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***Parathyridaria percutanea* and Subcutaneous Phaeohyphomycosis**

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Parathyridaria percutanea is an emerging fungus causing subcutaneous phaeohyphomycoses in renal transplant recipients in India. We identified *P. percutanea* from a patient with subcutaneous phaeohyphomycosis. From our culture collection, we identified the same fungus from 4 similar patients. We found 5 cases previously described in literature.

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Parathyridaria percutanea, earlier known as *Roussoella percutanea* in the order *Pleosporales*, has been reported to cause subcutaneous phaeohyphomycoses (1,2). *P. percutanea* belongs to coelomycetes, a group of fungi in which the conidia or asexual propagules lie within a cavity. *Parathyridaria* spp. generally exist as plant saprobes; *P. percutanea* is the only species reported as an opportunistic pathogen.

We recently observed a case of subcutaneous phaeohyphomycosis caused by *P. percutanea*. The patient was a 33-year-old man who had ACTH-dependent Cushing's disease with 2 cutaneous lesions, one under the left axilla and the other on the ulnar aspect of the left forearm, that had progressed slowly over 3 years (Appendix Figure 1, panel A, <https://wwwnc.cdc.gov/EID/article/25/9/19-0383-App1.pdf>). Direct microscopy of a biopsy sample taken from the left forearm lesion revealed dematiaceous septate hyphae with irregular hyphal swellings (Appendix Figure 1, panel B). Colonies on Sabouraud's dextrose agar at 25°C were flat, spreading with sparse aerial hyphae after 1 week, and later turned to cottony greenish-black growth (Appendix Figure 1, panel C). Lactophenol cotton blue mount revealed nonsporulating dematiaceous hyphae with chlamydospores (Appendix Figure 1, panel D). Several attempts to induce sporulation (on oatmeal agar and malt extract agar) failed. Histopathologic examination (Appendix Figure 1, panels E–G) showed neutrophilic infiltration with fungal hyphae, nodular swellings on Giemsa stain, and black hyphae on Grocott-Gomori's methamine silver stain.

We identified the fungus as *Roussoella percutanea* of the order *Pleosporales*, later renamed *P. percutanea*, by PCR sequencing of the internal transcribed spacer (ITS) and 28S regions of ribosomal DNA, as described previously (3). ITS sequencing of our strain NCCPF104001 (GenBank accession nos. MG708109 [by ITS] and MG708116 [by 28S]) had 99.8% identity with CBS128203 (type strain, GenBank accession no. KF322117) and CBS868.95 (GenBank accession no. KF322118), whereas 28S sequences had 100% identity with CBS128203 (GenBank accession no. KF366448) and CBS868.95 (GenBank accession no. KF366449) (Appendix Figure 2, panels A, B). The patient refused further treatment in the hospital and left against medical advice.

We screened all the isolates deposited in our National Culture Collection of Pathogenic Fungi (NCCPF, Chandigarh) and characterized them phenotypically as *Pleosporales*. Of 7 such isolates, we identified 4 as *P. percutanea* by sequencing (Table, <https://wwwnc.cdc.gov/EID/article/25/9/19-0383-T1.htm>). We further subjected these isolates to phylogenetic analysis of ITS and large ribosomal subunit (28S) of the rDNA using MEGA software version 6 (<https://megasoftware.net>) (3). The strains identified as *P. percutanea* clustered together with the ITS and 28S sequences of CBS12608 and CBS868.95 strains, the other 2 *P. percutanea*

isolates reported with gene sequences (2). Phylogenetically, *Parathyridaria* is now a distinct genus and clearly separated from closely related genera such as *Rousoella* and *Thyridaria* (Appendix Figure 2, panels A, B).

We searched published literature on Medline and PubMed for subcutaneous phaeohyphomycoses caused by *P. percutanea* or *R. percutanea* and identified 5 cases (Table). All 5 patients originated from tropical countries including the Caribbean islands (5), Republic of the Congo (6), Somalia (7), and India (2,8). Including these 5 with the case-patients we identified from culture and our study patient, 7 of 10 total cases originated in India. The patients had lesions in the extremities; we expect that the fungus is present in our environment and gains access from traumatic inoculation of patients working in the field or walking barefoot. The clinical description of all 10 patients is presented in the Table. Male patients outnumbered female patients. In 2 patients, underlying muscle tendon (2) and joint bursa (7) were involved. No discharging sinus or granuloma formation was seen in any of the 10 patients.

