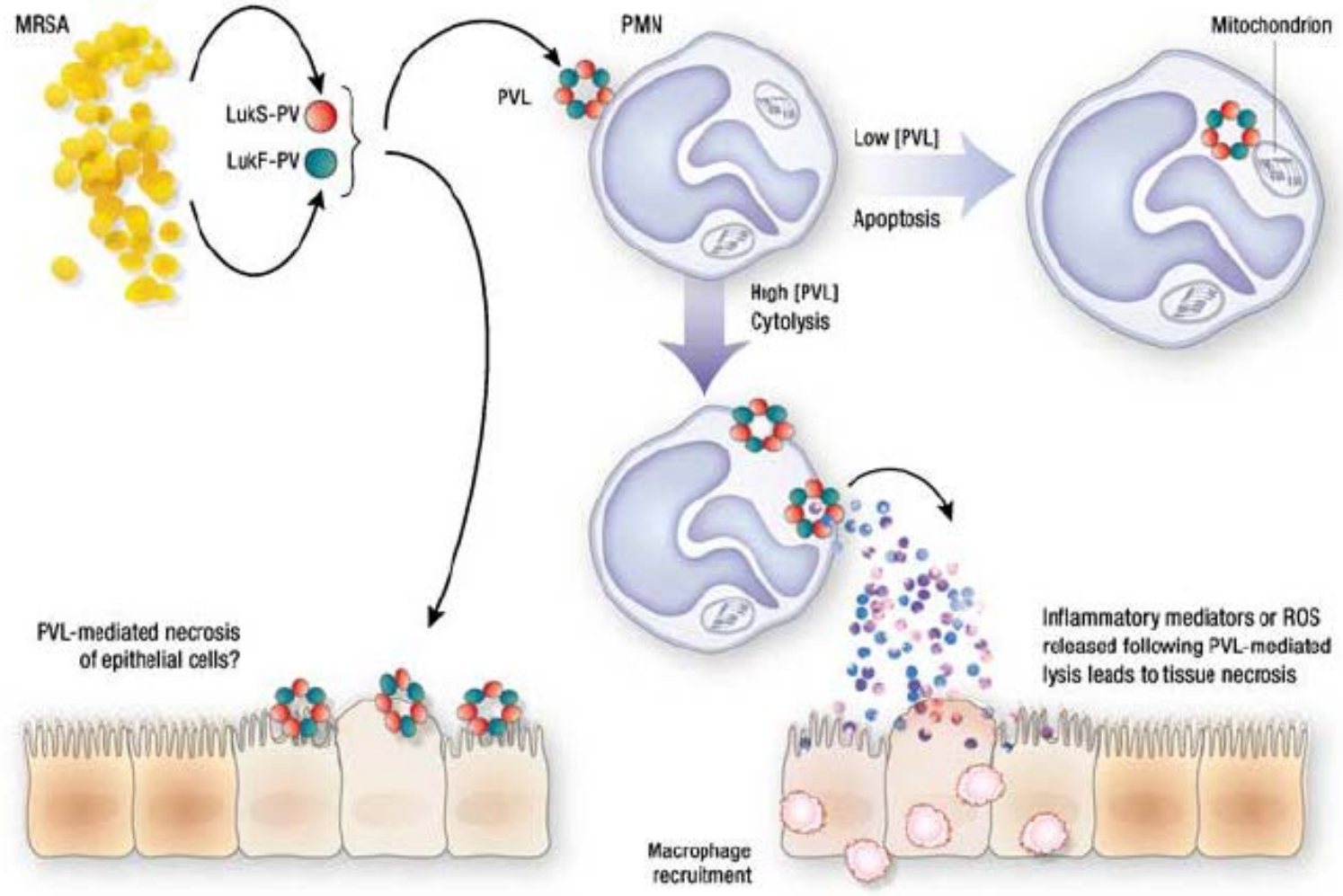


Conjonction of :

. the good genetic backgrounds
. a ”well-adapted” virulence factor
. a on/off resistance gene

+ hygienic social conditions
+ misuse of antibiotics ….

Susan-Boyle-Vavra , lab Invest, 2007



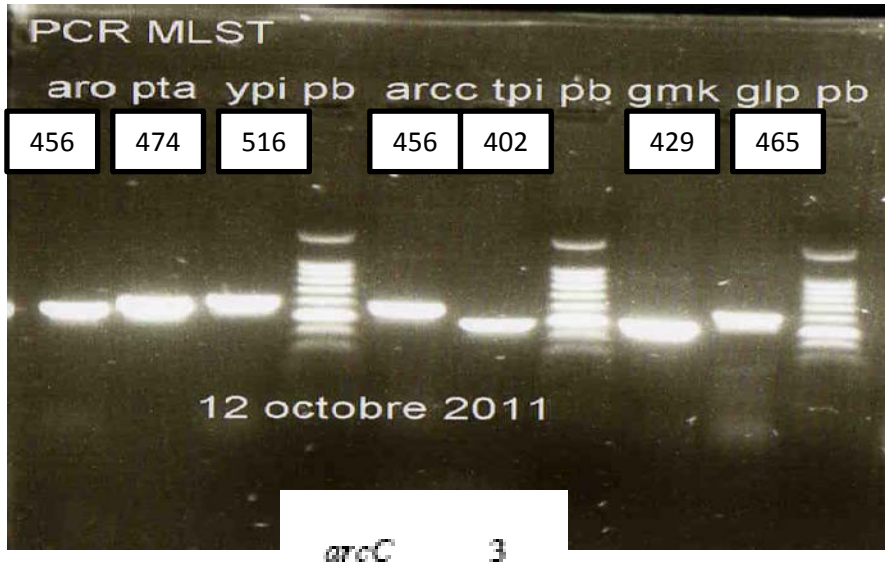
from Laboratory Investigation (2007) **87,** 3-9

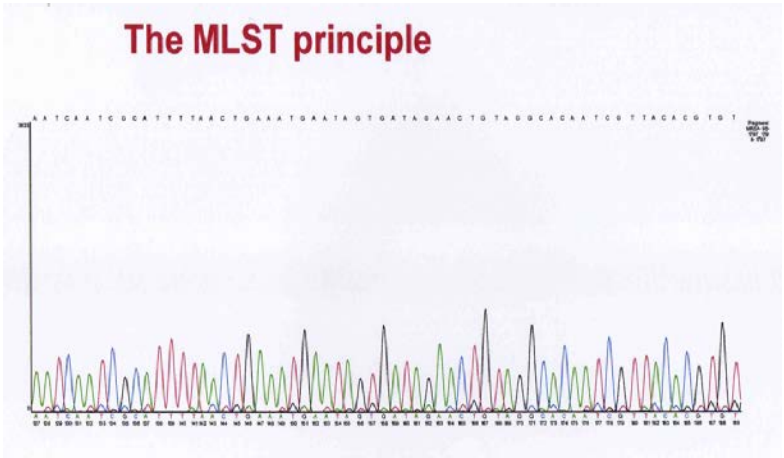
Community-acquired methicillin-resistant *Staphylococcus aureus*: the role of Panton-Valentine leukocidin

Susan-Boyle-Vavra and Robert S Daum

MLST (Multilocus Sequence Typing)
Séquence type

Amplification of 7 genes « keeping house » by PCR, sequencing the allelic profiles



