Engyodontium album Endocarditis

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This is the first reported case of native valve endocarditis caused by Engyodontium album. This fungus, rarely seen as a human pathogen, is separated from Tritirachium species by its lack of pigmentation and from Beauveria species by the presence of conidigenous cells in whorls.

Fungal endocarditis is a rare disease. The organisms most frequently isolated are Candida albicans and Aspergillus species. Predisposing factors include the presence of a prosthetic valve or severe underlying valvular heart disease (9). We report a case of native valve endocarditis caused by Engyodontium album which is, to our knowledge, the first case of such an infection caused by this fungus.

The patient, a 59-year-old man with a history of coronary artery bypass surgery 2 years previously, was transferred to Loyola University Medical Center with severe aortic regurgitation and recurrent congestive heart failure for aortic valve replacement. One blood culture obtained at the transferring hospital grew both Pseudomonas fluorescens and Staphylococcus epidermidis, for which the patient had been started on imipenem-cilastatin and tobramycin. The physical examination was remarkable for a temperature of 37°C, a grade II/IV diastolic murmur at the right upper sternal border, and the absence of retinal lesions, splenomegaly, petechiae, or other peripheral stigmata of endocarditis. He underwent an uneventful aortic valve replacement.

Hematoxylin-and-eosin-stained sections of the aortic valve showed fibrous tissue with mixed inflammatory cell infiltration, focal necrosis, and hyalinization. Grocott's methenamine silver stain and the periodic acid-Schiff stain revealed branching septate hyphae of irregular width (Fig. 1). Gram and acid-fast stains were negative for microorganisms.

The aortic valve was immediately submitted to the microbiology laboratory for aerobic and anaerobic culture. The tissue was homogenized, Gram stained, and cultured at 35°C on Trypticase soy broth with 5% sheep blood (BBL Microbiology Systems, Cockeysville, Md.), chocolate agar (BBL), and MacConkey agar (BBL) (all incubated in 5% CO₂), thioglycolate broth (BBL), prereduced anaerobic blood agar (Centers for Disease Control formulation) (Carr-Scarborough Microbiologicals Inc., Decatur, Ga.), and prereduced chopped meat glucose broth (Carr-Scarborough). The latter two media were incubated anaerobically at 35°C. The fungus which was isolated grew on aerobic blood agar, chocolate agar, and thioglycolate broth. It was then inoculated onto Sabouraud dextrose agar (BBL) and potato flake agar (8). The isolate grew at 37°C. Slide cultures, which were incubated at 25°C for 10 days, were prepared on potato flake agar and Sabouraud dextrose agar to study the microscopic morphology. Macroscopically, the fungus was morphologically mature within 8 to 10 days at 25°C. On Sabouraud dextrose agar at 30°C, the colonies were floccose, white, and 25 mm in diameter. The reverse of the colony was white. Microscopic examination showed narrow vegetative hyphae which were 1 to 2 μm wide, bearing fertile hyphae which were 2 to 4 μm wide and apically dichotomously branched, bearing conidigenous cells in whorls of one to three, sometimes at right angles. Occasionally, the conidigenous cells were borne singly or in pairs on a lateral stalk. Conidigenous cells consisted of an elongated cylindrical tapering structure with a well-developed rachis of up to 35 μm in length. The rachis was 1 μm wide for its entire length as well as geniculate and denticulate, with denticles about as wide as the rachis. Conidia were hyaline, smooth, and globose. The organism was identified as E. album. In addition to the fungus, which was the predominant organism, the aortic valve tissue grew a few colonies of coagulase-negative staphylococci with antibiotic susceptibilities different from those of the S. epidermidis isolated in blood culture prior to transfer to our institution.

Postoperatively, the patient was treated with vancomycin and amphotericin B. All blood cultures obtained at our institution were negative for pathogens. The patient's course was extremely complicated, including the inability to wean him from the ventilator, persistent hypotension requiring vasopressor support, and sepsis. Despite aggressive supportive care, the patient died on postoperative day 49. Permission for autopsy was refused by the family.

