

Les Infections à Staphylocoque en néonatalogie et maternité

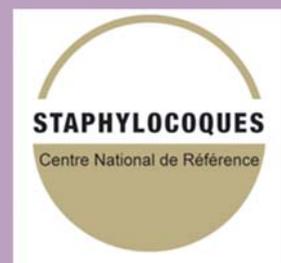
Anne Tristan

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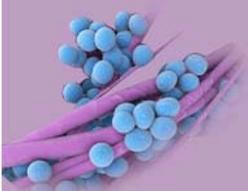
14/11/2019



Les staphylocoques en réanimation néonatale



<https://www.maternite-etoile.com>



Les staphylocoques à coagulase négative

- **Staphylococcus epidermidis**

Beyond sepsis: Staphylococcus epidermidis is an underestimated but significant contributor to neonatal morbidity

Dong Y, Speer CP, Glaser K
Virulence 9(1) 621-633 (2018)

The role of Staphylococcus epidermidis in neonatal sepsis: guarding angel or pathogenic devil?

Dong Y, Speer CP
International journal of medical microbiology : IJMM 304(5-6) 513-20 (2014)

- Rupture de la barrière cutanée KT
- Rôle des PSM dans la virulence

- **Staphylococcus capitis**

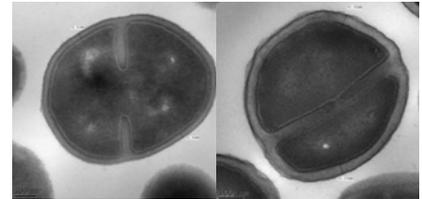
Staphylococcus capitis and NRCS-A clone: the story of an unrecognized pathogen in neonatal intensive care units

Laurent F, Butin M
Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases 25(9) 1081-1085 (2019)

Sources and reservoirs of Staphylococcus capitis NRCS-A inside a NICU

Butin M, Dumont Y, Monteix A, Raphard A, Roques C, Martins Simoes P, Picaud JC, Laurent F
Antimicrobial resistance and infection control 8 157 (2019)

- Multirésistance (glycopeptides)
- Persistance dans les couveuses



S. aureus

- ↗ du nombre d'épidémies rapportées au CNR
- La majorité des articles s'intéressent aux **SARM**
- Peu d'articles sur **SASM**

Staphylococcus aureus in a neonatal care center: methicillin-susceptible strains should be a main concern

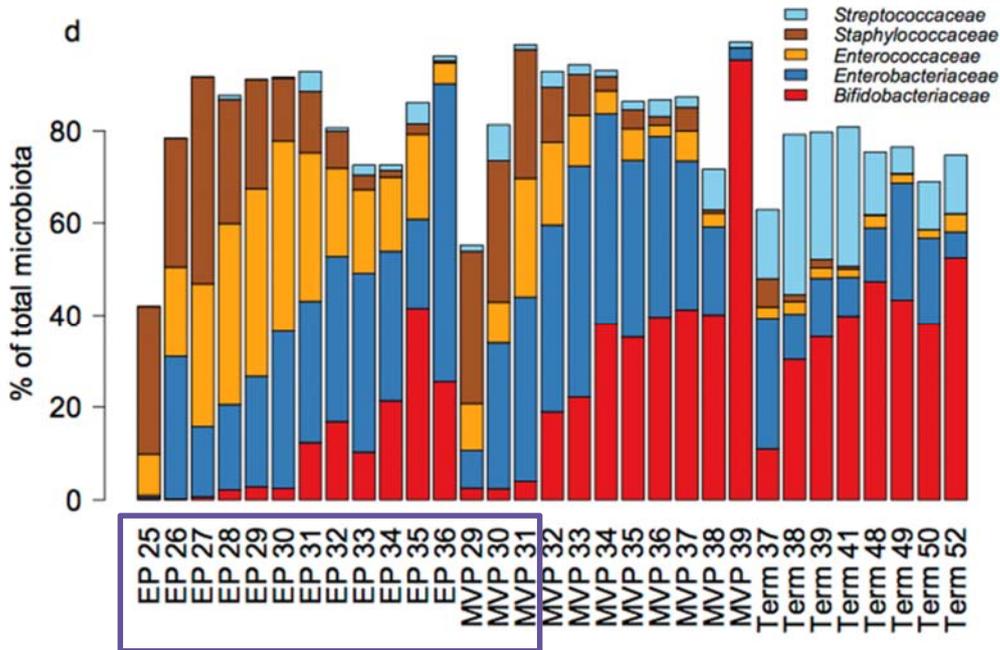
Romano-Bertrand S, Filleron A, Mesnage R, Lotthe A, Didelot MN, Burgel L, Jumas Bilak E, Cambonie G, Parer S
Antimicrobial resistance and infection control 3 21 (2014)