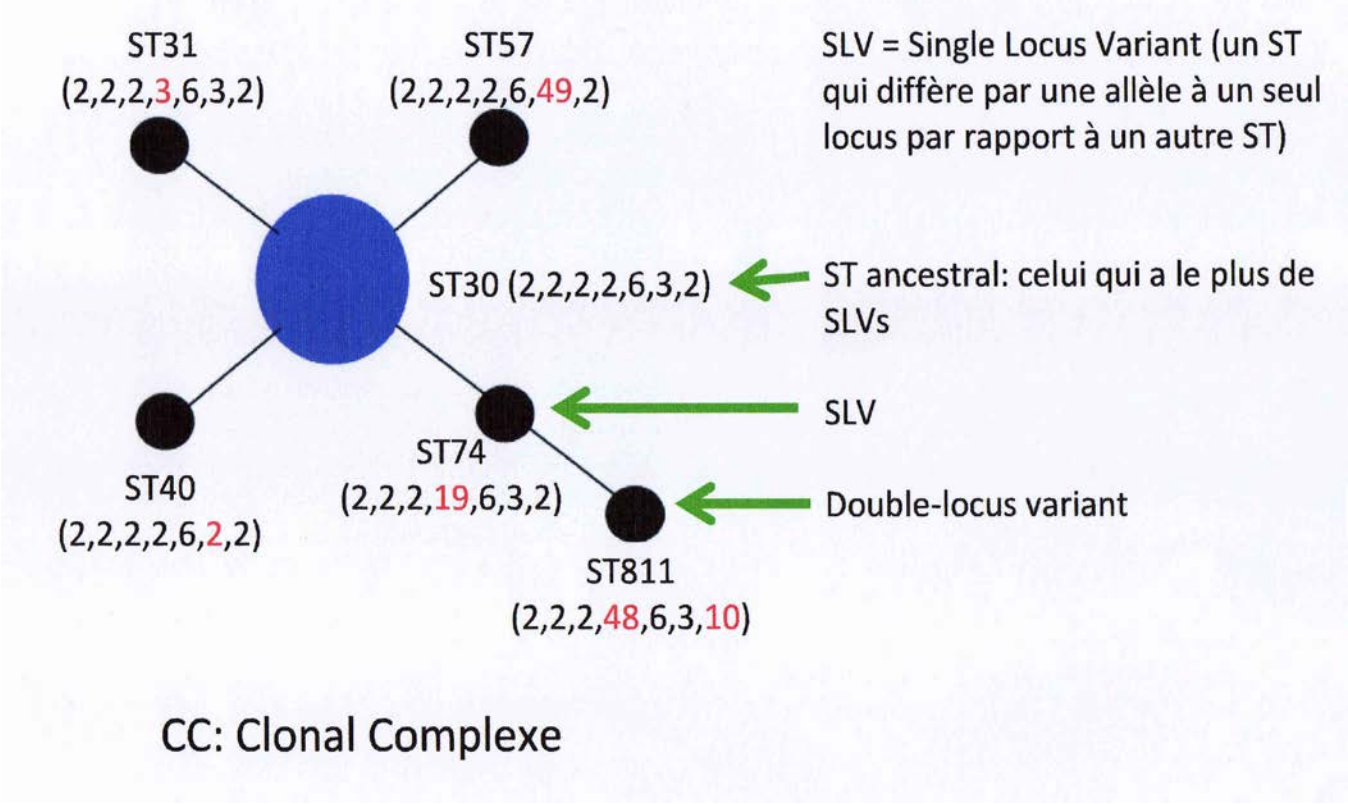


arcC	3
aroE	3
glpF	1
gmk	1
pta	4
tpi	4
yqiL	3
ST	**8**

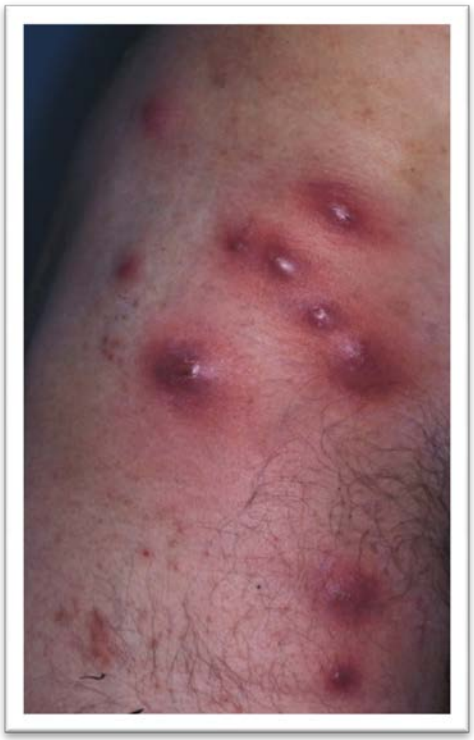
Clonal complex (CC)

Method: analyse BURST (Based Upon Related Sequence Types)

clones (ST) which have 5 commun genes (5/7) belonged to the same complexe clonal :CC



Clinical characteristics of PVL+ cutaneous infections



Characteristic	PVL+ Patients with PVL gene–positive cases (n = 16)	PVL- Patients with PVL gene–negative cases (n = 24)
Age, mean years (range)	20.8 (1–61)[a]	48.0 (12–62)
Disease		
Systemic	0 (0)[a]	7 (27)
Cutaneous	4 (28.6)	4 (15.4)
Number of lesions		
Single furuncle	6 (37.5)[a]	22 (84.6)
Multiple furuncles[b]	10 (62.5)[a]	4 (15.4)
Systemic symptoms present	1 (7.1)	1 (3.8)
Score for local symptoms, mean ± SD[c]		
Erythema	2.66 ± 0.70[a]	1.33 ± 0.48
Swelling	2.26 ± 0.48	1.68 ± 0.67
Pain	1.46 ± 0.51	1.44 ± 0.51

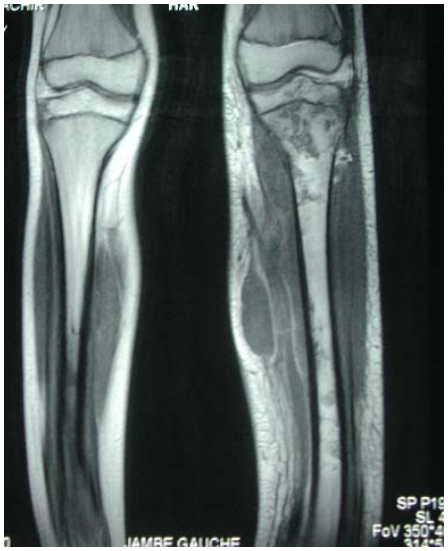
Yamasaki et al, CID 2005:40;381

Clinical characteristics of bone and joint infections due to *S. aureus pvl+*

Pediatric Bone and Joint Infections Caused by Panton-Valentine Leukocidin-Positive *Staphylococcus aureus*

Bruno Dohin, MD, PhD, Yves Gillet, MD,† Rémi Kohler, MD,* Gérard Lina, MD, PhD,‡ François Vandenesch, MD, PhD,‡ Philippe Vanhems, MD, PhD,§ Daniel Floret, MD,† and Jerome Etienne, MD, PhD‡*

- *S. aureus pvl+* osteomyelitis *versus pvl-*



	Ostéomyélites		
	PVL+ (14 cas)	**PVL-** (17 cas)	*P*
Délais avant consultation (heure)			
Médiane	24	96	0,02
	(12-144)	(18-432)	
CRP			
médiane	158	57	0.001
Complications			
chocs toxiques	6	0	0,004
ostéo-articulaires			
abcès musculaires	3	0	0,08
pyomyosites	5	0	0,01
abcès périostés	11	1	<0,001
pan-diaphysites	12	0	<0,001
fractures spontanées	3	0	0,08
générales autres			
abcès viscéral	11	0	0,012

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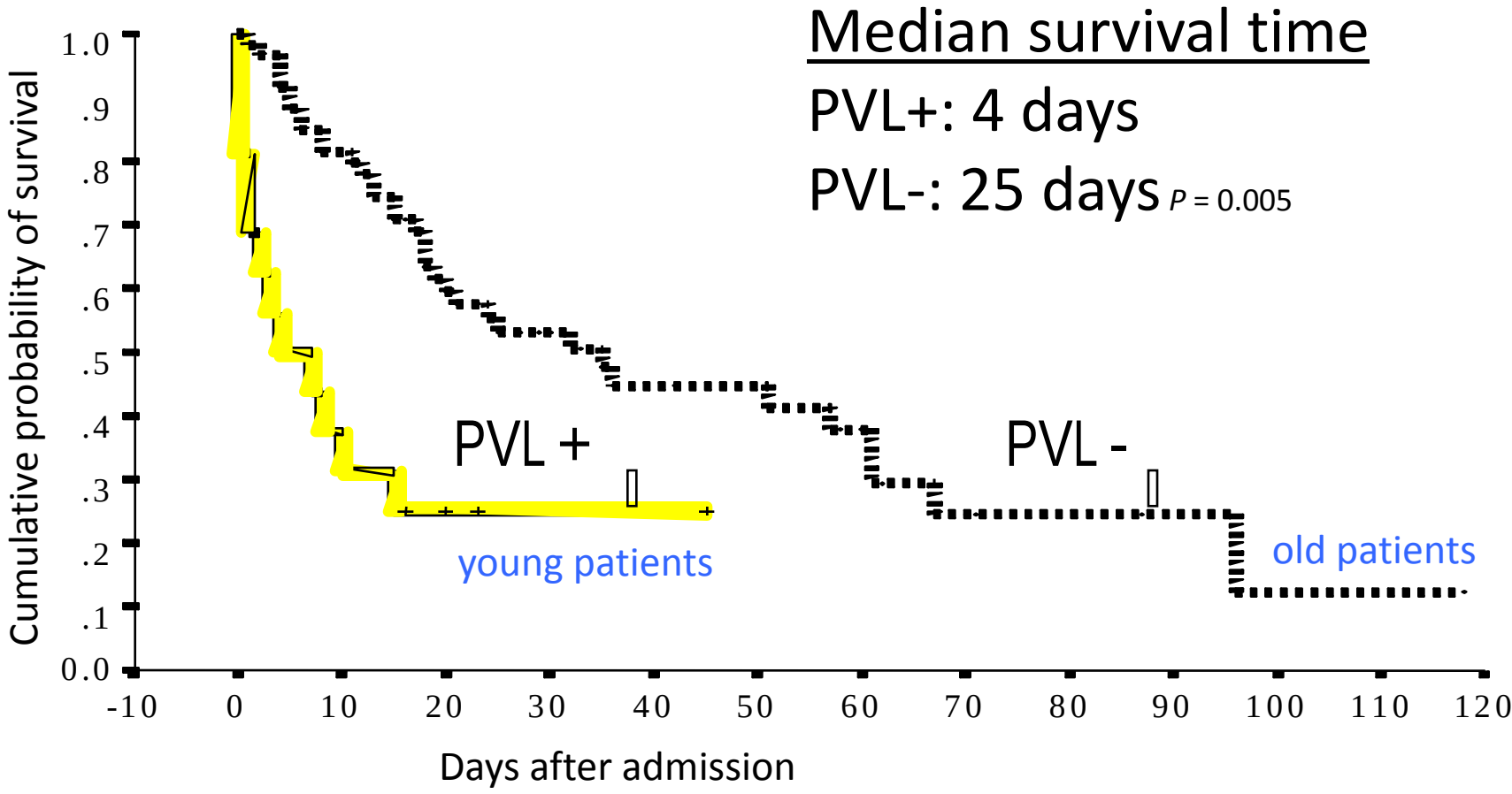
	Ostéomyélites		
	PVL+ (14 cas)	**PVL-** (17 cas)	*P*
Délais avant apyréxie			
moyenne	29	3	<0,001
Durée d'antibiothérapie			
intraveineuse (moyenne)	48 (10-112)	11 (5-9)	<0,001
orale (moyenne)	256 (21-1695)	(12-60)	<0,001
Nombre de geste chirurgical			
moyenne	2.8	0.5	0,002
Durée d'hospitalisation			
moyenne	45 ± 25	13 ± 4	<0,001

- PVL is associated to:
  - Extensive osteomyelitis
  - Longer antibiotherapy and hospitalisation

