Erythromycin-resistant *C. coli* has been also observed in the USA, where Wang et al. demonstrated that 27% of pig strains were resistant and Taylor & Courvalin demonstrated high-level erythromycin resistance in strains of *C. coli*. More recently, Payot et al. showed the presence of resistant organisms isolated from fattening pigs in France, where erythromycin resistance was described to be 55%, with all isolates examined being *C. coli*.

Few laboratories in the UK identify their isolates to species level and fewer still utilize any of the recognized typing schemes. The combined consequences of these is that there is scanty information about the frequency and distribution of strain types that cause human infection and where they are to be found in the food chain. Hence, it may be important for laboratories to consider speciating such erythromycin-resistant isolates, to help in epidemiological investigations to identify potential animal sources, where such isolates may have originated.

Further work is therefore required to help ascertain the origins of the erythromycin resistance in these campylobacters, and careful monitoring/surveillance is also important to help observe resistance trends, so that increasing trends in resistance do not begin to impact on current antibiotic policies.

**Acknowledgements**

This study was funded by the Research & Development Office, Department of Health & Public Safety, Northern Ireland [Infectious Disease—Recognised Research Group (RRG) 9.9].

**References**


**Correspondence**

Sir, *Streptococcus pneumoniae* is the most common cause of infections of the lower respiratory tract in adults and children. In Europe, France has the highest rates of penicillin and erythromycin resistance in pneumococci: in 2002, 53% and 58% of the strains were found to be non-susceptible to these antibiotics, respectively. In American guidelines (but not in French guidelines), ertapenem, a newly licensed parenteral carbapenem, constitutes an alternative to the usual parenteral β-lactams for inpatients with pneumococcal infection. The purpose of this national multicentre study was to report the *in vitro* susceptibility to ertapenem and comparator compounds of *S. pneumoniae* isolated from French adults suffering from bacteraemic pneumonia.

Between 2000 and 2003, 339 strains of *S. pneumoniae* were collected by The ColBVH Study Group, a network of 105 non-teaching hospitals representative of general hospitals in France. These non-duplicated isolates were from blood cultures from hospitalized adults with pneumonia and were sent to a central laboratory (Service d’Hygiène, Centre Hospitalier de Versailles). The MICs of ertapenem, and penicillin G, amoxicillin, cefuroxime, cefotaxime, ceftriaxone, imipenem, erythromycin,
**Table 1. Activity of antibiotics against 339 isolates of Streptococcus pneumoniae**