P. percutanea infection occurred in immunosuppressed patients; 9/10 patients were either renal transplant recipients (7 patients) or on steroid therapy (2 patients). The disease manifested 1–3 years posttransplant. Incidence of subcutaneous phaeohyphomycoses is reported in $\leq 3.6\%$ of renal transplant recipients (10). The tenth patient had diabetes, and the infection of *P. percutanea* occurred at a tattoo site, manifesting 2 years after tattooing. The fungus may remain dormant in subcutaneous tissue after traumatic inoculation and multiply slowly at the opportune time when host immunity is depressed because of immunosuppression or diabetes.

The outcome of *P. percutanea* infection was known in 5/10 patients, and they responded to surgical resection of the lesion followed by voriconazole therapy. The joint guidelines of the European Society of Clinical Microbiology and Infectious Diseases Fungal Infection Study Group and the European Confederation of Medical Mycology on the management of subcutaneous phaeohyphomycosis (9) recommended surgical resection (recommendation AII) along with oral azoles in immunosuppressed patients to prevent dissemination of disease (recommendation BIII). In vitro susceptibility testing, conducted for 3 isolates by Ahmed et al. (2) and Almagro-Molto et al. (7), revealed that *P. percutanea* exhibited low MIC to itraconazole, voriconazole, and posaconazole (Table). Therefore, itraconazole and posaconazole can be used in patients receiving other liver-metabolized drug therapies.

Especially in renal transplant patients in India, *P. percutanea* could be a possible etiologic agent of subcutaneous phaeohyphomycosis. Sequencing of ITS and 28S regions of ribosomal DNA confirms diagnosis. Effective treatment could include surgical excision of lesions and voriconazole or posaconazole therapy.