- Possibilité d'éliminer le SARM
- Toujours SASM présents
- Prévalence colonisation à *S. aureus* en néonatalogie ?
- Apport des études du microbiote digestif +/-
- Apport du **séquençage** +++ pour épidémies

Différence de microbiote intestinal selon l'âge

Intestinal microbiota development and gestational age in preterm neonates

Korpela K, Blakstad EW, Moltu SJ, Strømme K, Nakstad B, Rønnestad AE, Brække K, Iversen PO, Drevon CA, de Vos W
Scientific reports 8(1) 2453 (2018)



Chronologie de la colonisation à *S. aureus*

Patterns and Predictors of *Staphylococcus aureus* Carriage during the First Year of Life: a Longitudinal Study

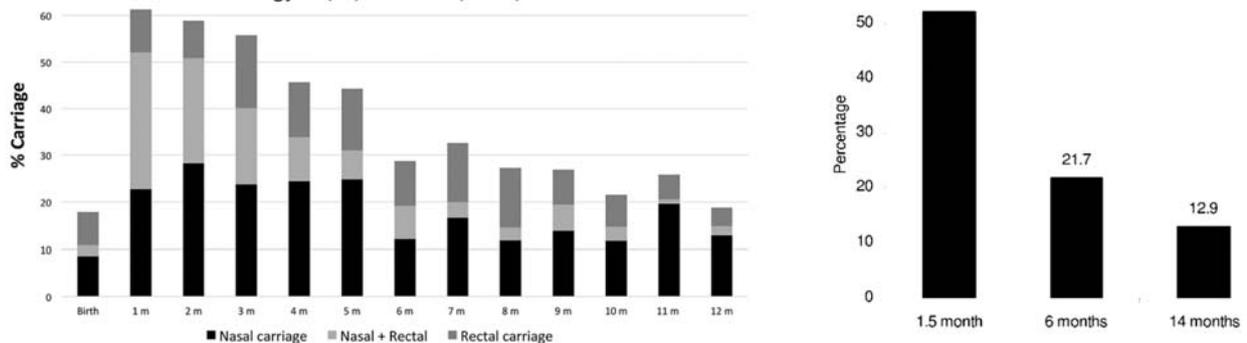
Reiss-Mandel A, Rubin C, Maayan-Mezger A, Novikov I, Jaber H, Dolitzky M, Freedman L, Rahav G, Regev-Yochay G
Journal of clinical microbiology 57(9) (2019)

Dynamics and determinants of *Staphylococcus aureus* carriage in infancy: the Generation R Study

Lebon A, Labout JA, Verbrugh HA, Jaddoe VW, Hofman A, van Wamel W, Moll HA, van Belkum A
Journal of clinical microbiology 46(10) 3517-21 (2008)

Determinants of acquisition and carriage of *Staphylococcus aureus* in infancy

Peacock SJ, Justice A, Griffiths D, de Silva GD, Kantzanou MN, Crook D, Sleeman K, Day NP
Journal of clinical microbiology 41(12) 5718-25 (2003)



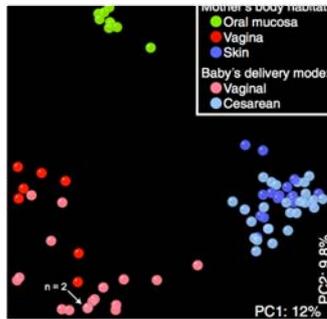
- 93% colonisés dans la 1^{ère} année de vie et 63% = souche mère
- Acquisition précoce = portage au long cours
- Facteurs favorisants : mère, mode d'accouchement, fratrie, allaitement

D'où vient la flore du nouveau-né ?

Delivery mode shapes the acquisition and structure of the initial microbiota across multiple body habitats in newborns

Dominguez-Bello MG, Costello EK, Contreras M, Magris M, Hidalgo G, Fierer N, Knight R

Proceedings of the National Academy of Sciences of the United States of America 107(26) 11971-5 (2010)



- Accouchement par VB = flore vaginale
- Césarienne = flore cutanée

Relationship between maternal and neonatal *Staphylococcus aureus* colonization

Jimenez-Truque N, Tedeschi S, Saye EJ, McKenna BD, Langdon W, Wright JP, Alsentzer A, Arnold S, Saville BR, Wang W, Thomsen I, Creech CB
Pediatrics 129(5) e1252-9 (2012)

Transmission of *Staphylococcus aureus* from mothers to newborns

Leshem E, Maayan-Metzger A, Rahav G, Dolitzki M, Kuint J, Roytman Y, Goral A, Novikov I, Fluss R, Keller N, Regev-Yochay G
The Pediatric infectious disease journal 31(4) 360-3 (2012)