Necrotizing pneumonia :survival of patients

Deaths : PVL+ 75%, PVL- 47%



Gillet et al Lancet 2002

Comparison of clinical, radiological and biological data

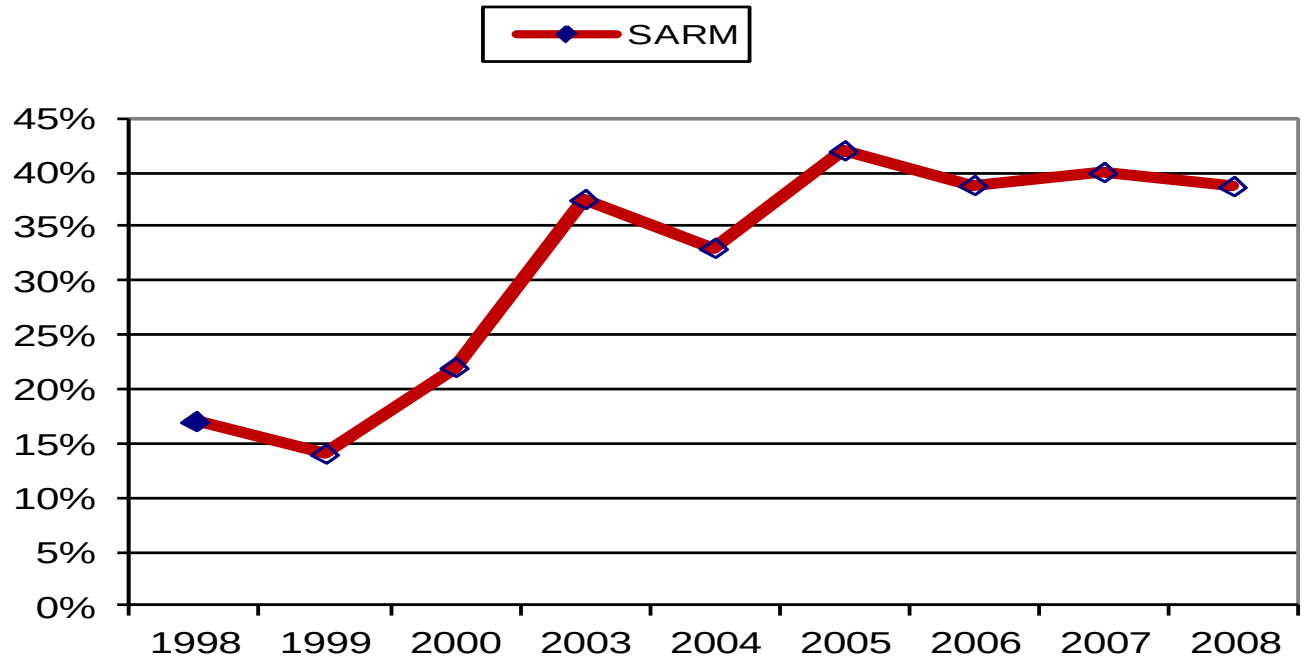
- **Airway hemorrhage** was more typically associated with CA-MSSA infection (44.2% vs. 24.1%; OR, 0.40; 95% CI, 0.16-1.02; *P*=0.056)

- No other statistical difference in clinical or biological data.

Characteristic	C-MSSA (N=104)	C-MRSA (N=29)	Univariate OR (95% CI)	*P*-value*
Demographics				
Age (years)	22 (4.5-43.7)	22.5 (0.7-46.5)	0.99 (0.98-1.01)	0.717
Male gender	64 (61.5)	17 (58.6)	1.29 (0.49-2.61)	0.831
Comorbid condition				
No underlying disease[1]	92 (88.5)	22 (75.9)	2.51 (0.82-7.64)	0.111
Personal or familial history of skin and soft tissue infection[2]	18 (24.0)	4 (18.2)	0.70 (0.21-2.35)	0.773
Symptoms before hospitalization				
Time from onset of symptoms to hospital admission (days)	3.0 (2.00-5.00)	3.5 (2.25-5.75)	1.01 (0.90-1.13)	0.847
Influenza-like syndrome	61 (59.8)	19 (65.5)	1.27 (0.54-3.02)	0.669
Skin and soft tissue infection[3]	28 (26.9)	3 (10.3)	0.31 (0.09-1.12)	0.082
Clinical symptoms during the first 24 hours of hospitalization[4]				
Fever >39° or temperature <36°	83 (79.8)	21 (72.4)	0.66 (0.26-1.71)	0.447
Airway hemorrhage[5]	46 (44.2)	7 (24.1)	0.40 (0.16-1.02)	0.056
Additional focus of staphylococcal infection[6]	26 (25.2)	2 (6.9)	0.22 (0.05-.99)	0.039
Radiological findings during the first 24 hours of hospitalization[7]				
Pleural effusion	16 (55.2)	13 (44.8)	1.09 (0.47-2.50)	0.836
Multilobar consolidation	67 (65.7)	15 (51.7)	0.56 (0.24-1.29)	0.195
Biological findings during the first 48 hours of hospitalization				
Lowest leukocyte count (10^9/L)	5.5 (1.4-14.6)	4.7 (1.2-11.8)	1.00 (0.99-1.01)	0.586
Categorical leukocyte count: <3000 leukocytes/mL 3000-10000 leukocytes/mL >10000 leukocytes/mL	 38 (36.9) 26 (25.2) 39 (37.9)	 13 (44.8) 8 (27.6) 8 (27.6)		0.580
Lowest platelet count (10^9/L)	171 (92-275)	164 (74-275)	1.00 (0.99-1.01)	0.767
ICU admission[4,8]	82 (79.6)	20 (69.0)	0.57 (0.23-1.43)	0.315
Severity markers				
PRISM score (n/N)	18 (12-35) 18/32	11 (5-31) 6/9	0.95 (0.89-1.02)	0.217
SAPS II score (n/N)	57 (27-78) 44/50	64 (39-89) 11/11	0.99 (0.97-1.01)	0.436
PaO_2/FiO_2 ratio (n/N)	70 (50-105) 49/82	67 (50-99) 10/20	1.00 (0.99-1.01)	0.968
Therapy				
Mechanical ventilation	69 (66.3)	16 (55.2)	0.62 (0.27-1.44)	0.282
Duration of mechanical ventilation (days)	2.0 (1.0-14.0)	3.5 (1.0-11.7)		0.797
Inotrope support	59 (56.7)	14 (48.3)	0.71 (0.31-1.62)	0.527
Appropriate antibiotic therapy in the first 24 hours of hospitalization[9]	86 (87.8)	19 (79.2)	0.53 (0.17-1.68)	0.324
Outcome				
Complications[10]	85 (81.7)	23 (79.3)	0.86 (0.31-2.39)	0.790
ARDS	48 (46.2)	10 (34.5)	0.61 (0.26-1.45)	0.296

Situation of C-MRSA in Algeria?

Increase of MRSA isolates in Algeria



Ramdani N. et al. ECCMID Istanbul 1-4 April 2001.
Borg MA et al. Eurosurveillance 2006;11:164-7 .
Ramdani N. et al. Antimicrob Agents Chemother 2006;50:1083-1085
Tazir M et al Rapport annuel 2006,2007,2008

ORIGINAL ARTICLE 10.1111/j.1469-0691.2010.03273.x

High prevalence of methicillin-resistant *Staphylococcus aureus* clone ST80-IV in hospital and community settings in Algiers

K. Antri[1]*, N. Rouzic[2,3]*, O. Dauwalder[2,3], I. Boubekri[1], M. Bes[2,3], G. Lina[2,3], F. Vandenesch[2,3], M. Tazir[1], N. Ramdani-Bouguessa[1] and J. Etienne[2,3]

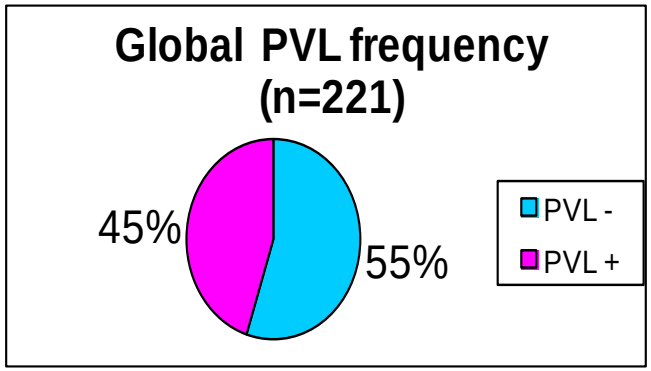
1) *Centre Hospitalo-Universitaire Mustapha Bacha, Algiers, Algeria, 2) Université Lyon 1, Lyon and 3) Hospices Civils de Lyon, Bron, France*

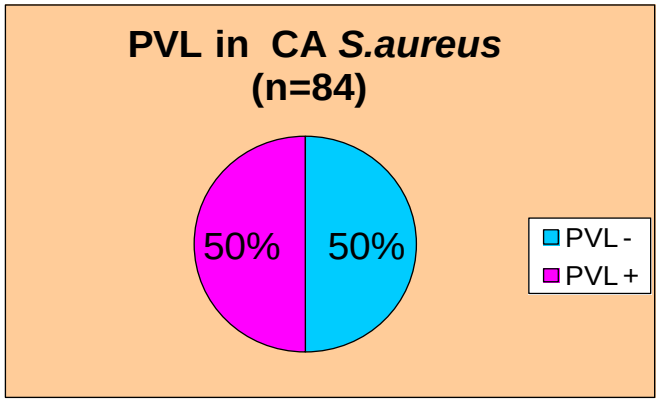
Infection	***S. aureus* (n=700)**	**MRSA (n=291)**
	Nb (%)	**Nb**
Skin and soft tissus	467 (67)	209
Bacteremia	43 (6)	20
Bone and joint infection	38 (5)	19
Pneumonia	33 (5)	12
ENT	56 (8)	11
ocular	12 (2)	6
Genital	10 (1)	2
Endocarditis	3 (0,4)	2