About the Author

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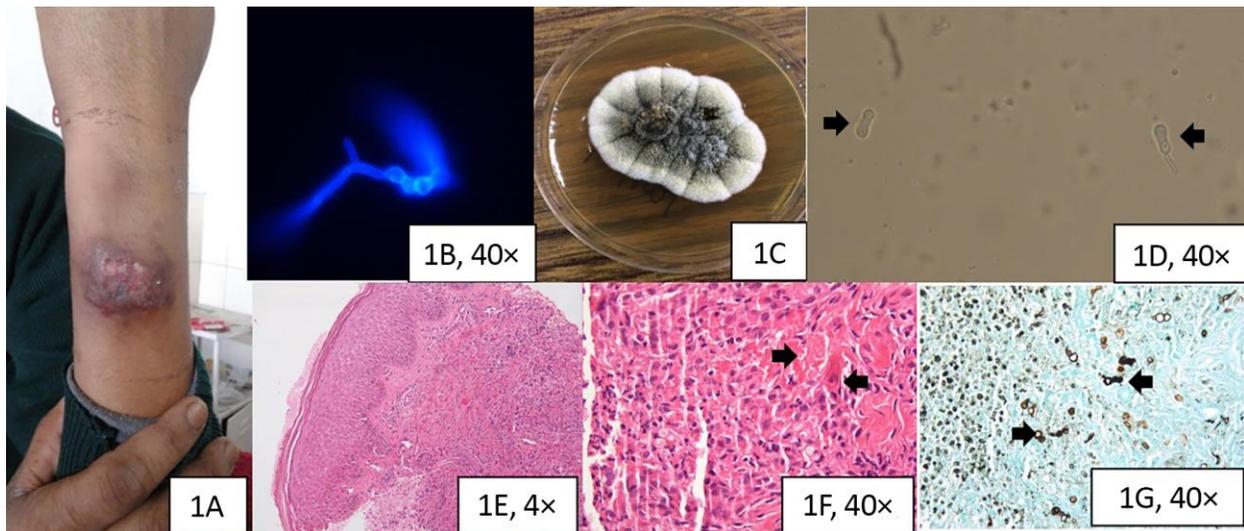
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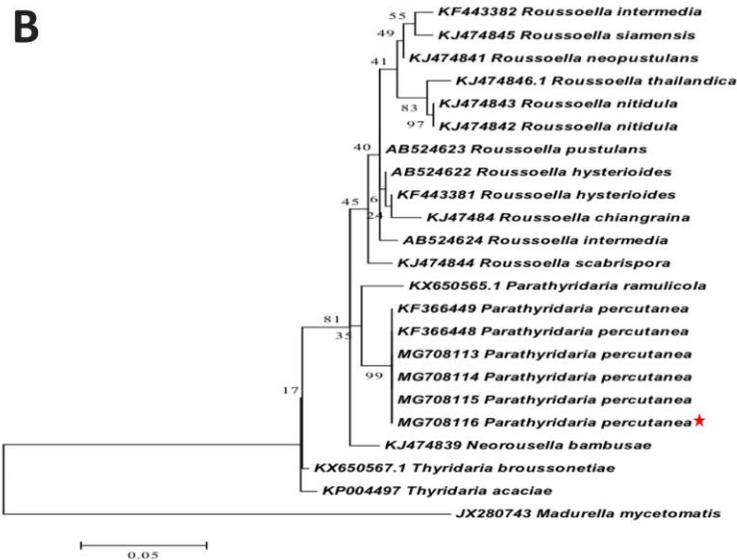
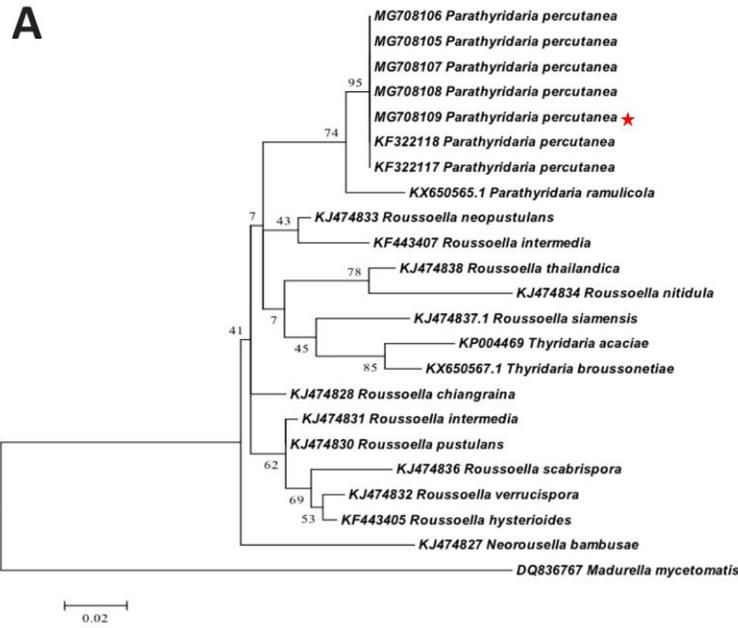
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Appendix



Appendix Figure 1. A) Hyperpigmented swelling with irregular ulcerated surface on dorsal aspect of left forearm. B) Calcoflour stain showing fluorescing septate hyphae with nodular swellings; original magnification $\times 40$. C) Greenish-black colony after 2 weeks of incubation. D) Lactophenol cotton blue mount showing nonsporulating hyphae with chlamydospores; original magnification $\times 40$. E) Histopathological examination of the biopsy showing neutrophilic infiltration in the subcutaneous tissue; original magnification $\times 4$. F) The same area showing presence of fungal hyphae' original magnification $\times 40$. G) Grocott-Gomori's methamine silver stain showing melanized fungal elements; original magnification $\times 40$.



Appendix Figure 2. Molecular phylogenetic analysis of ITS (A) and 28S (B) sequences of rDNA by maximum-likelihood method. The evolutionary history was inferred by maximum likelihood method based on the Tamura-Nei model. The percentage of trees in which the associated taxa clustered together is shown next to the branches. Initial tree(s) for the heuristic search were obtained automatically by applying neighbor-join and BioNJ algorithms to a matrix of pairwise distances estimated using the maximum composite likelihood approach, and then selecting the topology with superior log likelihood value. The tree is drawn to scale, with branch lengths showing number of substitutions per site. All positions containing gaps and missing data were eliminated. Red star indicates the sequence representing the index case, which clustered together with other *P. percutanea* isolates from our culture collection (named MG) and 2 isolates already in the database (named KF). ITS, internal transcribed spacer.