

Dracula is a fungi?

That's correct, the black loving, light fearing, blood sucking prince of darkness, Count Dracula was a fun-guy (read fungi)? In our recent research, we describe that just like Dracula, the fungus *Aspergillus fumigatus* "wants your blood." The parallels are uncanny, both prefer dark places (Dracula: a coffin, *Aspergillus*: a compost pile), both are very difficult to kill, both are opportunistic predators (Dracula stalking unwitting victims and *Aspergillus* invading immune suppressed persons) and both are driven by a blood thirsty need.

For those of you unfamiliar with *Aspergillus fumigatus*, you shouldn't be, as you have likely inhaled thousands of *Aspergillus* spores today. *Aspergillus fumigatus* is a common mold (a type of fungus) that grows in decaying organic material (sound like a thing Dracula would do?), releasing airborne spores, that cause a variety of lung diseases in millions of persons worldwide. In some people *Aspergillus* lies dormant, colonizing their lungs and causing conditions such as severe asthma. But in others it rises from its dormant state, invades its victims, resulting in often-fatal fungal pneumonias. Previously, the reason behind this switch in the mold's behavior was unknown. People that undergo lung transplantation are particularly vulnerable to *Aspergillus*-related pulmonary diseases, which occur in one third of patients. Most would attribute this increased risk of infection to immune suppressive medications used after transplant. However, we were puzzled as lung transplant recipients develop diseases related to fungal colonization and those classified as invasive. So if it is not immune suppression (as all lung transplants are immune suppressed) then it has to be something else? The plot thickens.

We performed mini-transplants. Removing a REALLY small windpipe from one mouse and implanting it into a recipient mouse. This simulated a lung transplant. We found that rejection of the transplant created "blood lakes" in the airway graft and that the appearance of these blood lakes predicted a change in behavior of the fungus from colonization to invasion. We found that *Aspergillus* liked blood, but what it really wanted was iron and the more iron it got the deeper the invasion became, its hunger was insatiable.

A passage from Bram Stoker's Dracula, describing the sea voyage of Dracula to London
"On the 2nd of August, another crew member disappears. At midnight...the remaining deck hand disappears and the captain and the mate are the only remaining men aboard."

Iron is one of the primary components of blood, allowing hemoglobin to transport oxygen from the lungs to our cells. Iron is essential for nearly all living organisms including harmful bacteria and fungi. Thus, the competition for iron is a critical battleground between the infected host and the infecting pathogen. We found that in our mini-transplants the blood became large iron deposits, like fertilizer for a plant. To make sure that we were not just describing a phenomenon in tiny mouse transplants, we obtained biopsies from persons after lung transplant. These tissues also had increased iron levels. So we concluded that when the iron balance is shifted in the lungs it increases the risk of infection by vampire-like pathogens.

All hope is not lost. Dracula has garlic and sunlight, *Aspergillus fumigatus* has iron chelators. Chelators are chemicals that bind metals, lowering the amount available for the fungus. When we treated transplanted mice with iron-binding chelators the fungus was not invasive. The ramifications of this are potentially important as a treatment for these infections and others. Remember that iron is a fundamental need. Thus, pathogens are less likely to develop resistance. (*Sigh of relief*)

So by now you are likely convinced that indeed Count Dracula is a fungus that by the way can also change into a bat (enough with the details!). But in case there remains doubt, consider this?

A passage from Bram Stoker's Dracula describing the contents on the ship.
The only cargo on board the ship was "*a ballast of silver sand, with only a small amount of cargo-a number of great wooden boxes filled with mold.*"

Here the 'mold' represents Transylvanian earth, lairs that Dracula rests in, in order to replenish his strength. Just like a fungus.