its mycological features have been well characterized [2, 6]. At 25–30˚C, the fungus grows in the mold form with the formation of septate hyphae and conidia, which is characteristic of the genus Penicillium. At 35–37˚C, the fungus grows in a yeast-like form, producing single-celled, round to oval arthroconidia [2, 7]. A unique characteristic of the mold form of T. marneffei is production of a soluble red pigment that diffuses into the agar medium [6, 7]; therefore, T. marneffei is suspected when a red pigment-producing Talaromyces (Penicillium) sp. is isolated from a clinical specimen. We encountered a case in which a red pigment-producing Talaromyces sp., different from T. marneffei, was isolated from a clinical specimen.

A 60-year-old female with a lobulated, solid pulmonary nodule of 23-mm diameter—detected by computed tomography scanning—underwent bronchoscopy for evaluation of lung cancer. Bacterial and fungal cultures and an acid-fast bacillus staining were performed using the patient’s bronchial washing fluid to exclude pulmonary infection. Her vital signs were stable and she did not present with any symptom to suggest infection. She had not traveled abroad before her examination. However, filamentous fungi were isolated from her specimen after three days of incubation at 25–30˚C on Sabouraud dextrose agar (SDA). Fungal colonies were lat, powdery to velvety, and centrally bluish gray to green but with white borders. The reverse side of the plate was red, and a red pigment was observed diffusing into the agar medium after five days of incubation (Fig. 1). Microscopy showed septate hyphae
with smooth conidiophores with four or five terminal metulae, with each metula bearing four to six phialides. The conidia were smooth and round and formed chains (Fig. 2). These microscopic features are characteristic of the *Penicillium* spp. Thus, *T. marneffei* was suspected. Subsequently, the organism was cultured at 37°C on SDA for seven days to examine its thermal dimorphism.
However, the fungus did not grow in culture. For definitive identification, we extracted the genomic DNA from the isolate and performed Sanger sequencing of the internal transcribed spacer (ITS) regions covering ITS1, 5.8S, and ITS2, and the beta-tubulin gene [8]. After searching the GenBank database by using the basic local alignment search tool (the BLAST algorithm), we found that the ITS and beta-tubulin sequences of the isolate respectively exhibited 100% (494/494 bp) and 98.6% (417/423 bp) identity to those of *T. albobiverticillius* (GenBank accession nos. KJ775225.1 and KJ775223.1). The second best-matched strain based on the beta-tubulin sequence was *T. erythropelis* with 95.0% (402/423 bp) similarity. Finally, the patient did not show any signs or symptoms of pulmonary infection without antifungal treatment, and was diagnosed with lung adenocarcinoma.

*T. albobiverticillius* is a red pigment-producing ascomycete fungus that was previously classified in the genus *Penicillium*. *T. albobiverticillius* reportedly has industrial value because this species produces large amounts of the red pigment that can potentially be used as a food-coloring agent [9]. However, to the best of our knowledge, isolation of *T. albobiverticillius* from a clinical specimen has not been previously reported. Like most *Penicillium* species, *T. albobiverticillius* could also be considered as a contaminant because it can be found indoors [10]. Some species of *Talaromyces* such as *T. purpureogenus* and *T. minioluteus* also secrete the red pigment [9, 11]. To differentiate these *Talaromyces* spp. from *T. marneffei*, samples should be incubated at 25–30˚C and 35–37˚C because *T. marneffei* is the only dimorphic fungus among *Penicillium* and *Talaromyces* spp. Moreover, red pigment-producing *Talaromyces* spp. are morphologically very similar to *T. marneffei*, distinguishing between them only by microscopy and colony examination is difficult.

In most clinical laboratories, fungi are usually identified by their typical colony morphologies and structures following lactophenol cotton blue staining. Results from this case suggest that laboratory staffs should be aware that mold form, which produce a red pigment on the surface of the culture medium, can be isolated and if their microscopic characteristics suggest *Talaromyces* (*Penicillium*) spp., the isolate could be a *Talaromyces* spp. other than *T. marneffei*. Recently, matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS) was used to identify various clinically important fungi, including *T. marneffei* and related species [12]. If rapid and accurate identification is required, DNA sequencing or MALDI-TOF MS should be used.

**AUTHORS’ DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST**

No potential conflicts of interest relevant to this article were reported.

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https://doi.org/10.3343/lmo.2017.7.4.211