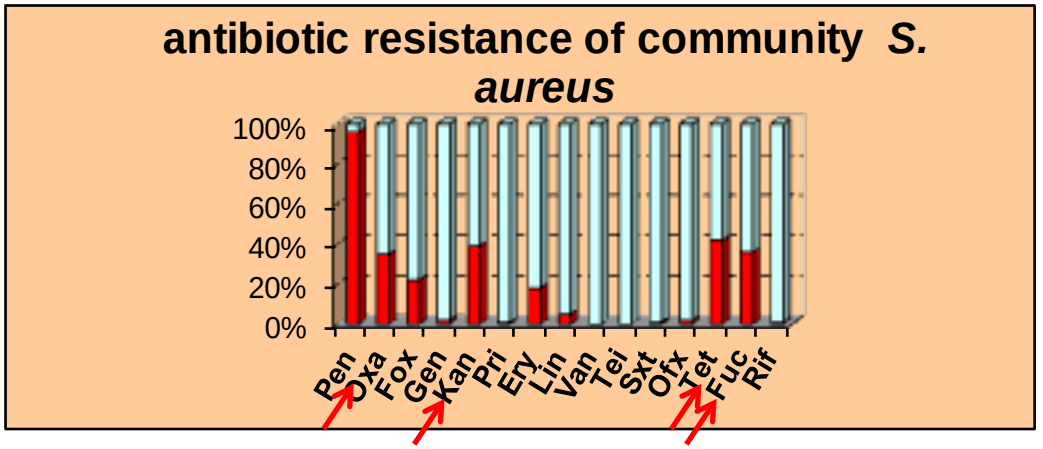
TABLE I. Baseline characteristics in 122 cases of methicillin-resistant *Staphylococcus aureus* (MRSA) and 89 cases of methicillin-susceptible *S. aureus* (MSSA) community- and hospital-acquired infections among patients admitted to Mustapha Bacha Hospital, Algiers, between April 2006 and December 2007

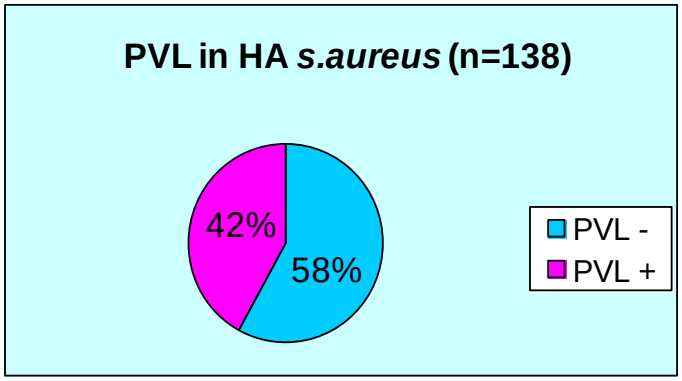
	Community infections				Hospital infections			
	MSSA		MRSA		MSSA		MRSA	
Characteristic	*n*	%	*n*	%	*n*	%	*n*	%
Staphylococcus aureus isolates	50	59.5	34	40.5	72	52.6	65	47.4
Demographics								
Median age (years)	39.9		34.7*		38.6		41.3*	
Sex ratio (M/F)	1.94 (33/17)		1.27 (19/15)		1.32 (41/31)		2.09 (44/21)	
Diagnosis								
Skin/soft-tissue infection	33	66**	30	88**	50	70	45	69
Bone/joint infection	7	14	1	3	8	11	9	14
Bacteraemia	3	6	0	0	7	10	4	6
Pneumonia	3	6	2	6	2	3	5	7
ENT or eye infection	3	6	0	0	3	4	1	2
Meningitis	0	0	1	3	1	1	1	2
Urinary tract infection	1	2	0	0	1	1	0	0

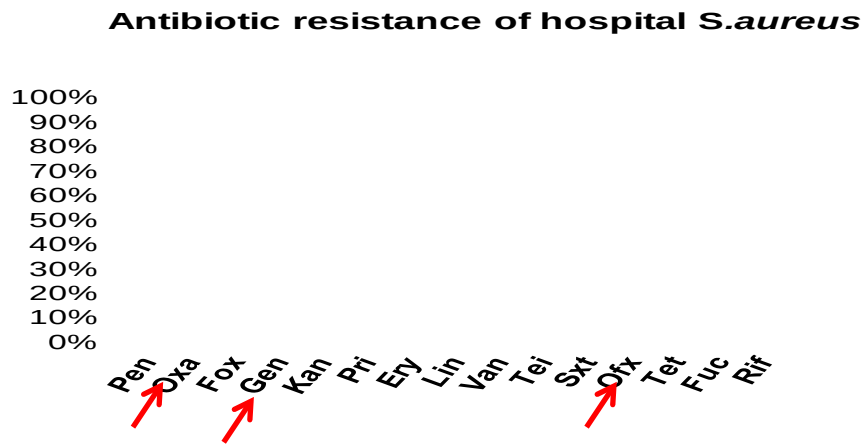
*p <0.05, community-acquired MRSA vs. hospital MRSA.
**p <0.05, MSSA vs. MRSA community infections.
ENT, ear, nose and throat.


Global PVL frequency
(n=221)
45%
55%
PVL -
PVL +


PVL in CA S.aureus
(n=84)
50%
50%
PVL -
PVL +


antibiotic resistance of community S. aureus
100%
80%
60%
40%
20%
0%
Pen
Oxa
Fox
Gen
Kan
Pri
Ery
Lin
Van
Tei
Sxt
Ofx
Tet
Fuc
Rif


PVL in HA s.aureus (n=138)
42%
58%
PVL -
PVL +


Antibiotic resistance of hospital S.aureus
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Pen
Oxa
Fox
Gen
Kan
Pri
Ery
Lin
Van
Tei
Sxt
Ofx
Tet
Fuc
Rif

Resistance phenotypes of PVL+ MRSA

Resistance profiles	C I (n=30)	NI (n=48)	Total (n=78)
pen,oxa,kan,tet,fuc	15	13	28
pen,oxa,kan	3	5	8
pen,oxa,kan,ery,tet,fuc	6	1	7
pen,oxa,gen,kan,ery,lin,pri,ofx,tet,fuc	0	7	7
pen,oxa,gen,kan,ofx,fuc	0	5	5
pen,oxa,gen,kan,ery,lin,pri,ofx,fuc	0	3	3
pen,oxa,kan,ofx,fuc	0	3	3

European clone ST80: oxa, kan,tet, fuc

mecA+, agr3, SCCmec IV, V

TABLE 2. Panton–Valentine leukocidin (PVL) genes in 221 *Staphylococcus aureus* isolates recovered from patients admitted to Mustapha Bacha Hospital, Algiers, between April 2006 and December 2007

	Community infections		Hospital infections		
Characteristic	*n*	%	*n*	%	p-value
All *Staphylococcus aureus*	84		137		
PVL-positive	42	50.0	57	41.6	Ns
PVL-negative	42	50.0	80	58.4	
All MSSA	50		72		
PVL-positive	12	14.3	8	5.8	0.06
PVL-negative	38	45.2	64	46.7	
All MRSA	34		65		
PVL-positive	30	35.7	49	35.8	0.13
PVL-negative	4	4.8	16	11.7	

MSSA, methicillin-susceptible *S. aureus*; MRSA, methicillin-resistant *S. aureus*.

Diversification of resistance profiles
ST80 PVL+ CA-MRSA

	N (%)	Country of origin (N)
P, OX, K	25 (7.0)	Algeria (9), France (13), Greece (1), Switzerland (2)
P, OX, K,E	12 (3.4)	Algeria (5), France (6), Switzerland (1)
P, OX, K, FU	19 (5.3)	Algeria (4), France (13), Switzerland (2)
P, OX, K, TE	6 (1.7)	Algeria (1), France (5)
P, OX, K, E, FU	8 (2.2)	Algeria (1), France (5), Switzerland (2)
P, OX, K, E, L	1 (0.3)	France (1)
P, OX, K, E, Rif	1 (0.3)	Algeria (1)
P, OX, K, OFL, FU	1 (0.3)	Algeria (1)
P, OX, K, TE, FU	**205 (57.4)**	Algeria (27), Belgium (1), France (147), Germany (1), Greece (3), The Netherlands (2), Slovenia (3), Switzerland (20), Singapore (1)
P, OX, K, T, G	1 (0.3)	France (1)
P, OX, K, E, L, FU	1 (0.3)	France (1)
P, OX, K, E, TE, OFL	1 (0.3)	France (1)
P, OX, K, E, TE, FU	**59 (16.5)**	Algeria (5), France (48), Roumania (1), Switzerland (5)
P, OX, K, E, L, TE, FU	2 (0.6)	France (2)
P, OX, K, T, E, L, TE	1 (0.3)	Algeria (1)
P, OX, K, T, G, OFL, FU	2 (0.6)	Algeria (2)
P, OX, K, T, G, TE, FU	1 (0.3)	Algeria (1)
P, OX, K, E, L, TE, OFL, FU	2 (0.6)	Algeria (2)
P, OX, K, T, G, E, OFL, FU	1 (0.3)	Algeria (1)
P, OX, K, T, E, L, OFL, FU	1 (0.3)	Algeria (1)
P, OX, K, T, G, E, TE, FU	1 (0.3)	France (1)
P, OX, K, T, G, OFL, FU, Rif	2 (0.6)	Algeria (2)
P, OX, K, T, G, TE, FU, Rif	1 (0.3)	Algeria (1)
P, OX, K, T, E, L, PRI, OFL, FU	2 (0.6)	Algeria (2)
P, OX, K, T, G, E, L, PRI, OFL, FU	1 (0.3)	Algeria (1)

Ramdani-Bouguessa N, et a Antimicrob Agents Chemother. 2006;50:1083-5.