- **Transmission horizontale** = premier mode de colonisation
- Transmission verticale = très rare

Facteurs intervenant dans la composition du microbiote du nouveau-né

The developing gut microbiota and its consequences for health

Butel MJ, Waligora-Dupriet AJ, Wydau-Dematteis S

Journal of developmental origins of health and disease 9(6) 590-597 (2018)

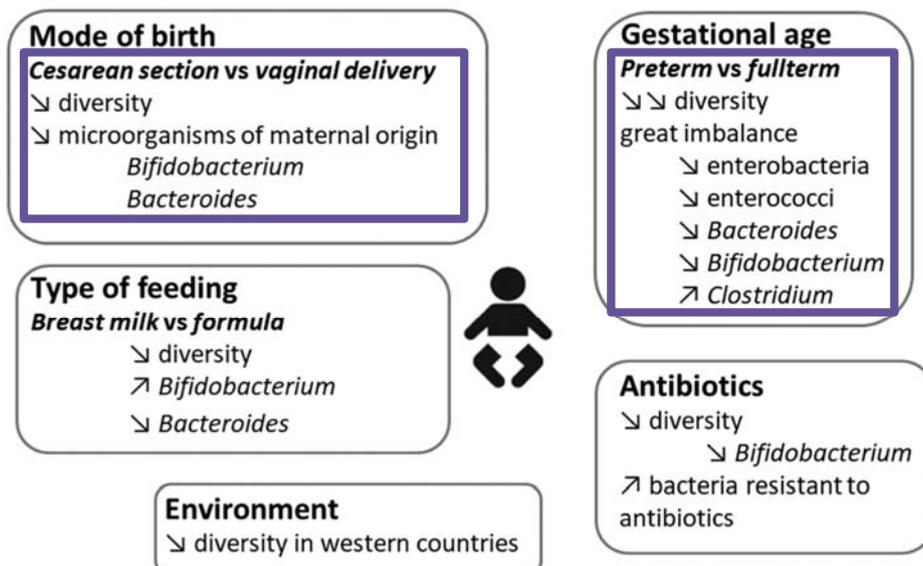
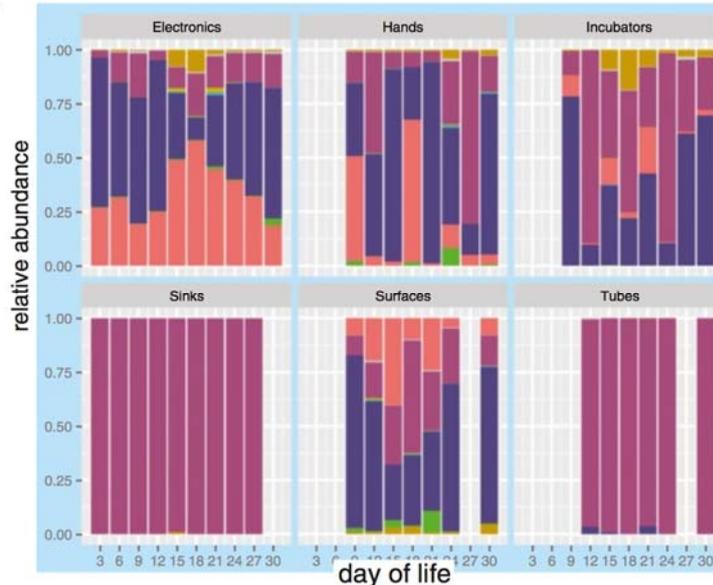


Fig. 2. Bacterial establishment in neonates and health consequences.

Autres origines possibles de la colonisation : les surfaces

The developing premature infant gut microbiome is a major factor shaping the microbiome of neonatal intensive care unit rooms
Brooks B, Olm MR, Firek BA, Baker R, Geller-McGrath D, Reimer SR, Soenjoyo KR, Yip JS, Dahan D, Thomas BC, Morowitz MJ, Banfield JF
Microbiome 6(1) 112 (2018)

Microbes in the neonatal intensive care unit resemble those found in the gut of premature infants
Brooks B, Firek BA, Miller CS, Sharon I, Thomas BC, Baker R, Morowitz MJ, Banfield JF
Microbiome 2(1) 1 (2014)



Actinobacteria Bacteroidetes Cyanobacteria Firmicutes Fusobacteria Other Proteobacteria

Autres origines possible de la colonisation : « les doudous »

Bacterial colonization of toys in neonatal intensive care cots
Davies MW, Mehr S, Garland ST, Morley CJ
Pediatrics 106(2) E18 (2000)

TABLE 2. Organisms Grown From Toys

Bacteria	Number (Percent of the Cultures)
Coagulase-negative staphylococci	84 (98%)
<i>Micrococcus</i> species	50 (58%)
<i>Bacillus</i> species	21 (24%)
Methicillin-resistant <i>Staphylococcus aureus</i>	13 (15%)
Diphtheroids	12 (14%)
Group B streptococcus	4 (5%)
<i>S aureus</i> (methicillin-susceptible)	3 (4%)
Nonhemolytic streptococcus	3 (4%)
Group D streptococcus	3 (4%)
α -hemolytic streptococcus	4 (4%)
Coliforms	2 (2%)
Fungi	0 (0%)



Quels sites de portage ?

