

Analysis of Fungi that Grow on Formalin-Fixed Human Cadavers at Thammasat University

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Abstract

The main problem of instructors and students in dissection of cadavers is the growth of fungi on cadavers. Many fungi can produce illness through inhalation of the mold or mycotoxin. This study aimed to analyze fungi that grow on formalin-fixed human cadavers at the Faculty of Medicine, Thammasat University. We collected the colonies of fungi that grow on formalin-fixed human cadavers and isolated them on Sabouraud dextrose agar and potato dextrose agar. The isolates colonized were morphologically identified by light microscopy. The results are that three fungi grew on formalin-fixed human cadavers : *Penicillium* spp., *Chrysosporium sitophila* and *Trichoderma* spp. These fungi are common aerial contaminants and are implicated in pulmonary disease. Instructors and students should use face masks and rubber gloves for protection from these fungi.

Keywords: Fungi, Human cadaver

1. Introduction

Cadavers remain a main teaching tool for instructors and students. The main problem of instructors and students are the growth of fungi on cadavers. Fungi have a worldwide distribution and grow in soil, water, air, animals and human bodies (including human cadavers) [2,4,6]. Most fungi grow well in the temperature range 25-30 °C [6]. Many fungi are very useful to humans, while others cause illness through inhalation of the mold itself or potent mycotoxins they may produce [2,5,6]. Some fungi are toxic to people who handle them during embalming procedures or dissections of cadavers [5,6,7]. Therefore, this study aimed to analyze the fungi that grow on formalin-fixed human cadavers at Thammasat University.

2. Materials and Methods

We collected the colonies of fungi that grow on formalin-fixed human cadavers by swabbing three cadavers (Figs. 1, 2 and 3) and isolating them on Sabouraud dextrose agar

(SDA) and potato dextrose agar (PDA) with the addition of chloramphenicol to suppress bacterial growth. We collected the fungi at the Division of Anatomy, Department of Preclinical Science, Faculty of Medicine, Thammasat University (September 2005 to December 2007). Dissecting room temperature fluctuated between 25 °C and 30 °C. Colony growth was checked daily, their description was recorded, and representative samples were photographed. The isolates colonized on the surface of skin, muscle and fascia were stained by lactophenol cotton blue and morphologically identified by light microscopy. Cultivation, storage of media, staining of colonies and identification were all performed at the same room temperature as the cadavers. Fungi were identified by comparing micrographic characteristics of fungi to standard mycology text books [1,5,6,7] and were analyzed by a microbiologist.



Fig. 1 Fungal colonies on skin of thoracic wall of cadaver (arrows).

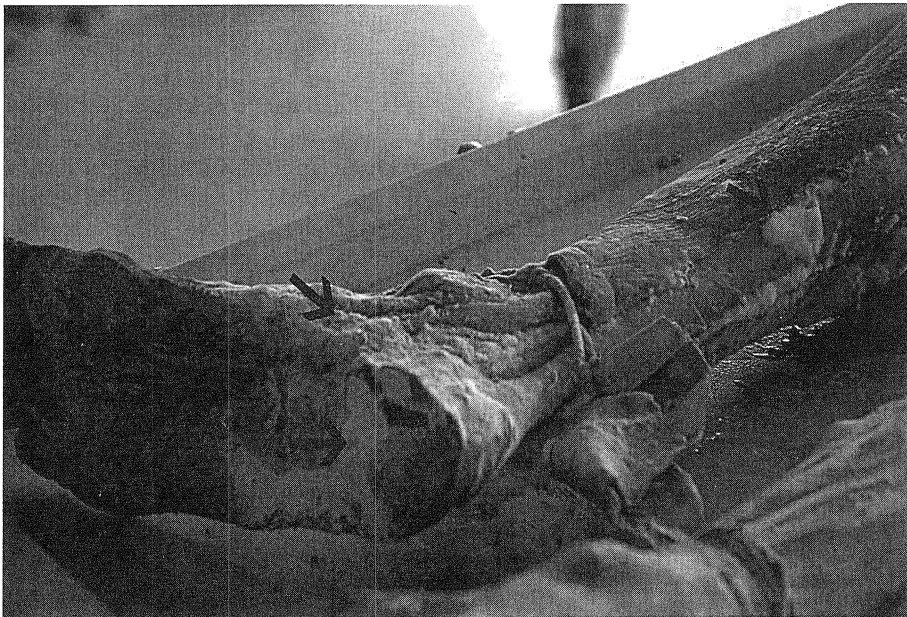


Fig. 2 Fungal colonies on muscle and fascia of right foot and leg (arrows).

