

*Balamuthia mandrillaris*

## Amebic Infections Resulting From Organ Transplants



*Joseph DiPersio, PhD, DABMM*

Dr. DiPersio is currently the Director of Clinical Microbiology at Summa Health System in Akron, OH and is an Associate Professor of Clinical Microbiology in Pathology at Northeastern Ohio Universities College of Medicine.

He is a Diplomate of the American Board of Medical Microbiology and has directed clinical microbiology laboratories for over 30 years.

Dr. DiPersio has also published over one hundred scientific journal articles and national meeting abstracts.

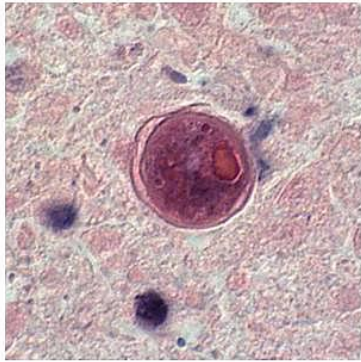
**B** *alamuthia mandrillaris* is a free-living amoeba that on rare occasions has caused skin infection in humans and fatal central nervous system disease much like *Naegleria* and *Acanthamoeba*.

*Balamuthia* has been isolated from soil and dust samples worldwide. Infection is thought to be acquired by exposure of mucus membranes or non-intact skin to cysts or trophozoites from soil. Water may also be a mode of transmission, but to date, *Balamuthia* has not been recovered from that source. Fewer than 200 human cases have been reported worldwide since its discovery as a human pathogen in 1990.



The true magnitude of disease is unknown since *Balamuthia* granulomatous amebic encephalitis (GAE) may be misdiagnosed as other neurologic diseases. Cutaneous lesions, primarily on the face, have preceded GAE in some cases suggesting nasal exposure.

Although successful treatment of *Balamuthia* GAE has been reported, once extension to the brain occurs the disease is usually fatal. *B. mandrillaris*, like *Acanthamoeba* is not easily isolated from CSF or differentiated in tissue sections. The two can, however, be differentiated by immunofluorescent staining or by electron microscopy.



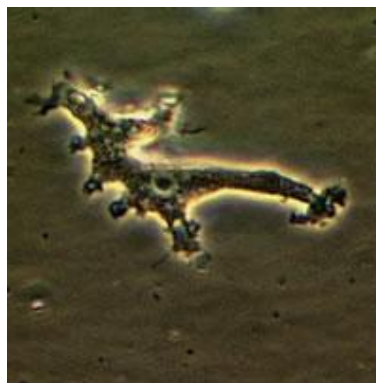
Cyst of *Balamuthia mandrillaris* in brain tissue. Photo credit: DPDx, CDC

Fresh biopsy/autopsy tissue inoculated onto mammalian cell cultures may recover the organism. Frozen specimens may also recover organisms if cysts are present.

Drugs used to treat GAE include flucytosine, pentamidine, sulfadiazine, fluconazole or amphotericin B, azithromycin or clarithromycin, and miltefosine.

Since December 2009, there have been two CDC reports of transplant-transmitted encephalitis caused by *Balamuthia*. The first involved two kidney transplant recipients who shared the same organ donor. One patient died and the other survived with neurologic sequelae. The donor was a 4 year old boy who was first treated with antivirals for a suspected influenza A

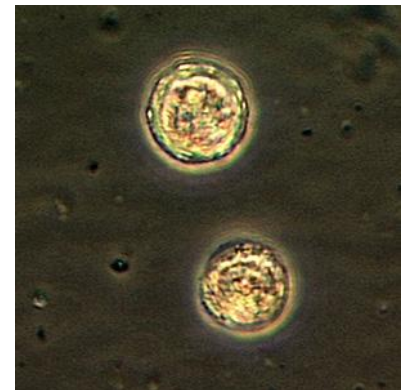
infection (rapid influenza test positive). He was hospitalized one week later with CNS symptoms thought to be influenza related. An extensive search for viral, bacterial, and fungal agents was negative. He was released but readmitted one week later with recurrent seizures. Despite treatment he developed subarachnoid hemorrhage and brain stem herniation one week later and died. His heart, liver, and kidneys were transplanted into four recipients at three different transplant centers. The heart and liver recipients remained well. Histopathologic testing at the CDC of brain biopsy tissue from the donor, demonstrated abundant ameba identified as *B. mandrillaris* by immunohistochemical and indirect immunofluorescent staining.



**Figure 2: Balamuthia mandrillaris in the trophozoite stage.** CDC photo.

In August 2010, the CDC was again notified regarding two patients who developed encephalitis following

transplant of organs from the same Hispanic male donor who died from a presumed stroke. The man had a large skin lesion on his back for about six months. The liver recipient developed diplopia and difficulty walking two weeks post transplant and died nine days later. The kidney-pancreas recipient developed a headache, nausea, and vomiting approximately four weeks post transplant and



**Figure 1: B. mandrillaris cysts.** CDC photo.

was hospitalized. A brain biopsy demonstrated amebic encephalitis on histopathologic examination. The patient died within a week of hospitalization. *B. mandrillaris* antigens were identified in the brain biopsy from the kidney-pancreas transplant patient and in postmortem brain and liver of the liver recipient using immunohistochemical stains. Brain tissue from both patients was also positive by PCR for *B. mandrillaris* DNA. Two additional organ recipients from this same donor (one heart and one

kidney) were transplanted at two different state transplant centers. These patients were given preemptive therapy and remained asymptomatic.

Risk factors for *Balamuthia* GAE are poorly defined but may include exposure to soil or stagnant water and Hispanic ethnicity. The presence of skin lesions with encephalitis should also alert clinicians. Transplant centers should also be aware of the potential for *Balamuthia* infection in donors with encephalitis of uncertain etiology.

Joseph DiPersio, PhD,  
DABMM

## References

Morbidity and Mortality Weekly Report. 2010, 59(36); 1165-1170

Clinical Microbiology Newsletter. 2008, 30(21); 159-166

For more information on free living amoeba, see:

<http://hardydiagnostics.com/catalog/2/hugo/FreeLivingAmebaeMedia.html>