- **Nez**

Molecular surveillance of Staphylococcus aureus colonization in a neonatal intensive care unit

Mongkolrattanothai K, Mankin P, Cranston J, Gray BM
American journal of infection control 38(8) 660-3 (2010)

- **Selles**

Intestinal carriage of methicillin-resistant Staphylococcus aureus in nasal MRSA carriers hospitalized in the neonatal intensive care unit

Nakao A, Ito T, Han X, Lu YJ, Hisata K, Tsujiwaki A, Matsunaga N, Komatsu M, Hiramatsu K, Shimizu T
Antimicrobial resistance and infection control 3 14 (2014)

- Portage SARM selles = portage nasal
- **Transmission plus importante +++**

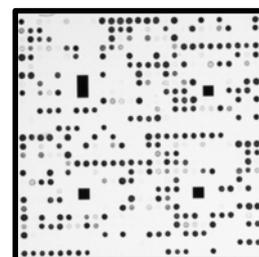
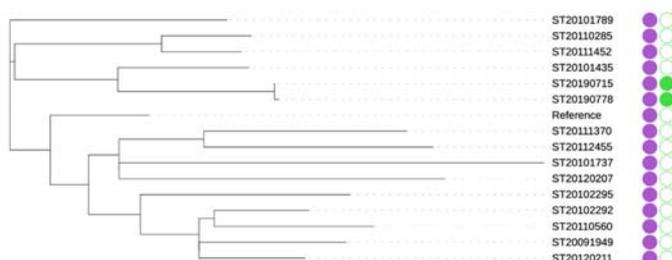
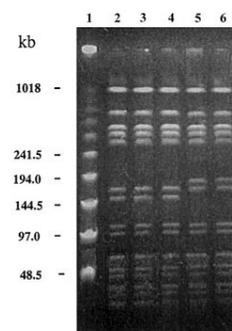
Staphylococcus aureus in a neonatal care center: methicillin-susceptible strains should be a main concern

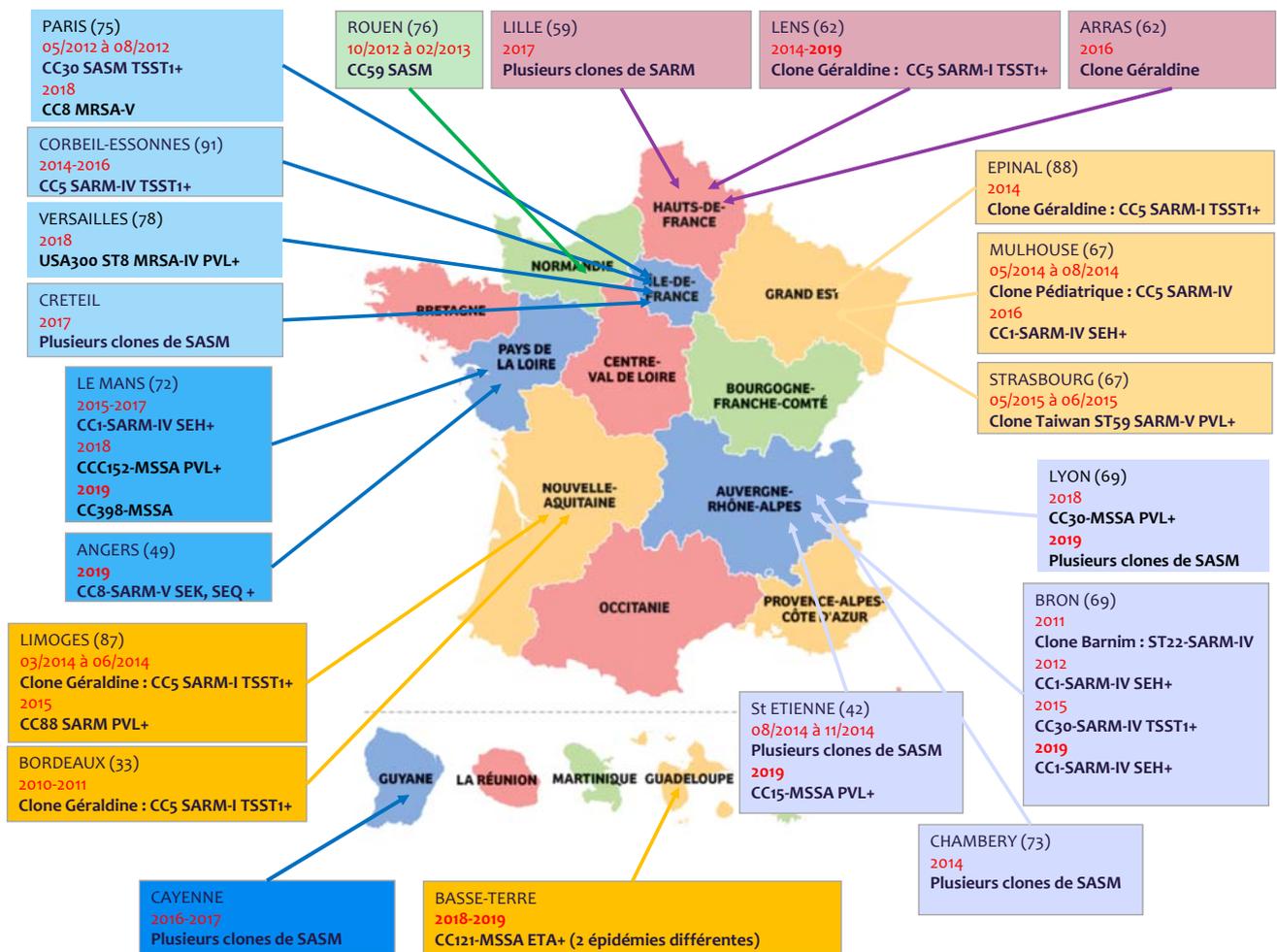
Romano-Bertrand S, Filleron A, Mesnage R, Lotthe A, Didelot MN, Burgel L, Jumas Bilak E, Cambonie G, Parer S
Antimicrobial resistance and infection control 3 21 (2014)