Tristan A et. EID, 2007

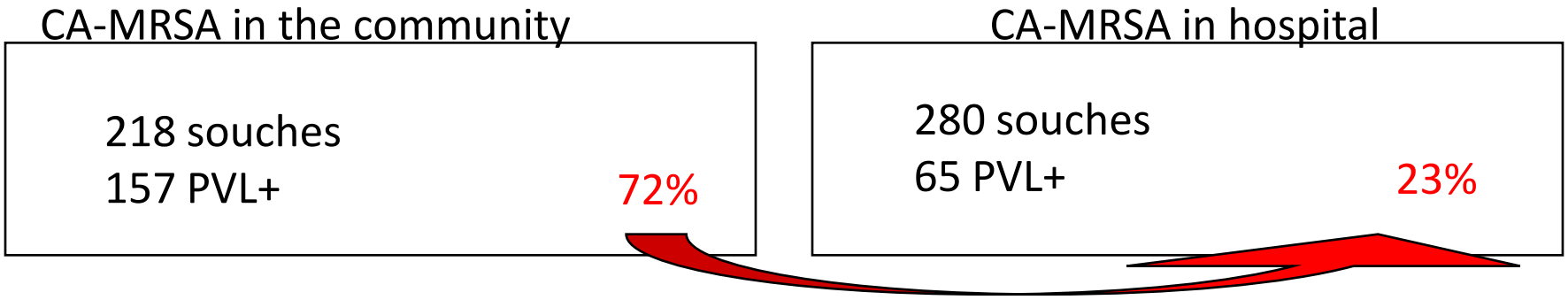
CA-MRSA PVL+ colonize the hospital

- **USA** % of infections

  Delaware (US) = 28% CA-MRSA in the community (USA300)

  …..and 20% of nosocomial infections
  Grady Memorial Hospital (USA, Delaware)
  Seybold U et al CID 2006;42:647-56

- **Greece**
  - Collection of 1058 *S. aureus*
  - 498 MRSA (47%)
  - 222/498 MRSA PVL + (45%)



from Chini V et al Eur J Clin Microbiol Infect 2006

S.aureus carriage

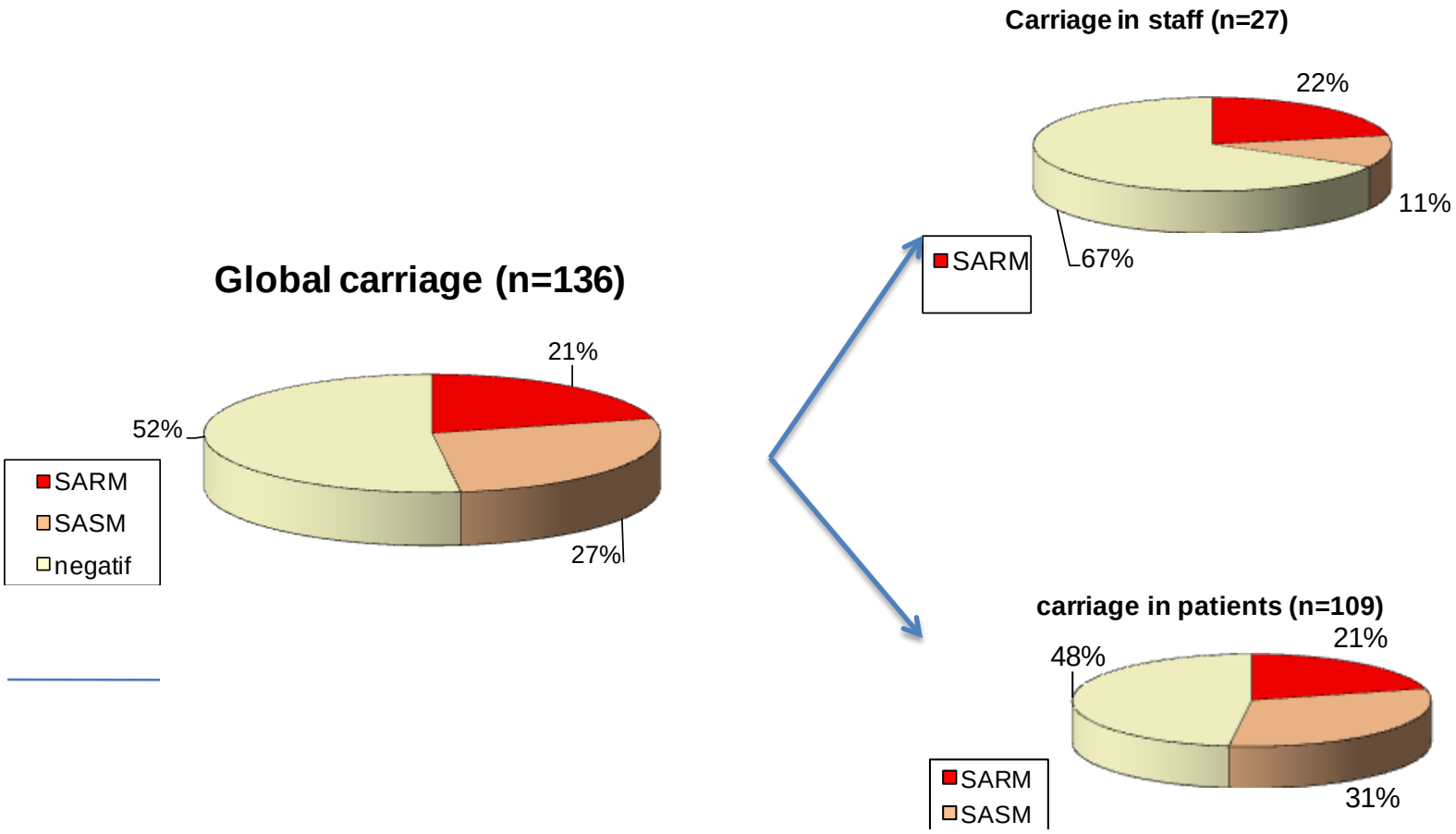
US300 in San Francisco (Tattevin

MRSA transmission:

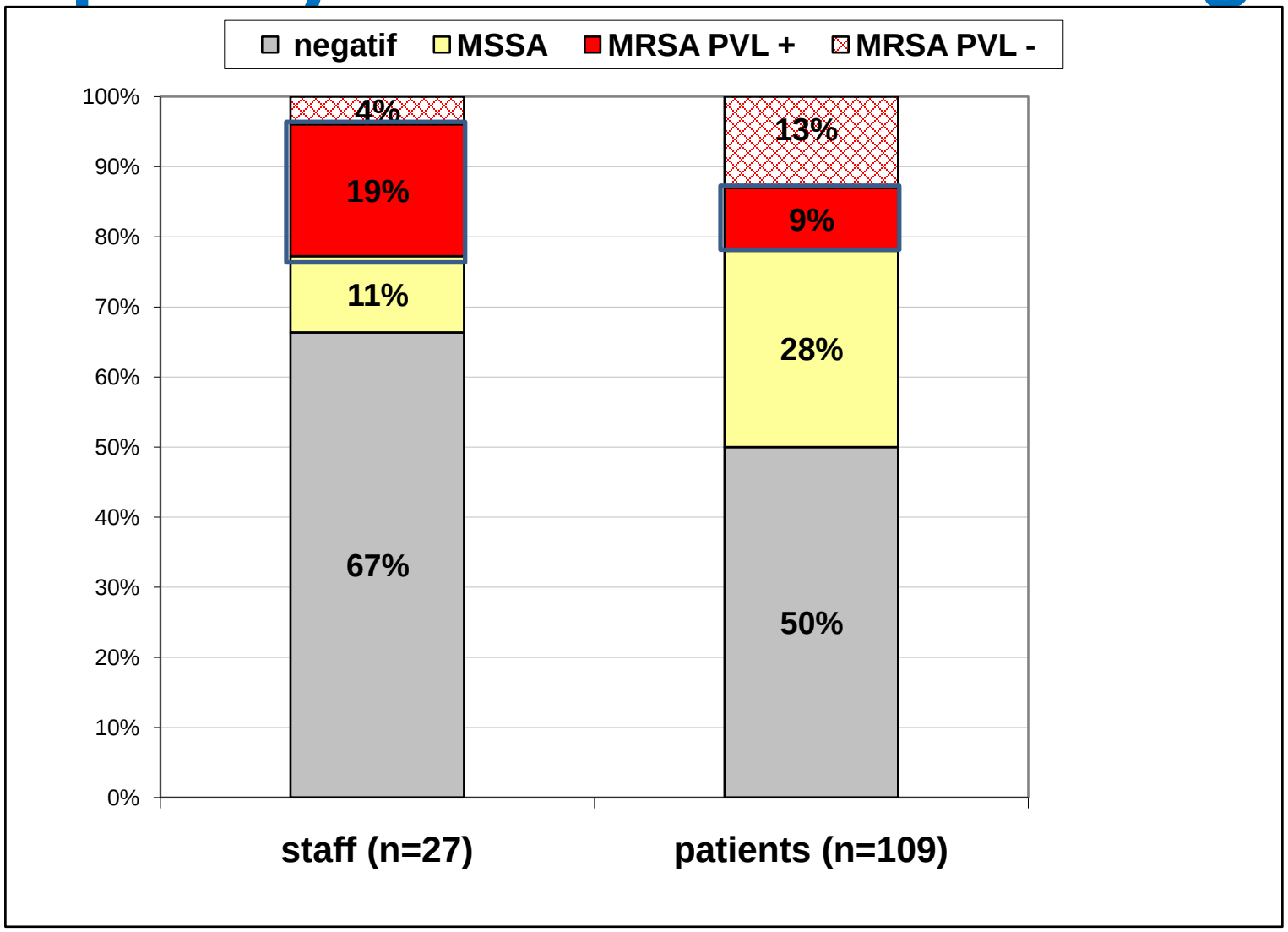
-contact skin-to-skin

-Nasal carriage

Nasal carriage in hospital staff (n=27) and patients (n=109) at dermatology depatment Algiers