<table>
<thead>
<tr>
<th>Antimicrobial agents</th>
<th>MIC&lt;sub&gt;50&lt;/sub&gt; (mg/L)</th>
<th>MIC&lt;sub&gt;90&lt;/sub&gt; (mg/L)</th>
<th>Range of MICs (mg/L)</th>
<th>%S</th>
<th>%I</th>
<th>%R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin</td>
<td>0.032</td>
<td>2</td>
<td>0.008–4</td>
<td>56.6</td>
<td>27.1</td>
<td>16.3</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>0.032</td>
<td>1</td>
<td>0.008–4</td>
<td>98.8</td>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>0.064</td>
<td>4</td>
<td>0.008–16</td>
<td>62.2</td>
<td>3.2</td>
<td>34.6</td>
</tr>
<tr>
<td>Cefotaxime</td>
<td>0.032</td>
<td>1</td>
<td>0.008–4</td>
<td>96.8</td>
<td>2.9</td>
<td>0.3</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>0.016</td>
<td>0.5</td>
<td>0.008–1</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ertapenem</td>
<td>0.008</td>
<td>0.125</td>
<td>0.008–0.125</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>0.25</td>
<td>512</td>
<td>0.064–512</td>
<td>55.5</td>
<td>0</td>
<td>44.5</td>
</tr>
<tr>
<td>Quinupristin/dalfopristin</td>
<td>0.25</td>
<td>1</td>
<td>0.25–1</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Linezolid</td>
<td>1</td>
<td>1</td>
<td>0.5–2</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>1</td>
<td>2</td>
<td>0.25–8</td>
<td>99.4</td>
<td>0</td>
<td>0.6</td>
</tr>
<tr>
<td>Gatifloxacin</td>
<td>0.25</td>
<td>0.5</td>
<td>0.032–8</td>
<td>99.4</td>
<td>0</td>
<td>0.6</td>
</tr>
<tr>
<td>Moxifloxacin</td>
<td>0.125</td>
<td>0.25</td>
<td>0.016–4</td>
<td>99.4</td>
<td>0</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Quinupristin/dalfopristin, linezolid, levofloxacin, gatifloxacin and moxifloxacin, were determined using the agar dilution method in ambient air and interpreted according to NCCLS guidelines. Among the 339 pneumococci tested, 92 (27.1%) and 55 (16.3%) were penicillin-intermediate and -resistant, respectively (Table 1). Ceftriaxone, ertapenem, imipenem, linezolid and quinupristin/dalfopristin were constantly active, although the MIC<sub>90</sub> of the first three compounds increased with penicillin resistance: 1, 0.25 and 0.125 mg/L for penicillin-resistant strain versus 0.016, 0.025 and 0.016 mg/L for penicillin-susceptible strains, respectively. In terms of percentage of full susceptible strains, ranking of β-lactams was: ertapenem = imipenem = ceftriaxone > amoxicillin > cefotaxime > cefuroxime > penicillin. Unlike cefuroxime, the in vitro activity of amoxicillin or cefotaxime remained high even amongst high-level penicillin-resistant strains. The percentage of erythromycin-susceptible strains decreased dramatically amongst penicillin non-susceptible isolates (88.5%, 17.4% and 3.6% of penicillin-susceptible, penicillin-intermediate and high-level penicillin-resistant pneumococci, respectively). Fluoroquinolones with enhanced activity against *S. pneumoniae* showed high in vitro activity (99.4% of susceptible strains).

Owing to the widespread occurrence of multidrug-resistant clones of *S. pneumoniae*, broad-spectrum cephalosporins combined with a macrolide and respiratory fluoroquinolones are now recommended for antibiotic therapy of severe pneumococcal infections. Ertapenem, which showed high in vitro and clinical efficiency against the main respiratory pathogens, could constitute an alternative antibiotic therapy. In this study, we have presented data concerning the ertapenem susceptibility of French bacteraemic isolates of *S. pneumoniae*. In terms of MIC<sub>50</sub>, this new compound seems to be at least as effective as ceftriaxone, the main comparator for the therapy of severe community-acquired pneumonia. These findings confirm data from previous studies. Nevertheless, the lack of ertapenem-intermediate or -resistant strains contrasts with the 40% of resistant strains amongst penicillin-resistant isolates reported in a recent Italian study. This dramatic discrepancy could probably be explained by the phenotypic characteristics of the penicillin-resistant isolates described here, which remained susceptible to third-generation cephalosporins. Amoxicillin, which showed high in vitro activity against pneumococci, could not be used in the empirical antibiotic therapy of severe pneumonia as the antimicrobial spectrum of this compound does not include β-lactamase-positive *Haemophilus influenzae* and *Moraxella catarrhalis* strains, two important agents of respiratory tract infections. Although cefuroxime and erythromycin were theoretically both active against *S. pneumoniae*, these agents are not recommended for empirical use in patients with severe pneumococcal infections. To date, imipenem, linezolid and quinupristin/dalfopristin were considered as second-line agents for multiresistant nosocomial bacteria and were not indicated in the antibiotic therapy of severe community-acquired lower respiratory tract infections. So the choice of empirical therapy of severe inpatient pneumonia was limited to third-generation cephalosporins (combined with a macrolide) or to an antipneumococcal fluoroquinolone. Concerning this last antibiotic class, some concerns have been raised regarding (i) the capacity of the phenotypic methods to detect first step mutants in *S. pneumoniae* and (ii) the role of prior quinolone use as a risk factor for subsequent infection with methicillin-resistant *Staphylococcus aureus* or quinolone-resistant Gram-negative bacilli. In the same way, the use of third-generation cephalosporins selects extended-spectrum β-lactamase-producing *Klebsiella* species. This ‘collateral damage’ as named by Paterson should be avoided with the use of ertapenem which is not hydrolysed by this kind of enzyme. Other investigational or licensed drugs such as faropenem or ketolides should be studied as comparator agents. However, for the time being, no parenteral formulation of these antibiotics is available. In summary, this study underlines the potential significant contribution of ertapenem in the parenteral therapy of bacteraemic pneumococcal pneumonia in France.