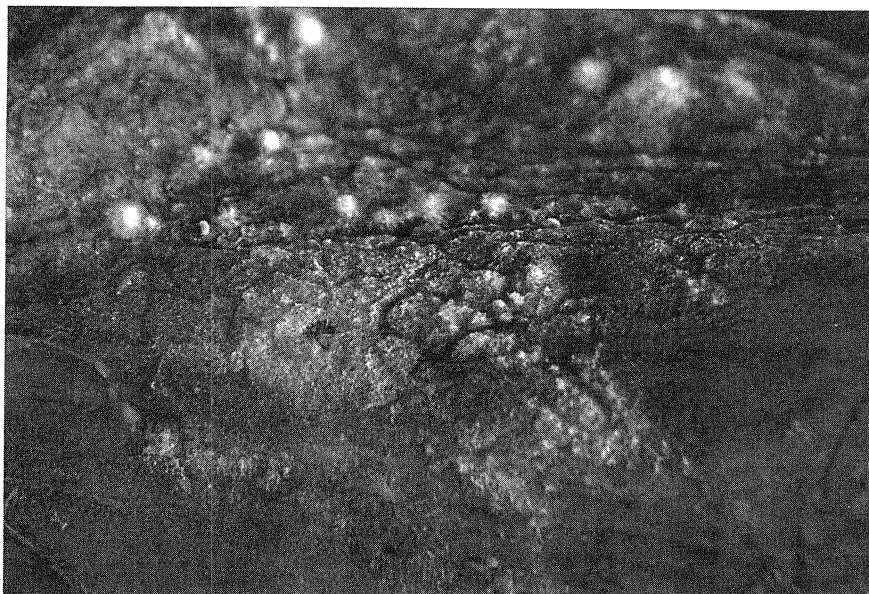


Fig. 3 Close up of colony growth on fascia of right thigh.

3. Results

In this study, we found three different colonies of fungi that grow on formalin-fixed cadavers. The first colony took 2 to 4 days to

grow on agar. It was white, wrinkled, powdery with a pale yellow reverse. Microscopically, hyphae were septate; phialides were produced on conidiophores with chains of conidia (Fig. 4).

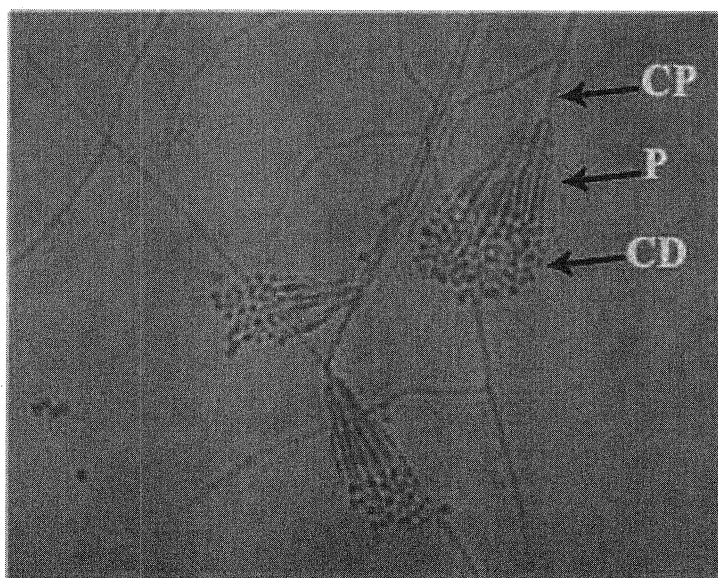


Fig. 4 Photomicrograph of conidiophores (CP), phialides (P) and conidia (CD) (400X magnification).

The second colony took 2 to 4 days to grow on agar. It was white to tan, powdery with a yellow reverse. Microscopically, hyphae were septate;

conidiophores produced branching chains of oval conidia by continuous budding (Figs. 5 and 6).