- Portage selles SASM souvent négligé
- **Mais colonisation cutanée + importante**
- **Risque infection, infections croisées et colonisation environnement +++**

CNR : Suivi d'épidémies en néonatalogie en France

- ↗ du nombre d'épidémies
- Rarement SARM-H classiques
- ↗ SASM
- ↗ utilisation du WGS





Etude d'épidémies avec le clone Géraldine (SARM-I TSST-1+) en néonatalogie



Epidémie de Bordeaux (01/2010-12/2011)

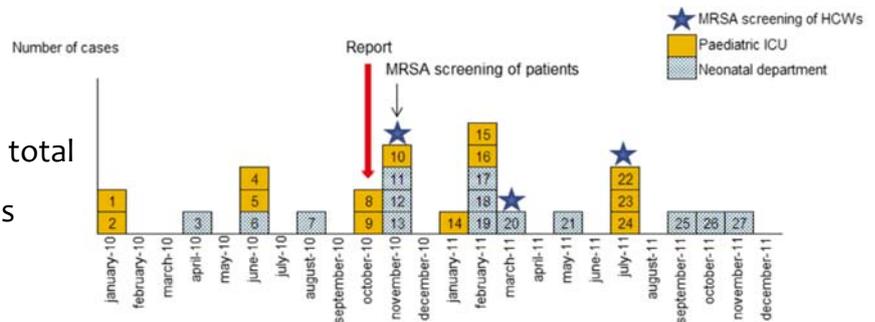
Outbreak in newborns of methicillin-resistant *Staphylococcus aureus* related to the sequence type 5 Geraldine clone

Leroyer C, Lehours P, Tristan A, Boyer F, Marie V, Elleau C, Nolent P, Venier AG, Brissaud O, de Barbeyrac B, Megraud F, Rogues AM
American journal of infection control 44(2) e9-11 (2016)

- 2 cas graves
- mise en place du dépistage néé, personnel, environnement

• Enfants

- 27 enfants concernés au total
- 16 infectés et 11 colonisés



• Professionnels de santé

- 3 campagnes de dépistages (11/10, 03/11, 07/11)
- 14 porteurs de SARM dont 7 SARM Géraldine
- 12/14 ont été décolonisés : mupirocine + chlorexidine (tous contrôlés négatifs au moins une fois à distance)

Epidémie de Lens (11/2014 à 10/2019)

- + de 60 souches reçues au CNR
- **52 souches** clone Géraldine
 - 12 infections (respiratoires et/ou bactériémies)
 - 40 portage
- **Personnel** : 4 personnels porteurs (2016)
- **2** nouveaux portages en **2019**
- Plusieurs fermetures pour bio-nettoyage
- Décontamination proposée aux personnels
- **Pas de synchronisation** bio-nettoyage/décontamination
- Organisation spatiale particulière (marguerite)
- Communication compliquée +++

