5. Tattevin P, Chapplain JM, Lesprit P, Billy C, Roblot F, Alfandari S, et al. Tuberculosis treatment duration in France: from guidelines to daily practice. Eur J Intern Med. 2006;17:427–9.
6. Essa SA, Abdel-Samea SA, Ismaeil YM, Mohammad AA. Comparative study between using Lowestein Jensen and Bio-FM media in identification of Mycobacterium tuberculosis. Egyptian J Chest Dis Tuberc. 2013;62:249–55.
7. Lawn SD, Zumla A. Diagnosis of extrapulmonary tuberculosis using the Xpert® MTB/RIF assay. Expert Rev Anti Infect Ther. 2012;10:631–5.

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https://doi.org/10.1016/j.eimc.2018.08.002
0213-005X/

Methicillin-resistant *Staphylococcus aureus* community-acquired pneumonia in infants☆

Neumonías adquiridas en la comunidad por Staphylococcus aureus *resistente a meticilina en lactantes*

Pneumonia is a major cause of morbidity and mortality in children. Over the past 2 decades, a slight increase in the prevalence of *Staphylococcus aureus* as the causative agent has been observed.[1] Among children hospitalised with community-acquired pneumonia (CAP), *S. aureus* is currently the causative agent in 1% of cases, and 15% of cases of typical CAP are of bacterial origin.[2]

A gradual increase in the rate of community-acquired methicillin-resistant *S. aureus* (MRSA) strains has also been observed in some countries.[1,3] These isolates are characterised as being more virulent since Panton-Valentine leukocidin (PVL) is produced more readily,[4] with MRSA pneumonia being more common in younger children, especially infants.[1]

A retrospective review of children under the age of 2 years hospitalised at our hospital with CA-MRSA pneumonia over the past 5 years (2013–2017) has been performed in order to describe their clinical and epidemiological characteristics.

Three cases were identified, all involving children under the age of 6 months born in Spain to immigrant families (Table 1). The 3 patients developed severe pneumonia with pleural effusion and parenchymal necrosis (X-ray images included in Appendix. Supplementary material) and clinical deterioration was observed with the usual antibiotic therapy. All isolates were susceptible *in vitro* to clindamycin and trimethoprim-sulfamethoxazole. After getting the culture results back (3–4 days after hospitalisation), the antibiotic regimen was changed to linezolid in 2 cases while the third patient continued to receive vancomycin. However, this had to be changed to linezolid after 72 h due to no signs of clinical improvement. The outcome was favourable in all cases, with complete clinical resolution at the time of discharge.

Methicillin resistance in community-acquired *S. aureus* in children was first described in Spain in 2006. These strains currently account for 5–10% of all community-acquired *S. aureus* isolates in children.[5] Most of the cases reported are skin and soft tissue infections.[5]

Community-acquired *S. aureus* pneumonia is associated with high mortality rates (1–5%)[6] and a higher risk of lung necrosis and abscesses.[7] In a recent European study on invasive

Table 1
Characteristics of infants admitted with community-acquired methicillin-resistant *Staphylococcus aureus* pneumonia.

	Case 1	Case 2	Case 3
Age	One month	Three months	Five months
Gender	Male	Male	Male
Family origin/MRSA isolate from family	Paraguayan mother/MRSA nasal colonisation	Filipino mother/MRSA pneumonia	Dominican family/grandmother and brother/MRSA nasal colonisation
Clinical manifestations	Fever without a focus	Fever, tachypnoea and grunting	Fever, grunting and difficulty breathing
Empirical antibiotic therapy	Ampicillin and cefotaxime	Cefotaxime and vancomycin	Cefotaxime and clindamycin
Chest X-ray	Necrotising pneumonia in the right upper lobe with pleural effusion	Necrotising pneumonia in the right lower lobe with pleural effusion	Necrotising pneumonia in the left lower lobe with pleural effusion
Clinical deterioration	Day 4 of hospitalisation (tachypnoea and hypoventilation of the right hemithorax)	Day 3 of hospitalisation (increased pleural effusion)	Day 4 of hospitalisation (increased difficulty breathing)
Admission to the PICU	Admission upon deterioration and need for chest drain, non-invasive ventilation required	Not required	Not required
Microbiology	MRSA in pleural fluid	MRSA in pleural fluid	MRSA in pleural fluid
Panton-Valentine leukocidin	Positive	Positive	Positive
Targeted therapy	Linezolid	1. Vancomycin 2. Linezolid	Linezolid
Clinical outcome	Favourable	Favourable	Favourable

MRSA: methicillin-resistant *Staphylococcus aureus*; PICU: paediatric intensive care unit.

☆ Please cite this article as: Martín Espín I, Aguilera-Alonso D, García-Perea A, Baquero-Artigao F. Neumonías adquiridas en la comunidad por *Staphylococcus aureus* resistente a meticilina en lactantes. Enferm Infecc Microbiol Clin. 2019;37:551–552.

community-acquired *S. aureus* infections in children, methicillin-resistant isolates produced more cases of pneumonia than methicillin-susceptible strains and infection severity was associated with PVL production.[4]

MRSA pneumonia often presents with unilateral consolidation, pneumatoceles and pleural effusion[8] and is more common in younger infants. At our hospital we found no cases of CA-MRSA pneumonia in infants over the age of 6 months. In children over the age of 2 years, the radiological findings, need for surgery and complications of MRSA pneumonia are similar to those observed in infants.[6]

MRSA carrier status increases the risk of pneumonia caused by this strain up to six-fold,[3] and the rate of intrafamilial spread is very high.[6] MRSA colonisation in Spain is more common among the immigrant population, especially among immigrants from South America.[9] There is an ongoing spirited debate regarding the need for decolonisation in children and their family members. Decolonisation seems to be well advised in children with risk factors, such as premature infants, immunosuppressed children or patients admitted to intensive care units, and their relatives.