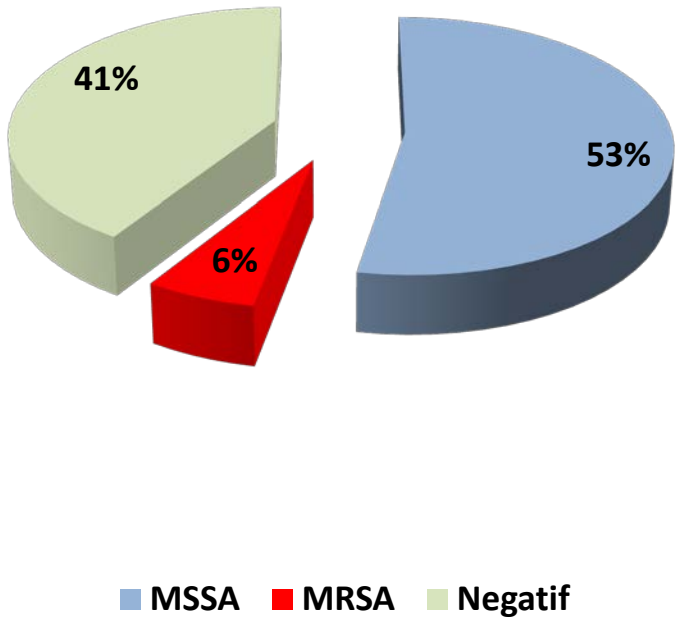


Frequency of MRSA-PVL+ carriage

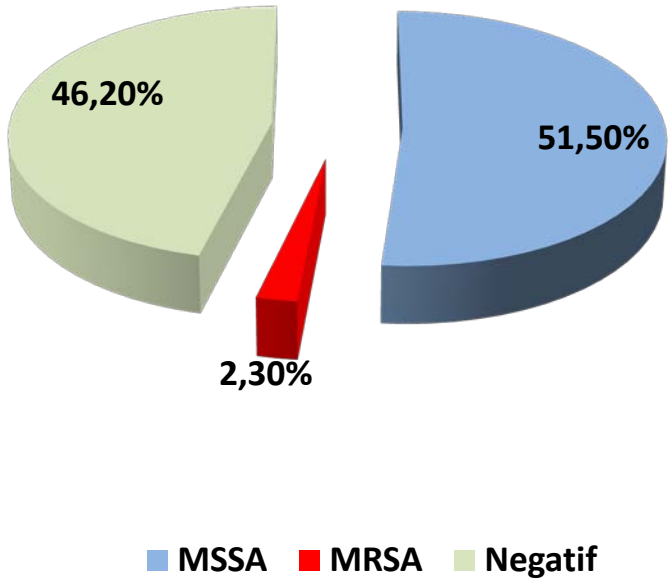


S. aureus carriage in the community in Algiers

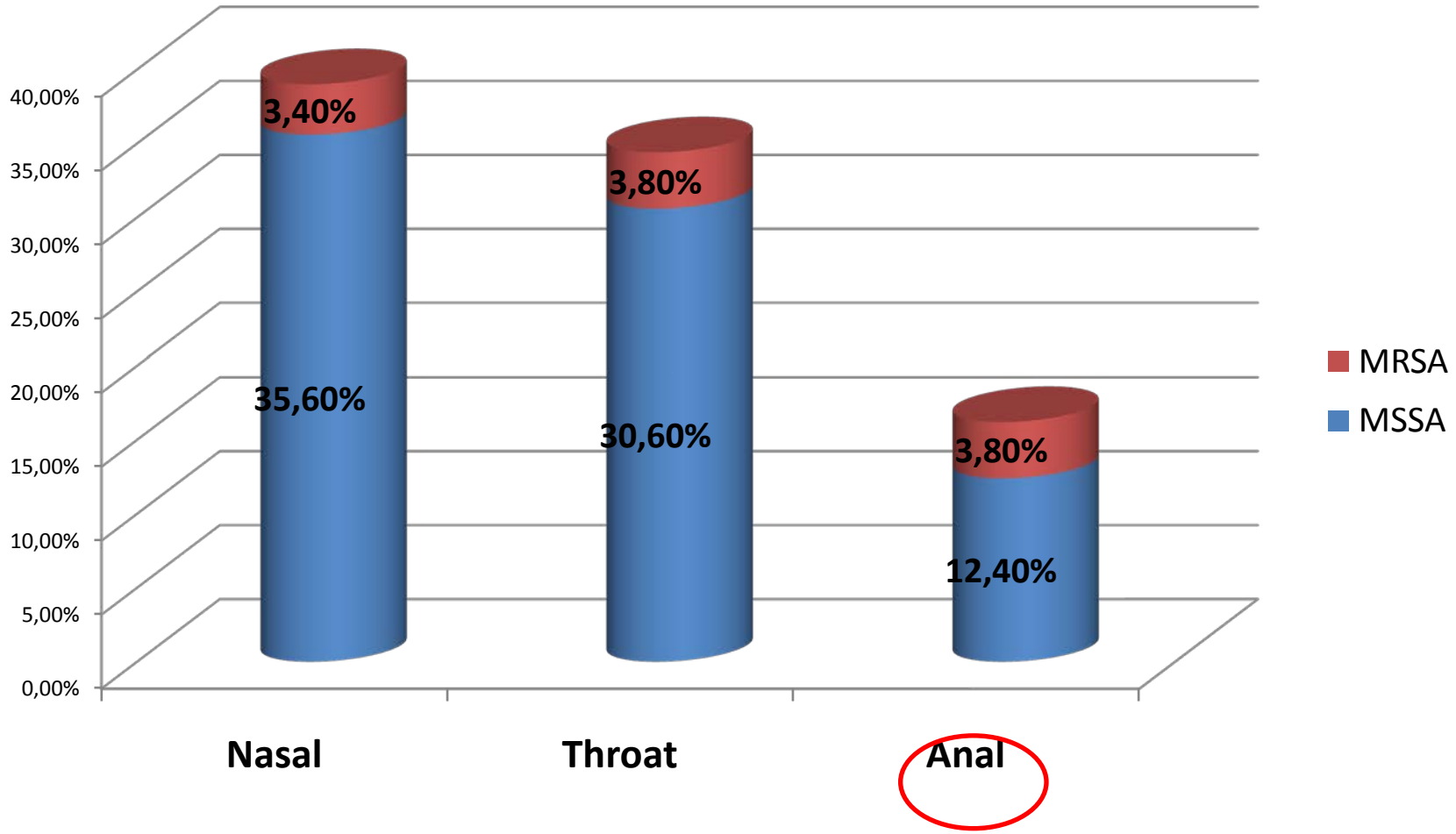
Carriage in chidren (n=258), 3 sites: nasal+throat+anal



Carriage in adults (n=200), 2 sites: nasal+throat



MRSA carriage in 3 sites



What is the situation in Maghreb and the world?

Epidemiology of methicillin-susceptible *Staphylococcus aureus* lineages in five major African towns: high prevalence of Panton–Valentine leukocidin genes

S. Breurec[1], C. Fall[1], R. Pouillot[2], P. Boisier[3], S. Brisse[4], F. Diene-Sarr[1], S. Djibo[3], J. Etienne[5], M. C. Fonkoua[2], J. D. Perrier-Gros-Claude[6], C. E. Ramarokoto[7], F. Randrianirina[7], J. M. Thiberge[4], S. B. Zriouil[8,9], the Working Group on *Staphylococcus aureus* infections*, B. Garin[1,†] and F. Laurent[5,†]

1) *Institut Pasteur, Dakar, Senegal,* 2) *Centre Pasteur, Yaounde, Cameroon,* 3) *CERMES, Niamey, Niger,* 4) *Institut Pasteur, Paris,* 5) *University of Lyon, National Reference Centre for Staphylococci, Lyon, France,* 6) *Institut Pasteur, Casablanca, Morocco,* 7) *Institut Pasteur, Antananarivo, Madagascar,* 8) *Ibn Rochd University Hospital and* 9) *Hassan II University, Casablanca, Morocco*

TABLE I. Distribution of 228 methicillin-susceptible *Staphylococcus aureus* isolates obtained in five African towns (Antananarivo, Casablanca, Dakar, Niamey, and Yaounde) according to the presence of Panton–Valentine leukocidin (PVL) and the types of infection[a]

	Antananarivo		Casablanca		Dakar		Niamey		Yaounde		Total	
	N	PVL+, *n* (%)	N	PVL+, *n* (%)	N	PVL+, *n* (%)	N	PVL+, *n* (%)	N	PVL+, *n* (%)	N	PVL+, *n* (%)
Bacteraemia	0	0	0	0	17	8 (47)	0	0	0	0	17	8 (47)
Myositis	0	0	0	0	25	23 (92)	0	0	0	0	25	23 (92)
Osteomyelitis	2	0	0	0	11	8 (73)	5	3 (60)	1	1 (100)	19	12 (63)
Pulmonary infection	0	0	0	0	6	3 (50)	0	0	0	0	6	3 (50)
Skin and soft tissue infection	24	8 (33)	18	3 (17)	47	34 (72)	13	10 (77)	17	12 (71)	119	67 (56)
Surgical site infection	12	5 (42)	0	0	7	1 (14)	14	7 (50)	3	3 (100)	36	16 (44)
Genitourinary tract infection	2	0	0	0	2	0	0	0	0	0	4	0
Unknown type of infection	0	0	0	0	0	0	0	0	2	1 (50)	2	1 (50)
Total	40	13 (33)	18	3 (17)	115	77 (67)	32	20 (63)	23	17 (74)	228	130 (57)

N, total number of strains isolated.