E. album is an unusual pathogen but is a rather common inhabitant of waste and moist material, relatively frequently being isolated from substrates such as paper, jute, linen, and painted walls. Its dispersal is by dry, hygroscopic conidia, and hence it may be isolated from house air. The infections reported to be caused by E. album include keratitis (7), brain abscess (11), and eczema vesiculosum (1). The isolation of this organism from blood or cardiac tissue has never been reported. This is the first case report of an individual with Engyodontium infective endocarditis. The presence of heart failure worsening despite maximal medical therapy is typical of the clinical course of an untreated endocarditis. However, this patient lacked fever and peripheral manifestation of infective endocarditis. The P. fluorescens and S. epidermidis which were isolated from blood prior to his transfer to our institution were likely not pathogenic in that they were present in only one culture and were not evident on histologic examination of the tissue. No fungal blood cultures were obtained preoperatively, yet the fungus never grew from the aerobic blood cultures. Unquestionably, the histopathology, which revealed an invasive fungal process, corroborated the pathogenic nature of this organism. The

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source of the *E. album* in this man remains unknown. He did not use intravenous drugs or inject insulin, he had no clinical evidence of depressed immunity, and detailed discussion with family members failed to reveal an occupational risk. While the patient’s death was believed to be related to postoperative complications, the lack of an autopsy prevented determination of a source or evidence of *Engyodontium* dissemination.

The taxonomic status of *E. album* has gone through many changes. Originally, *E. album* was included in the genus *Beauveria* described by Vuillemin (13). Limber (4) then included it in a new genus, *Tritirachium*. Van Beyma (12) agreed with separating this fungus from the genus *Beauveria*. Even though conidia are produced in a similar manner (on a rachis) in both the genera *Beauveria* and *Tritirachium*, there were sufficient differences to warrant two separate genera. It was noted that in *Tritirachium* species the primary, secondary, and tertiary branches that are produced successively from the central conidiophore are produced in whorls. In *Beauveria* species, the sporogenous cells occurred singly, in twos, or in groups along the main axis of the mycelium or on conidiophores. The conidiophores could be simple or branched, occurring individually, in twos, or in thick rosettes, seldom in whorls along the hyphae to form sporiferous clusters typical of *Beauveria* species. *Tritirachium* species developed a very limited growth on artificial media which was brushlike, whereas *Beauveria* species spread rapidly on the media, forming a more procumbent to flocculent growth with a powdery surface. Saccas (10) reclassified the three species of *Tritirachium* back to the genus *Beauveria*. In 1954, MacLeod (5) again separated *Beauveria* from *Tritirachium* species by noting that *Beauveria* species were primarily parasitic on insects whereas *Tritirachium* species were saprophytic. It was felt that there were other morphological and biological differences between them. In 1972, this organism was returned to the genus *Beauveria* (1). The zigzag shape of the rachis and the verticillate arrangement were suggestive of the genus *Tritirachium*; however, the denticulate rachis and absence of pigmentation were more typical of *Beauveria* species. These morphological distinctions were not recognized by Matsushima (6). Since 1972, a new genus, *Engyodontium*, has been created with two species, *E. album* and *E. parvisporum* (2). *Engyodontium* colonies appear white and cobweblike. Conidiophores are hyaline and thin walled, with a branching pattern subverticillate to verticillate, as highlighted in Fig. 2. Conidiogenous cells form holoblastic conidia on butt-to-hair-shaped denticles on elongated rachides. This separated the two species into the genus *Engyodontium*, leaving the genus *Tritirachium* to include organisms that were similar to *Engyodontium* species in having whorls but that had pigmented colonies and regularly geniculate conidiiferous rachides with flat conidial scars. The genus *Beauveria* does not include conidiogenous cells in whorls but rather those borne singly, in pairs, or in clusters. Gams et al. (3) have extended the genus *Engyodontium* to include six species.

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**LITERATURE CITED**