The American Academy of Pediatrics recommends the use of vancomycin or clindamycin in suspected cases of MRSA pneumonia.[10] Once advantage of clindamycin is that it is active against PVL, but experience in actual cases of pneumonia is very limited and there may be resistant isolates. Vancomycin shows poor tissue penetration and its toxicity requires the use of serial loading doses. Linezolid is an excellent alternative, since its activity against MRSA is similar to that of vancomycin and it shows adequate penetration into lung tissue and antitoxic activity. Although the use of linezolid in paediatrics is *off-label*, pharmacokinetic and safety studies have demonstrated that it is a well-tolerated drug, with adequate plasma concentrations at the established doses, and that it also allows sequential administration due to its excellent oral bioavailability.

To conclude, MRSA must be suspected as the causative agent in cases of CAP with radiological signs of clinical deterioration (necrosis and pleural effusion) despite conventional empirical antibiotic therapy, especially in infants born to immigrant families. Linezolid is a good alternative to vancomycin in these patients.

Appendix. Supplementary material. Supplementary data

Supplementary material associated with this article can be found in the online version available at https://doi.org/10.1016/j.eimce.2019.04.008.

References

1. Carrillo-Marquez MA, Hulten KG, Hammerman W, Lamberth L, Mason EO, Kaplan SL. *Staphylococcus aureus* pneumonia in children in the era of community-acquired methicillin-resistance at Texas children's hospital. Pediatr Infect Dis J. 2011;30:545–50, http://dx.doi.org/10.1097/INF.0b013e31821618be.
2. Jain S, Williams DJ, Arnold SR, Fakhran S, Balk R, Bramley AM, et al. Community-acquired pneumonia requiring hospitalization among U.S. children. N Engl J Med. 2015;372:835–45, http://dx.doi.org/10.1056/NEJMoa1405870.
3. Aliberti S, Reyes LF, Faverio P, Sotgiu G, Dore S, Rodriguez AH, et al. Global initiative for meticillin-resistant *Staphylococcus aureus* pneumonia (GLIMP): an international, observational cohort study. Lancet Infect Dis. 2016;16:1364–76, http://dx.doi.org/10.1016/S1473-3099(16)30267-5.
4. Gijón M, Bellusci M, Petraitiene B, Noguera-Julian A, Zilinskaite V, Sanchez Moreno P, et al. Factors associated with severity in invasive community-acquired *Staphylococcus aureus* infections in children: a prospective European multicentre study. Clin Microbiol Infect. 2016;22, http://dx.doi.org/10.1016/j.cmi.2016.04.004, 643.e1–6.
5. Chaves F. Emergence of paediatric infections due to community-associated methicillin-resistant *Staphylococcus aureus:* should we sound the alarm? Enferm Infecc Microbiol Clin. 2010;28:672–4, http://dx.doi.org/10.1016/j.eimc.2010.07.003.
6. Len KA, Bergert L, Patel S, Melish M, Kimata C, Erdem G. Community-acquired *Staphylococcus aureus* pneumonia among hospitalized children in Hawaii. Pediatr Pulmonol. 2010;45:898–905, http://dx.doi.org/10.1002/ppul.21269.
7. Masters IB, Isles AF, Grimwood K. Necrotizing pneumonia: an emerging problem in children? Pneumonia. 2017;9:11, http://dx.doi.org/10.1186/s41479-017-0035-0.
8. Erdem G, Bergert L, Len K, Melish M, Kon K, DiMauro R. Radiological findings of community-acquired methicillin-resistant and methicillin-susceptible *Staphylococcus aureus* pediatric pneumonia in Hawaii. Pediatr Radiol. 2010;40:1768–73, http://dx.doi.org/10.1007/s00247-010-1680-0.
9. Manzur A, Dominguez AM, Pujol M, González MP, Limon E, Hornero A, et al. Community-acquired methicillin-resistant *Staphylococcus aureus* infections: an emerging threat in Spain. Clin Microbiol Infect. 2008;14:377–80, http://dx.doi.org/10.1111/j.1469-0691.2007.01934.x.
10. Bradley JS, Byington CL, Shah SS, Alverson B, Carter ER, Harrison C, et al. The management of community-acquired pneumonia in infants and children older than 3 months of age: clinical practice guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America. Clin Infect Dis. 2011;53:e25–76, http://dx.doi.org/10.1093/cid/cir531.

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https://doi.org/10.1016/j.eimce.2019.04.008
2529-993X/

Imported cryptosporidiosis caused by *Cryptosporidium hominis* IbA13G3 in Spain. The relevance of molecular-based surveillance

Criptosporidiosis importada por Cryptosporidium hominis *IbA13G3. La relevancia de la vigilancia basada en métodos moleculares*

Cryptosporidium is the most common diarrhoea-causing protozoan parasite globally. *Cryptosporidium* infections primarily affect children aged <24 months in the sub-Saharan Africa and South Asia, where three out of four reported cases were due to *C. hominis*.[1] Based on sequence analysis of the 60-kDa glycoprotein (*GP60*) gene, *C. hominis* has been demonstrated to comprise nine (Ia-Ik) subtype families with marked differences in geographical distribution.[2,3]

In middle August 2018 two Spanish-borne siblings complaining of gastrointestinal symptoms (a 2 years-old boy and a 12-years old girl) from a Nigerian family were attended at the María Jesús Hereza primary health centre (Leganés, Madrid). Both children had just returned from a 2-month family trip to Nigeria, where acute, non-bloody watery diarrhoea initiated. Three consecutive, soft stool specimens were obtained from each patient and submitted