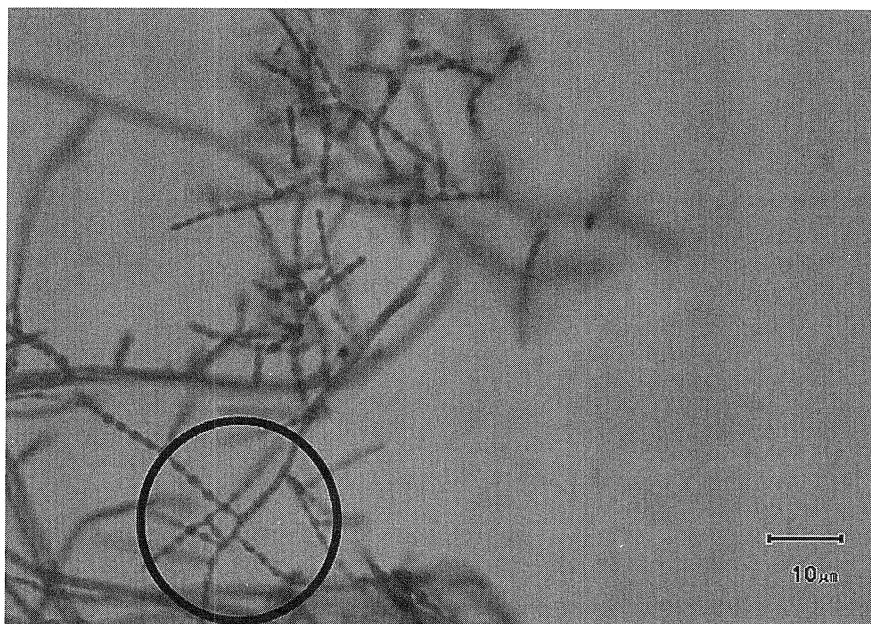


Fig. 5 Photomicrograph of specimen 2 with branching chains of oval conidia by continuous budding (circle).

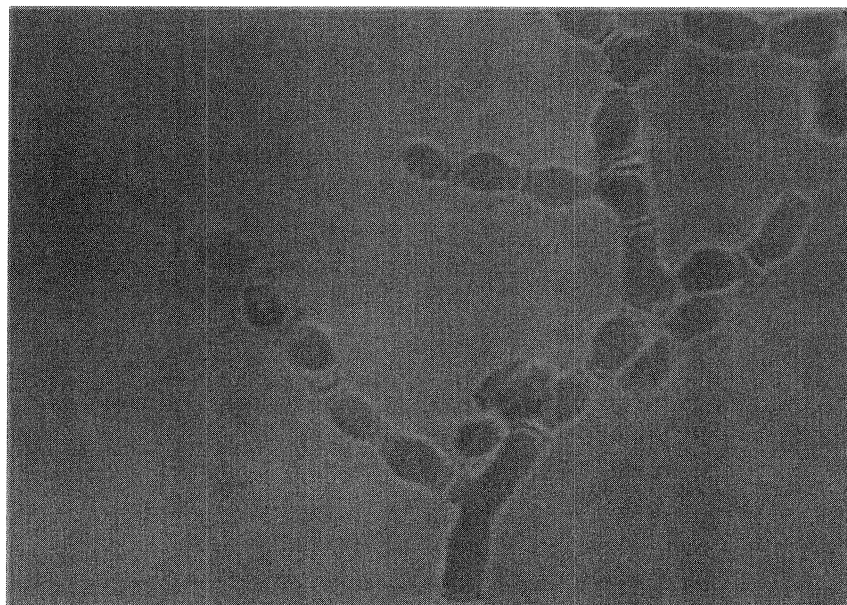


Fig. 6 High magnification of specimen 2 with chains of oval conidia (400X magnification).

The third colony took 3 to 5 days to grow on agar. It had white fluff peripherally and green patches centrally with a yellow reverse. Microscopically, hyphae were septate; phialides

were flask-shaped. Conidia were round, single-celled and clustered together at the end of each phialide (Figs. 7 and 8).

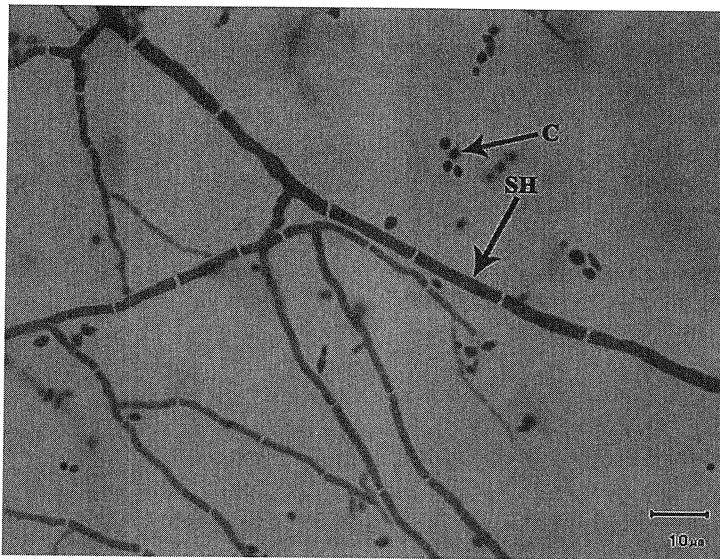


Fig. 7 Photomicrograph of specimen 3 with septate hyphae (SH) and round conidia (C).