Eur J Clin Microbiol Infect Dis (2011) 30:499–508
DOI 10.1007/s10096-010-1109-6

ARTICLE

Nasal carriage of *Staphylococcus aureus* in healthy humans with different levels of contact with animals in Tunisia: genetic lineages, methicillin resistance, and virulence factors

K. Ben Slama · H. Gharsa · N. Klibi · A. Jouini · C. Lozano · E. Gómez-Sanz · M. Zarazaga · A. Boudabous · C. Torres

Table 1 Characteristics of the 423 healthy individuals in relation to specific risk factors and characteristics of recovered *Staphylococcus aureus* isolates

Characteristics of individuals tested		No. of individuals tested	No. of individuals with *S. aureus*	No. (%) of individuals with MRSA	Individuals with toxigenic *S. aureus*[b]
Contact with animals	Other risk factors[a]				
High contact with farm animals: veterinarian students or staff; farmers; abattoir workers	No	83	16	1 (1.2 %)	PVL (3), TSST-1 (2)
	Yes	28	5	0	ETA + ETB (1)
High contact with companion animals	No	36	8	0	TSST-1 (4), ETA (1)
	Yes	21	1	0	
Sporadic contact with animals	No	73	2	0	PVL (1)
	Yes	21	1	0	
No contact with animals	No	132	15	0	TSST-1 (2)
	Yes	29	7	0	TSST-1 (3)
Total		423	55	1 (0.2%)	(17)

[a] Use of antibiotics or contact with hospitalized patients in the three months prior to sampling

[b] PVL: Panton–Valentine leukocidin; ETA and ETB: exfoliative toxins A and B, respectively; TSST: toxic shock syndrome toxin

CA-MRSA *pvl*$^+$

- CA-MRSA
  - First description 1990
  - USA: **ST8 – USA300**
    - **97% of** SSTI emergency
    - **58%** des SSTI aux USA
  - Europe : **ST80**
  - Taiwan, Vietnam, China : **ST59**
  - Corée : **ST72**
  - Austria: **ST30**

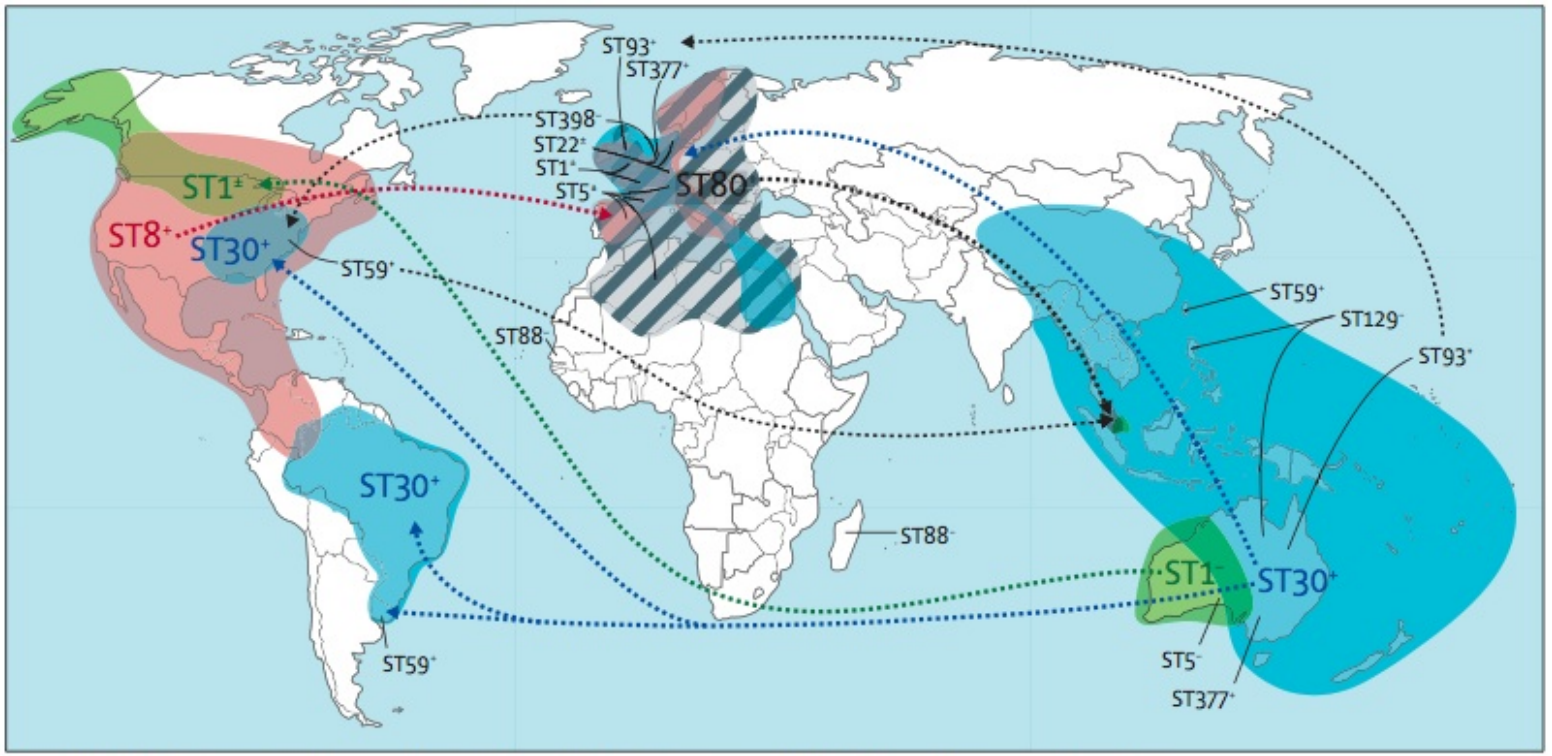
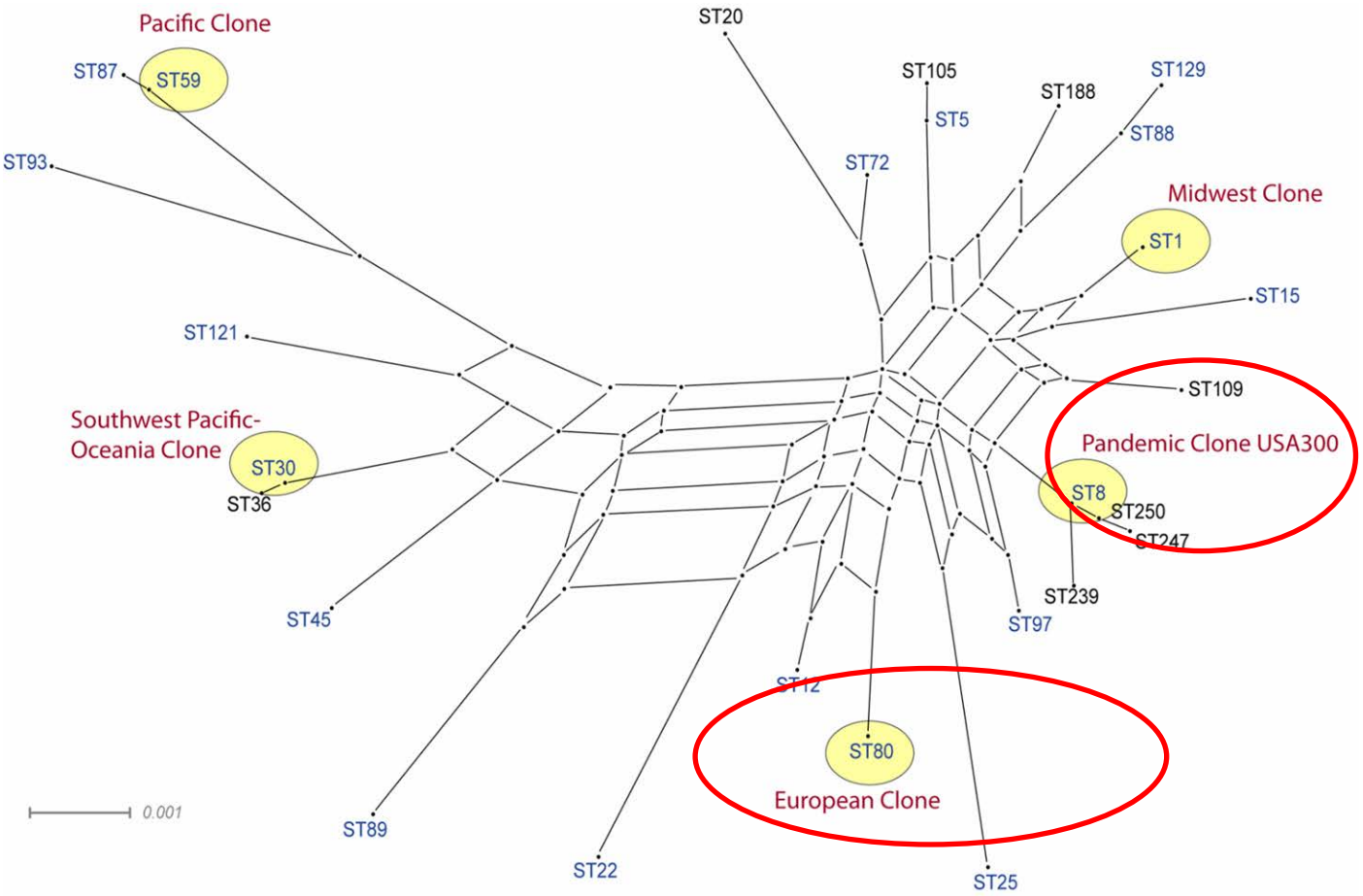


Figure 1: Global distribution of community-associated meticillin-resistant *Staphylococcus aureus* (CA-MRSA) by multilocus sequence type (ST)
Dotted lines indicate possible route of dissemination of the CA-MRSA strains. Estimates of the areas are shown in which infections with the main strains—ie, ST1 (green), ST8 (red), ST30 (blue), and ST80 (yellow) clones—have been reported. +=Panton-Valentine leukocidin (PVL)-positive strains. –=PVL-negative strains. ±=combination of PVL-positive and PVL-negative strains.

Moran *et al.*, NJEM 2006 ; Deleo et al. Lancet (2010)
Otto M. - Basis of virulence in community-associated methicillin-resistant *Staphylococcus aureus*. - Annu Rev Microbiol. 2010;64:143-62.