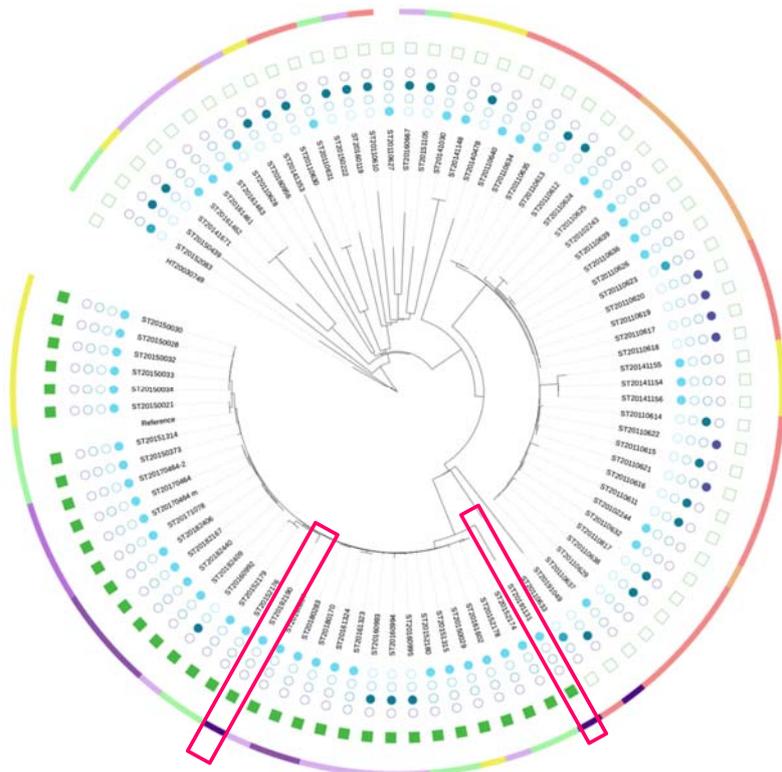
Epidémie de Lens (11/2014 à 10/2019)

Légende (intérieur vers l'extérieur)

- nouveau né
- enfant
- adulte
- environnement
- CH Lens

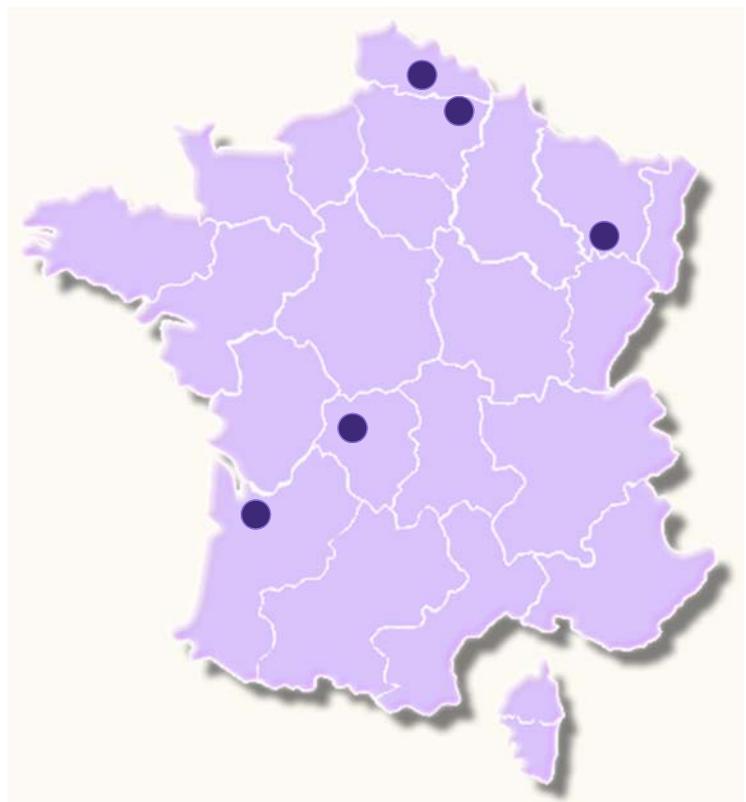
Gradient couleurs (années d'isolement)

