

## Clinical Note

### Fungi that grow on formalin-fixed cadavers

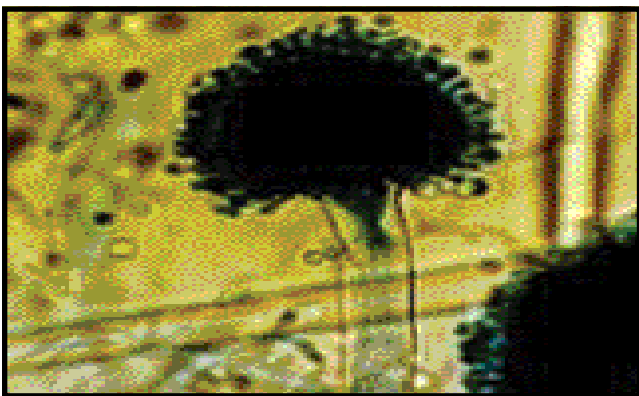
Sir,

Fungi are widely spread in nature and thrive on every climate on earth. One of the problems that face anatomists is the growth of fungi on cadavers. The balance between formalin concentrations that cause irritation to students and staff, and fungal growth is often difficult to achieve. In other words, raising formalin concentration is highly irritant while lowering it will open the door for fungi to grow. During the hot summer months of July 2000, the temperature fluctuated between 25°C (low) and 50°C (high), swabs were taken from the exposed parts of cadavers and from the surface of the formalin pools from suspected fungal colonies. Sabouraud glucose agar was used for culture with the addition of chloramphenicol (to suppress bacterial growth).<sup>1</sup> Colony growth was checked daily, their description was recorded, and representative samples were photographed. In addition, microscopic examination was performed for all colonies using potassium hydroxide and lactophenol cotton blue stain. Cultivation, storage of media, and examination were all performed in the same storage room as the cadavers.

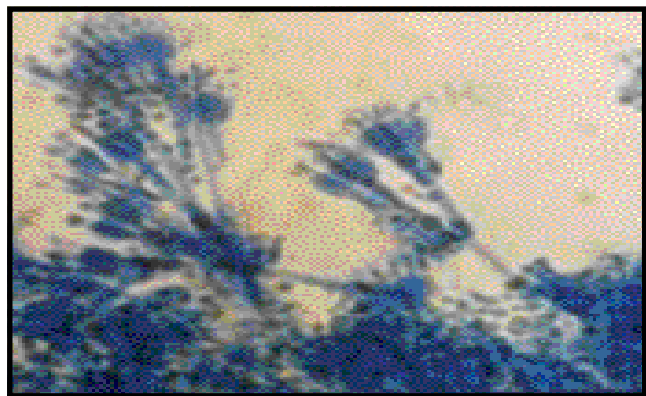
Five genera of fungi, which grew on Sabouraud glucose agar, were identified. Standard mycology textbooks were referred to.<sup>2</sup> 1. *Aspergilli*: Colonies developed after 2 to 3 days, some of them were lemon green (*Aspergillus fumigatus*), others were black (*Aspergillus niger*). Colonies were rounded or irregular with growing white edge. Microscopically, hyphae were septate and branched. Phialides formed

on top of swollen vesicles at the end of a long conidiophore (**Figure 1**). 2. *Penicillium*. Developed readily (2-3 days). Colonies were bluish green with whitish growing edge. Under the microscope, chains of conidia were produced by phialides, which were supported by branched conidiophores (**Figure 2**). 3. *Trichophyton*. Colonies developed after 10 days and were creamy circular or button-shaped and plicated with raised darker center. Microscopically there were irregular conidial chains. Macro- and micronidia were absent (reported to be rare in this medium). 4. *Epidermophyton*. Colonies developed after 7 days and were creamy, resembling brain tissue with folds and furrows. Colony sectors arose and overgrew the colony. Microscopically there were septate hyphae, short club-shaped macronidia, 2-4 cells and smooth wall. 5. *Cryptococcus*. Colonies were luxuriant creamy mucoid in nature with rapid profuse growth (2 days). Microscopically there were spherical to oval thin-walled cells. Hyphae could not be seen.

Although many fungi are beneficial to humankind, there are some fungi that cause huge economic losses every year; and many fungal species are pathogenic as well. Since fungi colonize every suitable substrate, damage to dead naturally occurring material is inevitable.<sup>3</sup> It is well known that fungal spores are widely spread in air, water and soil, the dissections and storage rooms for cadavers are no exception. Raising the formalin concentrations in fixation and preservation fluids is effective in controlling fungal growth, but this is highly irritant to students and staff. The balance between a safer and harmless concentration and fungal growth remains illusive. Searching in literature, very few studies have tackled



**Figure 1** - Examples of fungi that grow on formalin-fixed cadavers (*Aspergillus*).



**Figure 2** - Examples of fungi that grow on formalin-fixed cadavers (*Penicillium*).

this problem. One report has suggested formalin concentration effective enough to prevent fungal growth should not be less than 5%.<sup>4</sup> In our view, this concentration is extremely dangerous to skin and the upper respiratory tract and is unacceptable. As for fungi, a few reports have mentioned "fungal growth" on living and dead tissues, but without specification.<sup>5</sup> In this study we have recorded 5 genera of fungi that grew on formalin-fixed cadavers, namely: *Aspergilli*, *Penicillium*, *Trichophyton*, *Epidermophyton* and *Cryptococcus*. It appears that these fungi have some sort of adaptation and resistance to low formalin concentrations. The source of these fungi, as we mentioned, could be air or water, or they could have been brought with the dead bodies in the first place. Addition of fungicidal agents could synergistically help in lowering the formalin concentrations, but their cost and side effects must be kept in mind.

*Elsebai F. Hammad*  
*Abbas A. Al-Janabi*  
*Shadia A. Mohamed*  
College of Medicine  
University of Al-Anbar  
Iraq

### References

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