Sporotrichosis is a subcutaneous mycosis affecting humans and animals caused by Sporothrix schenckii. It has a worldwide distribution, especially in tropical and subtropical areas of Latin America, where areas of endemicity have been recognized (1, 3, 4, 12). Recently, Marimon et al. (9, 11) proposed that Sporothrix schenckii is a complex encompassing six cryptic species that had been previously identified by others (4). In this context, variation in the antifungal susceptibility profiles among these new species was hypothesized. The aim of this study was to explore a collection of 40 isolates formerly classified as Sporothrix schenckii in order to identify new species and evaluate their susceptibility to antifungal agents.

The isolates were from cases of human (n = 31) and animal (n = 9) sporotrichosis diagnosed in the hinterlands of Rio Grande do Sul (Brazil) and were maintained in the Department of Microbiology of the Universidade Federal de Santa Maria (UFSM), Santa Maria, Brazil. Among the human-derived strains, 18 (58.06%) were from fixed cutaneous sporotrichosis. As proposed by Marimon et al. (9, 11), the species that had been previously identified by others (4). In this context, variation in the antifungal susceptibility profiles among these new species was hypothesized. The aim of this study was to explore a collection of 40 isolates formerly classified as Sporothrix schenckii in order to identify new species and evaluate their susceptibility to antifungal agents.

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brasiliensis and S. albicans agreed with the results reported by Marimon et al. (10), but in general, our S. schenckii strains were more susceptible. S. schenckii has been reported to show a high MIC to itraconazole by several authors (6, 7, 10). Although breakpoints have not been established for S. schenckii, document M38-A3 (2) suggests that, for analytical purposes, a MIC of \( \geq 4.0 \) \( \mu \)g/ml for itraconazole may be considered resistant for some filamentous fungi. In keeping with this finding, the itraconazole-resistant strains (S. albicans and S. luriei) showed cross-resistance with all other azoles. Kohler et al. (7) and Meinerz et al. (12), prior to the studies of Marimon et al. (9), reported that isolates from animals were more resistant to itraconazole than isolates from humans. This observation was supported by our results because, among 9 strains from animals, 2 showed itraconazole resistance, and among 31 strains from human cases of sporotrichosis, none showed itraconazole resistance. In addition, our results indicated the presence of the greater proportion of itraconazole-resistant species in animal sporotrichosis (2/9) than in human sporotrichosis (0/31). Although the Mann-Whitney test did not show differences between the two groups, the geometric mean showed that in general S. schenckii animal-derived isolates were more susceptible than human-derived isolates. However, when the new Sporothrix species (S. albicans, S. brasiliensis, and S. luriei) were included, the animal-derived strains showed less sensitivity to azoles than human-derived strains. The MIC values for am-

![FIG. 1. Evolutionary relationship of 15 taxa (linearized). The evolutionary history was inferred using the neighbor-joining method (14). The optimal tree is shown, with the sum of branch lengths = 0.63953762. The percentages of replicate trees in which the associated taxa clustered together in the bootstrap test (1,000 replicates) are shown next to the branches (5). The tree is drawn to scale, and branch lengths are in the same units as the evolutionary distances used to infer the phylogenetic tree. The evolutionary distances were computed using the maximum composite likelihood method (16) and are in units representing the number of base substitutions per site. All positions containing gaps and missing data were eliminated from the data set (complete deletion option). There were a total of 265 positions in the final data set. Phylogenetic analyses were conducted with MEGA software version 4.0 (17).](http://jcm.asm.org/)

<table>
<thead>
<tr>
<th>Antifungal agent( ^a )</th>
<th>Humans (S. schenckii; ( n = 31 ))</th>
<th>Animals (( n = 9 ))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIC (( \mu )g/ml) for isolates from( ^b ):</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>50%</td>
</tr>
<tr>
<td>ITZ</td>
<td>0.06–1</td>
<td>0.25</td>
</tr>
<tr>
<td>KTZ</td>
<td>0.125–2</td>
<td>0.5</td>
</tr>
<tr>
<td>MCZ</td>
<td>0.5–4</td>
<td>1</td>
</tr>
<tr>
<td>V CZ</td>
<td>2–16</td>
<td>8</td>
</tr>
<tr>
<td>FLZ</td>
<td>16–128</td>
<td>128</td>
</tr>
<tr>
<td>TRB</td>
<td>0.03–0.25</td>
<td>0.125</td>
</tr>
<tr>
<td>AMB</td>
<td>0.03–2.0</td>
<td>0.25</td>
</tr>
<tr>
<td>CAS</td>
<td>8–32</td>
<td>32</td>
</tr>
</tbody>
</table>

\( ^a \) ITZ, itraconazole; KTZ, ketoconazole; MCZ, miconazole; V CZ, voriconazole; FLZ, fluconazole; TRB, terbinafine; AMB, amphotericin B; CAS, caspofungin.

\( ^b \) 50% and 90%, MIC\(_{50}\) and MIC\(_{90}\), respectively; GM, geometric mean.
Photericin B and terbinafine were similar for both groups of strains. Due to the low number of animal isolates included here, these observations require further studies.

Finally, our findings emphasize two main points. (i) *S. luriei* had a remarkable azole resistance, as reported here for the first time. (ii) The recent studies focusing on the susceptibility of the former species *S. schenckii* (8, 15) or the new *Sporothrix* species (9, 10) included strains from different countries. However, here we included only strains isolated in the central region of Rio Grande do Sul State. Even in this limited area, we found a varied susceptibility profile to antifungal agents and detected four of the six new *Sporothrix* species. Therefore, our findings reinforce the importance of identifying *Sporothrix* isolates as proposed by Marimon et al. (9) and of evaluating their susceptibility patterns to better determine the best therapeutic option for each case of sporotrichosis.

We report that we have no conflicts of interest.

REFERENCES