misidentified by the laboratory. SCV*S. aureus* may cause persistent and recurrent infections and may have novel mechanisms for antibiotic resistance. While there have been previous reports of CO₂-dependent *S. aureus*, to our knowledge, this is the first reported case of a CO₂-dependent PVL-producing MRSA. Recognition of this variant by laboratories can be achieved by incubation in both O₂- and CO₂-containing atmospheres.

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Transparency declarations

None to declare.

References

Table 1. In vitro Sb susceptibility profiling of L. infantum isolates collected from HIV-positive and HIV-negative patients in Asunción (Paraguay) and in the Brazilian states Pernambuco (PE), Mato Grosso do Sul (MS), Espírito Santo (ES), Distrito Federal (DF) and Rio de Janeiro (RJ)

<table>
<thead>
<tr>
<th>L. infantum clinical isolate</th>
<th>Patient data</th>
<th>kDNA PCR–RFLP identity</th>
<th>IC&lt;sub&gt;50&lt;/sub&gt; Sb&lt;sup&gt;V&lt;/sup&gt; (µg/mL eq.)</th>
<th>IC&lt;sub&gt;50&lt;/sub&gt; Sb&lt;sup&gt;III&lt;/sup&gt; (µg/mL eq.)</th>
<th>Resistance phenotype</th>
</tr>
</thead>
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<tr>
<td></td>
<td>international code</td>
<td>clinical isolate</td>
<td>district&lt;sup&gt;a&lt;/sup&gt;</td>
<td>clinical form</td>
<td>HIV</td>
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<td>MHOM/BR/2003/ACS</td>
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<td>PE</td>
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<td>ND</td>
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<td>VL</td>
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<td>ND</td>
</tr>
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<td>ES</td>
<td>VL</td>
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<tr>
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<tr>
<td>MHOM/PY/2007/AS6</td>
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<tr>
<td>MHOM/BR/2007/JFF-CL</td>
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<tr>
<td>MHOM/MA/67/ITMAP263</td>
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</tbody>
</table>

CL, cutaneous leishmaniasis; ND, not done.

<sup>a</sup>Known endemic zones for VL.

<sup>b</sup>AI < 3 = susceptible (S); 3 ≤ AI ≤ 4 = intermediate (I); and AI > 4 = resistant (R).
index (AI), which is the ratio of the IC$_{50}$ for the field strain/IC$_{50}$ for the susceptible reference laboratory strain (L. infantum MHOM/MA/67/ITMAP263), was calculated, with AI $\geq$4 denoting drug resistance. Intraspecific genetic variability was checked using kDNA minicircles PCR–RFLP fingerprinting. A direct PCR was applied using the primers LIN-R4 (5'-GTT TGG TGT AAA ATA GGG-3') and LIN-19 (5'-GAA CGC CCC TAC CCG-3'). Each PCR product was digested using HaeIII and Rsal restriction enzymes, and fragments were visualized after gel electrophoresis.

Various drug susceptibility phenotypes were identified (Table 1): Sb$_V$ susceptible/Sb$_{III}$ susceptible (S/S; n = 2); Sb$_V$ intermediate resistant/Sb$_{III}$ susceptible (I/S; n = 4); Sb$_V$ resistant/Sb$_{III}$ susceptible (R/S; n = 6); and Sb$_V$ resistant/Sb$_{III}$ intermediate resistant (R/I; n = 3). Isolates with the R/R phenotype were not found, although this phenotype has been reported for other Leishmania species. We noted a clear trend for a higher proportion of Sb$_V$-resistant isolates among HIV-positive patients (7/9 Sb V-resistant isolates versus 2/6 among HIV-negative patients), but a considerably larger sample size would be required to confirm the significance of this difference.

Our results demonstrate the occurrence of primary Sb$_V$-resistant L. infantum isolates among the two categories of VL patients. The existence of this phenomenon among HIV-positive patients can best be explained by the anthropopotic transmission suggested to occur among them. This is supported by the observation of identical kDNA-RFLP patterns in four isolates that were collected from three different HIV-positive patients over a time period of 4 years in Mato Grosso do Sul, Brazil, two of them originating from the same patient before and after treatment (Table 1). This contrasts with the unique patterns observed for all of the other isolates. On the other hand, the occurrence of primary resistance in HIV-negative patients is normally not expected in the context of zoonotic L. infantum. A similar observation was already made in Leishmania braziliensis and could be explained by domestication of the natural transmission cycle or anthropization through the vicinity of HIV-positive patients. Resistant strains could also be acquired from dogs previously exposed to antimonials. In Brazil, treatment of dogs with human medications is officially prohibited, but unauthorized use is not a rare situation.

Taking all observations together, our results clearly highlight the need for epidemiological monitoring of L. infantum antimony (Sb$_{III}$ and Sb$_V$) resistance in HIV-positive and HIV-negative patients, to better understand the dynamics of the emergence and spread of this phenomenon. Similarly, particular emphasis should be put on the follow-up of treatment outcome in patients infected with the different phenotypes, as observed here. On the one hand, the therapeutic efficacy of Sb$_V$ may theoretically not be hampered, since Sb$_V$ becomes reduced to the active Sb$_{III}$, to which most isolates were still susceptible; on the other hand, the relation between in vitro susceptibility phenotype and treatment outcome still needs to be substantiated in many more patients and locations. Previous studies in Leishmania donovani and L. braziliensis already indicated that the relationship between treatment outcome and in vitro drug resistance is not necessarily straightforward. In the case of L. infantum, the zoonotic reservoir in dogs should be considered as well.

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**Transparency declarations**

None to declare.

### References


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**Linezolid for endocarditis: a case series of 14 patients**

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