**Acknowledgements**

We received no funding from any pharmaceutical manufacturers.

We thank the microbiologists who participated in The ColBHV Study Group: J. Akli (Blois), C. Alba-Sauviat (Chaumont), G. Aubert (Saint Etienne), Amiraoult (Vierzon), J. Assens (Saint-Africque), J. P. Aubry (Quimperle), P. Aucher (Saint Jean D’angely),...
Correspondence

C. Auvray (Charleville Mezieres), A. Bailly (Albi), A. Barrans (Sete), D. Barraud (Gonseesse), C. Benoit (Fontainebleau), E. Bichier (Saumur), H. Biessy (La Rochelle), M. Bietrix (Martigues), P. Bineau (Saint Dizier), V. Blanc (Antibes), S. Bland (Annecy), A. Boisivon (St Germain en Laye), Y. Boucaud-Maire (Lyon), C. Bouguigny-Saison (Soissons), P. Brisou (Toulon Naval), S. Brovedani (Rambouillet), M. Caillaux (Tourcoing), B. Cancet (Villeneuve sur Lot), J. Carre-Cavelier (Bayeux), G. L. Cartolano (St Germain En Laye), J. Cartron (Dreux), G. Chambreuil (La Roche sur Yon), P. Chantelat (Vesoul), A. Chapelle (Aubenas), C. Chaplain (Saint Denis), H. Chardon (Aix En Provence), B. Chaurang (Neuilly Sur Seine), A. Clarac (Poissy), F. Clergeau (Sallanches), E. Collot (Bar Le Duc), P. Courrier (Metz Armees), M. F. Danjoux (Tarbes), J. P. Darchis (Compiegne), H. De Montclos (Bourg En Bresse), A. Decoster (Lomme Les Lille), C. Delamare (Thionville), J. M. Delarbre (Mulhouse), P. Deligne (Remiremont), F. Delubac (Annonay), M. C. Demachy (Meaux), H. Demontclos (Bourg en Bresse), J. Deregnaucourt (Paris), M. A. Desailly-Chanson (La Roche Sur Yon), J. Didion (Metz), F. Doucet-Populaire (Versailles), A. Dublanchet (Villeneuve St Georges), B. Dubourdieu (Rodez), S. Dubourdieu (Gisors), Dupond (Laon), C. Durand (Provins), C. Eloy (Troyes), P. Emerique (Remiremont), G. Evreux (Le Havre), D. Fevre (Vienne), J. Flipo (Wissembourg), N. Fonsale (St Etienne), A. Fremaux (Creteil), C. Fuhrmann (Lyon), S. Gabriel (Monaco), M. Galanti (Coulommiers), G. Gallou (Falaise), F. Gandhilhon-Crepet (Monbrison), I. Ganivala (Montauban), E. Gardien (Morlaix), Garnotel (Marseille-Armees), M. Gavignet (Bourgos), G. Geoffroy (Quimper), C. Grassik (Cahors), B. Gravagna (Lyon), G. Grise (Elbeuf), C. Guier (St Valler), P. Guiet (Nemours), A. Heidt (Hagueuneau), M. Helfre (Firminy), J. Heurtre (Beauvais), E. Heuss (Bayeux), M. C. Jaffar Bandjee (Saint Denis Reunion), D. Jan (Laval), E. Jaouen (Sable Sur Sarthe), G. Khatib (Bagnols Sur Ceze), J. P. Lafargue (Dax), R. Lamarca (Narbonne), V. Larroque (Carcassonne), E. Laurens (Cholet), A. Le Coutumier (Cahors), F. Le Turdu (Argenteuil), J. Y. Leberre (Saint Nazeau), E. Leclaque Thibon (Perpignan), H. Lefrand-Crepin (Avignon), P. Lemaire (Creil), C. Lemble (Selestat), M. Leneuve (Meulan), Lepillipe (St Dizier), A. Mandjee (Romans), A. Mangel (Montfermeil), M. F. Marchal (Annemasse), M. Marcolin (Arras), A. Marmonier (Le Mans), T. Masseron (Lyon Cedex 03), R. Meley (Saint Etienne), O. Menoumi (Montceau les Mines), M. Menouar (Rang Du Flier), A. Michel (Marseille), M. Mora (Frejus), B. Moreau (Cayenne), A. Morel (Le Havre), O. Morvan (Saint Brieuc), D. Neri (Manosque), G. Otterbein (Bry Sur Marne), X. Palette (Plaisir), B. Pangon (Versailles), J. Paul (Boulogne sur Mer), C. Payen (Brignoles), M. Perrin (Thionville), D. Pierrejean (Auch), P. Pouedras (Vannes), D. Pressac (Tulle), R. Rauf (Poissy), D. Reisz (Montceau les Mines), F. Richard (Mantes La Jolie), Y. Rio (Metz), P. Roos (Thionville), P. Roussellers (Salon De Provence), Rousseau (Beaune), M. Rouviere (Mende), O. Sabot (Belley), Saly (St Denis de la Reunion), S. Samaille (Saint Omer), R. Sanchez (Perigueux), A. Scanvic (Argenteuil), Y. Scat (Paris), A. Secher (Chartres), H. Sep-Hieng (Avanches), D. P. Simeon (Langres), V. Simha (Hyeres), C. Sire-Bidault (Chalon sur Saone), Smati (Aubenas), A. Sommabere (Brive), P. Stoeessel (Neuchateau), P. Stolidi (Aubagne), F. Templier (Armentieres), J. P. Thellier (Chateau Thierry), Thore (Beaune), J. Tous (Chambery), A. Trevoux (Mulhouse), A. Vachee (Roubaix), E. Valle (EAubonne), J. Vaucel (St Brieuc), A. Verhaeghe (Dunkerque), M. Villemain (Aurillac), M. Viot (Nice), I. Vray (Voiron), J. F. Ygout (Lorient).

References


In vivo synergy of daptomycin plus a penicillin agent for MRSA?

Marc Scheetz¹, Pavani Reddy², Michael Postelnick¹ and John Flaherty³

¹Department of Pharmacy, Northwestern Memorial Hospital, Chicago, IL; ²Division of Infectious Diseases, Department of Medicine, Feinberg School of Medicine, Northwestern University, Chicago, IL, USA

Keywords: methicillin-resistant Staphylococcus aureus, therapy, lipopeptide

*Corresponding author. Tel: +1-312-926-2546; Fax: +1-312-926-7956; E-mail: mscheetz@nmh.org

Sir,

We describe a refractory case of methicillin-resistant Staphylococcus aureus (MRSA) bacteraemia treated with daptomycin plus a penicillin agent. A 64-year-old male with a history of end-stage renal disease on haemodialysis, diabetes and right leg osteomyelitis status post below the knee amputation presented to the emergency room with fevers of 2 days duration. On admission, his temperature was 38.5°C. Examination revealed a clean, dry right subclavian vascular catheter, a grade III/VI holosystolic murmur and a 6 cm grade II ulcer at the healed site of the right lower extremity amputation. His WBC count was 17,400 cells/mm³.

398