Twenty-two out of these 50 ESBL-producing Salmonella isolates showed variable levels of resistance to the aminoglycosides tested (gentamicin, kanamycin and streptomycin) and were screened for detection of the armA methylase gene by PCR, as described by Gonzalez-Zorn et al. The armA gene was detected in the isolates showing high-level resistance (no inhibition zone) to all of the aminoglycosides tested: Salmonella Typhimurium \( n = 13 \); and Salmonella Typhi \( n = 1 \). The armA gene was also detected in four isolates of Salmonella Enteritidis displaying high-level resistance to gentamicin and kanamycin but susceptibility to streptomycin. No armA gene was detected among the four isolates displaying high-level resistance to gentamicin and streptomycin but susceptibility to kanamycin. Sequencing of the bla\(_{\text{CTX-M}}\) genes from the 18 armA-positive isolates allowed identification of the CTX-M-15 determinant. Moreover, 13 of them co-produced CMY-2 (Table 1).

The conjugal transfer of the 16S RNA methylase and ESBL determinants was performed with Escherichia coli J53 and nalidixic acid-resistant E. coli JM109 as recipient strains. Selection of the transconjugants was performed on agar plates containing 100 mg/L sodium azide supplemented with 50 mg/L amoxicillin, and on agar plates supplemented with 30 mg/L amikacin and 30 mg/L gentamicin. In each experiment, no strain highly resistant to aminoglycosides and to β-lactams was recovered after this selection.

The genetic diversity of the armA-positive isolates was analysed by PFGE using the standardized PulseNet protocol. PFGE analysis of 12 armA-positive isolates of Salmonella Typhimurium revealed an identical pattern, suggesting the spread of an epidemic clone. The four armA-positive Salmonella Enteritidis isolates displayed three distinct PFGE patterns, most likely indicating horizontal spread of the resistance determinants (Table 1).

So far, enterobacterial isolates co-harbouring the bla\(_{\text{CTX-M-15}}\) and armA genes have been identified as Klebsiella pneumoniae, Klebsiella oxytoca and E. coli. Interestingly, in the study by Bogaerts et al., the patients seemed to have been transferred from Algeria. We report here the concomitant occurrence of these two genes among ESBL-producing S. enterica isolates that have been recovered in Algeria. In that country, the armA gene had been previously identified among CTX-M-3-producing S. enterica serotype Senftenberg isolates.

The emergence of the armA methylase gene among CTX-M-15 ESBL-harbouring strains of S. enterica is a public health concern in Algeria. It certainly requires the implementation of a strict hospital infection control policy as well as the promotion of epidemiological surveys in the community in order to avoid the dissemination of such multiresistant strains.

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Transparency declarations
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References

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In vitro susceptibility of Actinobaculum schaalii to mecillinam

Pernille Kræmer Andersen*, Karen Marie Søby, Steffen Bank and Jørgen Prag

Department of Clinical Microbiology, Viborg Hospital, Viborg, Denmark

*Corresponding author. Tel: +45-78-44-36-00; Fax: +45-78-44-36-66; E-mail: pka@postman.dk

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Sirs,

In the last decade, *Actinobaculum schaalii*, a Gram-positive, facultative anaerobic, cocoid rod,\(^1\) has emerged as a uropathogen, mainly in elderly patients with underlying urological predispositions.\(^2\)–\(^4\) Due to difficulties in cultivating *A. schaalii*, the incidence of the bacteria has probably been underestimated for many years.

Unless microscopy of Gram's stain or wet smear is used for screening urinary samples, specimens will often not be cultured in an atmosphere supporting growth of *A. schaalii*. However, even when cultured in a CO\(_2\)-enriched atmosphere *A. schaalii* can often only be identified by PCR, as a study has shown that in 90% of the cases it occurs together with fast-growing commonly known uropathogens, and thus is overlooked.\(^3\)

*A. schaalii* is susceptible in vivo to nearly all β-lactams, such as amoxicillin or cephalosporins, but is resistant to trimethoprim.\(^4\) In a recent study of *A. schaalii* isolates for all isolates using Etest (AB bioMérieux, Solna, Sweden).

conditions at 35°C for 48 h. The MIC of mecillinam was determined to nearly all antimicrobial agents, including those commonly used for the treatment of urinary tract infections (UTIs), were determined. Pivmecillinam was not included, but it is often the antibiotic of choice for the oral treatment of UTIs in Scandinavia, e.g. in Denmark it accounts for approximately half of the defined daily doses used for UTIs.\(^6\)\(^7\)

We therefore selected 18 clinical *A. schaalii* isolates and measured the MICs of mecillinam.

Fourteen of the isolates were obtained from urine specimens and four were from blood cultures. As a confirmatory test, all isolates were screened using a real-time PCR assay specific for *A. schaalii*,\(^3\) and the *A. schaalii* strain CCUG 27420 was used as a reference. The susceptibility testing was performed on Schaedler agar (Oxoid) supplemented with 5 μg/mL haemin, 1 μg/mL vitamin K\(_1\) and 5% sheep blood. An inoculum suspension adjusted to a turbidity equivalent to that of a 1 McFarland standard in 0.9% NaCl was spread on to the agar and incubated under anaerobic conditions at 35°C for 48 h. The MIC of mecillinam was determined for all isolates using Etest (AB bioMérieux, Solna, Sweden). *Bacteroides fragilis ATCC 25285* was used as a quality control strain.

The susceptibility testing of mecillinam against the 18 *A. schaalii* isolates showed MIC values in the range 0.5–2.0 mg/L (Table 1), and the MIC\(_{50}\) and MIC\(_{90}\) were 1.0 and 2.0 mg/L, respectively. This is consistent with previous findings in which nine strains of *A. schaalii* were susceptible to mecillinam (aminocillin), with an MIC range of 0.25–1.5 mg/L, an MIC\(_{50}\) of 0.5 mg/L and an MIC\(_{90}\) of 1.0 mg/L.\(^2\)

The present study suggests that pivmecillinam will be effective as an alternative to other β-lactams in the treatment of *A. schaalii* UTIs, although this β-lactam is not usually used against Gram-positive bacteria.\(^6\) The advantages of choosing pivmecillinam include the low level of resistance in urinary pathogens, in addition to the possibility of achieving very high urinary concentrations (>200 mg/L) due to active excretion into the urine.\(^6\)

In conclusion, pivmecillinam as a first-choice antibiotic against UTIs probably covers *A. schaalii*, both when *A. schaalii* is identified in monocolonies and more frequently when it occurs as a co-pathogen with common fast-growing uropathogens.

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The study was carried out as part of our routine work.

### Transparency declarations

None to declare.

### References


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**Table 1.** In vitro activity of mecillinam against 18 clinical isolates of *A. schaalii*  

<table>
<thead>
<tr>
<th>Antimicrobial agent</th>
<th>MIC range (mg/L)</th>
<th>MIC(_{50})</th>
<th>MIC(_{90})</th>
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<tr>
<td>Mecillinam</td>
<td>0.5–2.0</td>
<td>1.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

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1. Hospital de la Vega Baja, Orihuela, Alicante, Spain; 2. Hospital General Universitario de Elche, Elche, Alicante, Spain; 3. Universidad Miguel Hernández, Elche, Alicante, Spain.