- 2019
- 2018
- 2017
- 2016
- 2015
- 2014
- 2011
- 2010



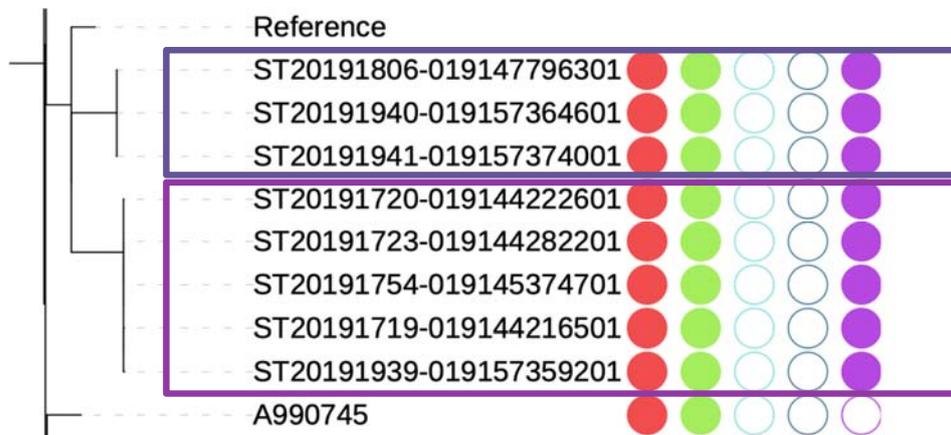
Clone Géraldine : clone émergent en néonatalogie ?

- Bordeaux : 2010-2012
- Epinal : 2014-2015
- Limoges : 2014
- Lens : 2014-2019
- Arras : 2016



SASM : apport du séquençage

- Exemple :
 - 8 souches d'infections CC30-MSSA *tst1* et *sea* +



- 2 populations : 234 SNPs d'écart
- Souvent : ↗ **prévalence** du portage au sein d'un service de néonatalogie mais souvent clones ≠

Intérêt de la décolonisation ???



• YES

Effect of mupirocin decolonization on subsequent methicillin-resistant *Staphylococcus aureus* infection in infants in neonatal intensive care units

Huang YC, Lien RI, Lin TY

The Pediatric infectious disease journal 34(3) 241-5 (2015)

Decolonization and decontamination: what's their role in infection control?

Vergnano S

Current opinion in infectious diseases 28(3) 207-14 (2015)

Active Surveillance Cultures and Targeted Decolonization Are Associated with Reduced Methicillin-Susceptible *Staphylococcus aureus* Infections in VLBW Infants

Wisgrill L, Zizka J, Unterasinger L, Rittenschober-Böhm J, Waldhör T, Makristathis A, Berger A

Neonatology 112(3) 267-273 (2017)

• NO

High prevalence of mupirocin resistance in *Staphylococcus aureus* isolates from a pediatric population

Antonov NK, Garzon MC, Morel KD, Whittier S, Planet PJ, Lauren CT

Antimicrobial agents and chemotherapy 59(6) 3350-6 (2015)

Mupirocin-induced mutations in *ileS* in various genetic backgrounds of methicillin-resistant *Staphylococcus aureus*

Lee AS, Gizard Y, Empel J, Bonetti EJ, Harbarth S, Francois P

Journal of clinical microbiology 52(10) 3749-54 (2014)

Epidemiology and risk factors for recurrent *Staphylococcus aureus* colonization following active surveillance and decolonization in the NICU

Akinboyo IC, Voskertchian A, Gorfu G, Betz JF, Ross TL, Carroll KC, Milstone AM

Infection control and hospital epidemiology 39(11) 1334-1339 (2018)

Prevalence of resistance to antiseptics and mupirocin among invasive coagulase-negative staphylococci from very preterm neonates in NICU: the creeping threat?

Lepointeur M, Royer G, Bourrel AS, Romain O, Duport C, Doucet-Populaire F, Decousser JW

The Journal of hospital infection 83(4) 333-6 (2013)

Intérêt de la décolonisation : bénéfice-risque ?

Decolonization to prevent *Staphylococcus aureus* transmission and infections in the neonatal intensive care unit

Popoola VO, Milstone AM

Journal of perinatology : official journal of the California Perinatal Association 34(11) 805-10 (2014)



- Décolonisation en période d'épidémies
- Fort taux de recolonisation
- Sélection de souches mupir, qacR
- SASM ?
- Qui remplace le SA ?

Mupirocin for *Staphylococcus aureus* Decolonization of Infants in Neonatal Intensive Care Units

Kotloff KL, Shirley DT, Creech CB, Frey SE, Harrison CJ, Staat M, Anderson EJ, Dulkerian S, Thomsen IP, Al-Hosni M, Pahud BA, Bernstein DI, Yi J, Petrikin JE, Haberman B, Stephens K, Stephens I, Oler RE, Conrad TM

Pediatrics 143(1) (2019)

- Décolonisation efficace MAIS
- 2-3 semaines : recolonisation...