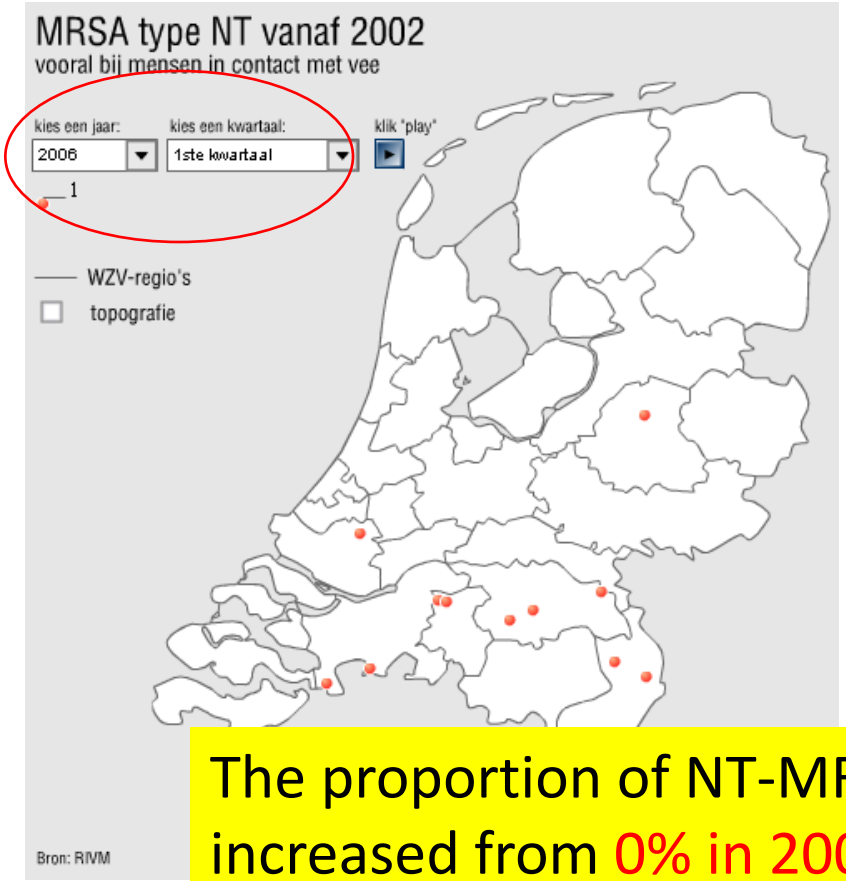
Worlwide emergence of cMRSA

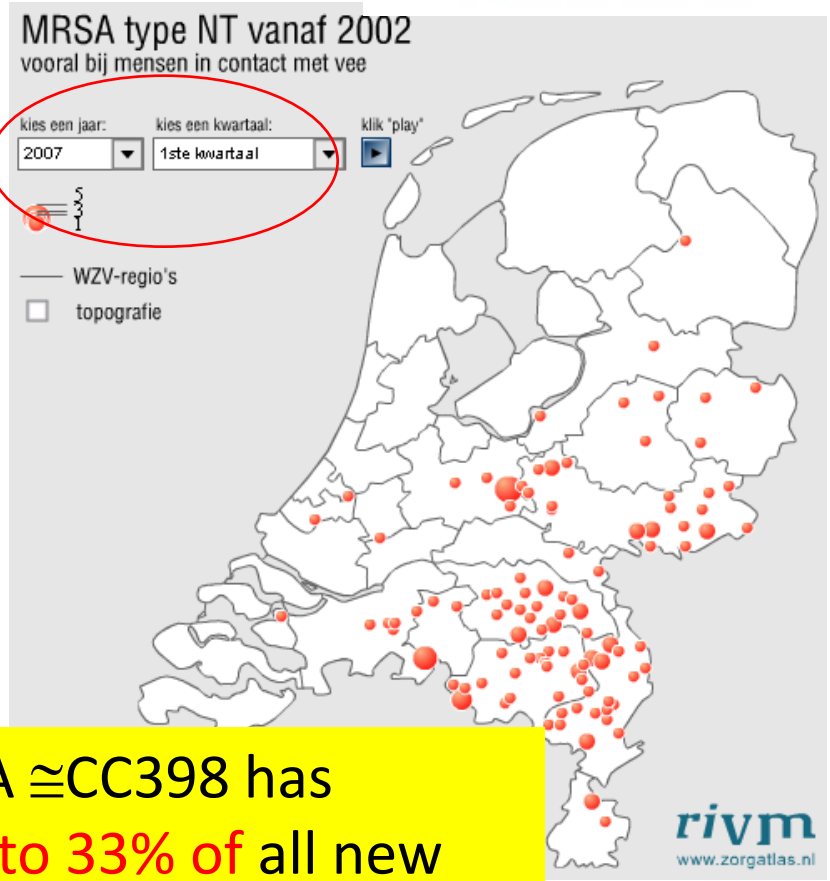


Diep and Otto, Trends in Microbiol 2008

Recent emergence animal MRSA ·

LA (livestock)-MRSA (ST398) animal to man transmission





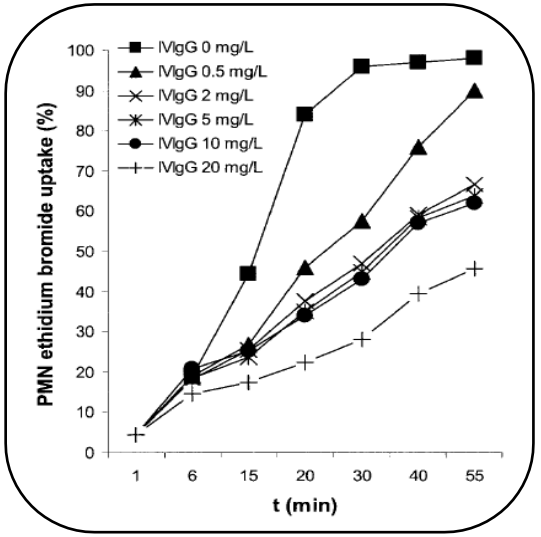
The proportion of NT-MRSA ≅CC398 has increased from 0% in 2003 to 33% of all new reported cases of MRSA in the 2007

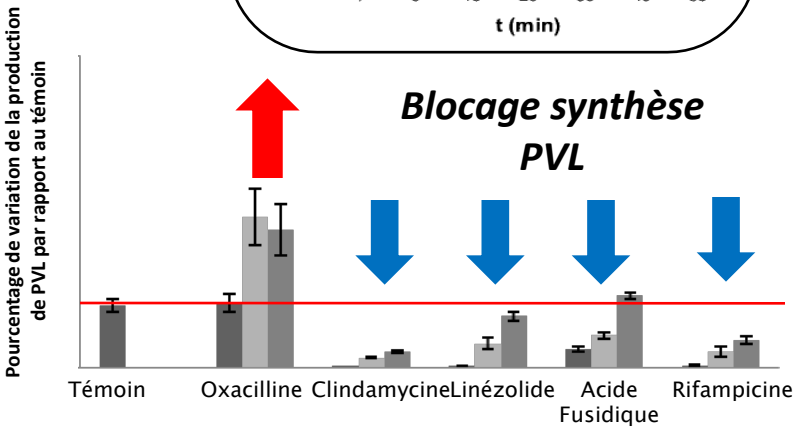
Why rapid diagnosis of *S. aureus pvl*$^{+}$?

- Specific therapeutics EXIST!

- **Primitive cutaneous infections**
  - nasal & cutaneous decontaminations
  - Control the epidemic spread

- **Necrotizing pneumonie**
  - ***IGIV***
    - Toxine neutralisation
  - ***anti toxinic antibiotics***
    - *Clindamycin*
      - inhibit toxine synthesis
    - *Linézolid*
      . inhibit toxine synthesis





Gauduchon *et al.* 2004 ; Gillet *et al.* 2008; Dumitrescu *et al.* 2007

Therapeutic options

furonculosis

- MSSA
  - Oxacillin for 5 days
  - Pristamycin for 5 days
- MRSA :
  - Clindamycin
  - Pristinamycin
  - Alternatives
    - Doxycycline
    - Cotrimoxazole

Bone JI *S. aureus pvl*$^{+}$

- MSSA
  - Oxacilline + Rifampicin
  - Clindamycin + Rifampicin
- MRSA :
  - Vanco + Rifampicin or Fusidic Ac. or Fosfomycine or Doxycycline
  - Clindamycin + Rifampicin
  - **Vancomycin + clindamycin**

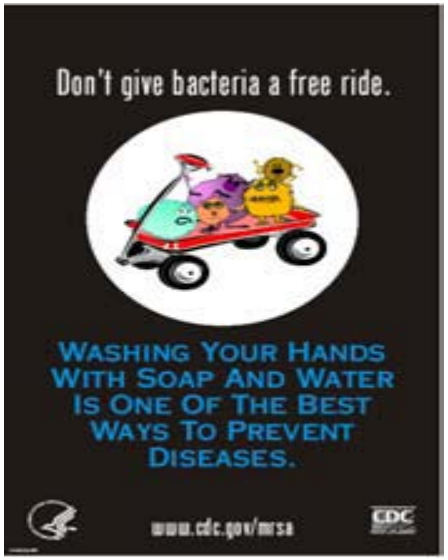
necrotizing pneumonia

- MSSA
  - Oxacillin
  - and Clindamycin
  - **OR** Rifampicine for 5 days
- MRSA
  - Linezolide for 14 days
  - **OR** Vancomycin **and** clindamycin **OR** Rifampicin for 5 days
  - **Vancomycin + clindamycin**

Recommandations IOA 2008 Haute Autorité de Santé

Prevention

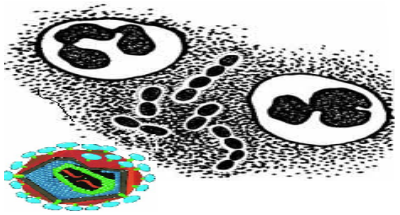

Don't open the door to infection.
ANY OPENING IN YOUR SKIN INCREASES THE RISK OF INFECTION.
Keep your cuts, scrapes, and scratches
Clean
Dry and
Covered!
www.cdc.gov/mrsa
CDC


Don't give bacteria a free ride.
WASHING YOUR HANDS WITH SOAP AND WATER IS ONE OF THE BEST WAYS TO PREVENT DISEASES.
www.cdc.gov/mrsa
CDC


Sharing isn't always caring.
SHARING PERSONAL ITEMS LIKE TOWELS, RAZORS, OR TWEEZERS CAN SPREAD DISEASES.
www.cdc.gov/mrsa
CDC


Don't let infection
get under your skin.
CUTS AND SCRAPES ARE PART OF THE GAME. TAKE CARE OF THEM PROPERLY.
To avoid skin infections:
• Wash your hands frequently.
• Shower after playing sports; use a clean towel.
• Keep cuts and scrapes clean and covered with a bandage.
Tell your coach or athletic trainer if you think you have a skin infection.
CDC

Algerian Society for Clinical Microbiology



Société Algérienne
de
Microbiologie Clinique
SAMiC

Site web:www.samic-inf.com

Saturday 16 june 2012

Thème : *Staphylococcus aureus* : un germe, des pathologies