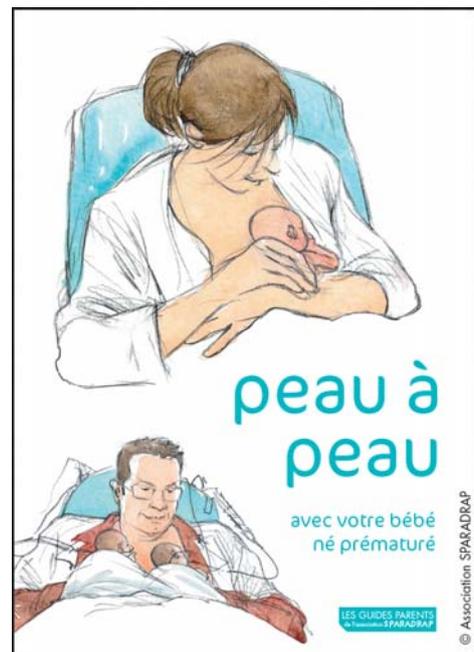
Autres alternatives ?

Effect of maternal skin-to-skin contact on decolonization of Methicillin-Oxacillin-Resistant *Staphylococcus* in neonatal intensive care units: a randomized controlled trial

Lamy Filho F, de Sousa SH, Freitas IJ, Lamy ZC, Simões VM, da Silva AA, Barbieri MA

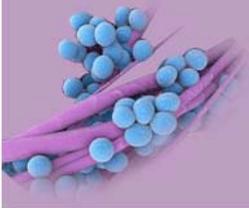
BMC pregnancy and childbirth 15 63 (2015)

- Décolonisation MRSE/MRSA
- Mais mère non porteuse MRSE/MRSA
- Pas d'étude des SASM ...





Les staphylocoques en maternité



Problématique différente

- Epidémies plus rares mais classiques : **SSSS**

Neonatal staphylococcal scalded skin syndrome: clinical and outbreak containment review

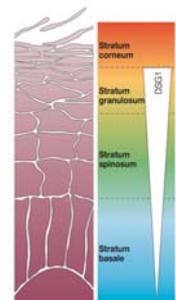
Neylon O, O'Connell NH, Slevin B, Powell J, Monahan R, Boyle L, Whyte D, Mannix M, McElligott F, Kearns AM, Philip RK
European journal of pediatrics 169(12) 1503-9 (2010)

An outbreak of skin infections in neonates due to a *Staphylococcus aureus* strain producing the exfoliative toxin A

Pimentel de Araujo F, Tinelli M, Battisti A, Ercoli A, Anesi A, Pantosti A, Monaco M
Infection 46(1) 49-54 (2018)

Nosocomial outbreak of staphylococcal scalded skin syndrome in neonates in England, December 2012 to March 2013

Paranthaman K, Bentley A, Milne LM, Kearns A, Loader S, Thomas A, Thompson F, Logan M, Newitt S, Puleston R
Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin 19(33) (2014)



- Souches productrices d'exfoliatines
- Souvent un soignant porteur asymptomatique



Pr Y. Gillet

- Transmission mère/enfant
 - Allaitement/abcès de sein
 - Transmission de souches PVL+

Merci de votre attention

A CHILD'S FIRST LINE OF DEFENSE AGAINST MRSA: A WELL-INFORMED MOM.



What are the signs and symptoms of an MRSA skin infection?

MRSA is methicillin-resistant Staphylococcus aureus, a potentially dangerous type of single bacteria that is resistant to certain antibiotics and may cause skin and other infections. Signs including MRSA is usually caused by having direct contact with someone who's infected area. When treated early, MRSA skin infections usually get better.

MRSA and other staph skin infections appear as:

- Bumps or infected area on the skin that may be:
 - Red
 - Swollen
 - Painful
 - Warm to the touch
 - Full of pus or other drainage
 - Accompanied by a fever

If you or someone in your family experiences these signs and symptoms, cover the area with a bandage and contact your healthcare professional. This is especially important if MRSA signs and symptoms are accompanied by a fever.

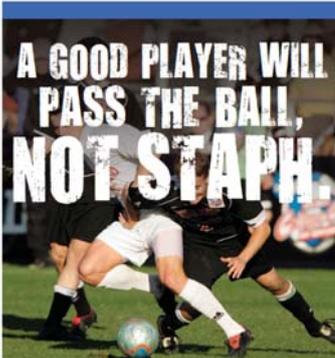
To protect yourself and your family from MRSA, keep hands and skin clean, cover cuts and scrapes, and avoid sharing personal items such as towels or razors.

 **CDC**

For more information, please call 1-800-CDC-INFO or visit www.cdc.gov/MRSA.



A GOOD PLAYER WILL PASS THE BALL, NOT STAPH.



Do not share personal items such as towels or razors.
Wash your hands frequently.
Shower immediately after each practice and game.
 Use clean towels each time you shower.
 Launder clothes and towels after each use.

WASH YOUR HANDS.
 REMIND YOUR CAREGIVERS TO DO THE SAME.



Stopping MRSA is in your hands. 