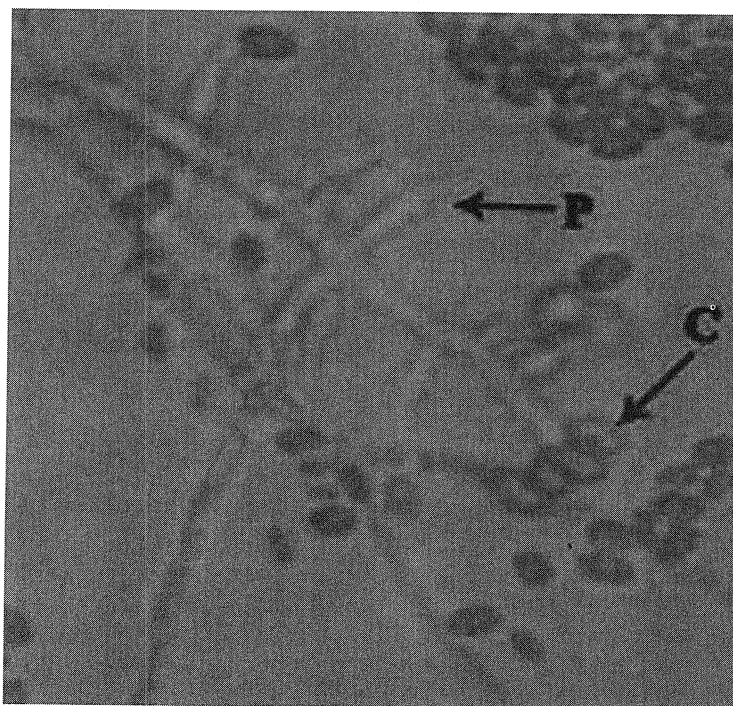


Fig. 8 High magnification of specimen 3 with flask-shaped phialide (P), round conidia (C) and clustered together at the end of each phialide (400X magnification).

4. Discussion

Three fungi were found growing on formalin-fixed cadavers. Colony and microscopic morphology of the first fungus correspond with *Penicillium* sp., the second correspond with *Chrysonilia sitophila* and the third was a *Trichoderma* sp. Elsebai et al [2] reported five genera of fungi that grow on formalin-fixed cadavers, namely *Aspergilli*, *Penicillium*, *Trichophyton*, *Epidemophyton* and *Cryptococcus*. Koyoshi et al [4] reported that the main isolates colonizing surfaces of skin and bones were *Eurotium repens*, *Eurotium rubrum*, *Eurotium chevalieri* and *Gliocladium* spp. The genus *Eurotium* usually inhabits soil and exhibits osmophilic properties.

Penicillium spp. are commonly considered aerial contaminants, of which infection is found in immunocompromised people [7]. It has been known to cause pulmonary infection, skin infection, mycotic keratitis, external otomycosis, endocarditis and urinary tract infection [3,6].

Chrysonilia sitophila is also commonly considered a contaminant, rarely involved in infections of cornea [6] and endophthalmitis [1]. *Chrysonilia sitophila* induces occupational asthma in the logging industry [9].

Trichoderma spp. are a common genus of molds especially in soils and on decaying wood. *Trichoderma* has been related with pulmonary fungus ball disease. However, the disease is quite rare and only reported in immunocompromised people [6].

Increasing the concentration of formalin in fixative and preservative solutions is effective in controlling fungal growth, but this is highly irritating to instructors and students [2,8]. The source of fungi that grow on formalin-fixed human cadavers at Thammasat University may be airborne. Instructors and students should wear face masks and rubber gloves when dissecting contaminated cadavers.

5. Conclusion

Colonies of three fungi that grow on formalin-fixed cadavers were preliminary identified as *Penicillium* sp., *Chrysonilia sitophila* and *Trichoderma* sp. These fungi are commonly considered aerial contaminants and

found to cause diseases in immunocompromised people. They have been shown to be related with pulmonary disease. The source of fungi that grow on formalin-fixed human cadavers at Thammasat University may be airborne.

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7. References

- [1] Collier, L., Balows, A. and Sussman, M., Topley & Wilson's Microbiology and Microbial Infections, 9th ed., Arnold, London, pp.307-543, 1998.
- [2] Elsebai, F.H. and Abbas, A., Fungi that Grow on Formalin-fixed Cadavers, Saudi Medical Journal, Vol.23, No.7, pp.171-872, 2002.
- [3] Forbes, B.A., Salm, D.F. and Weissfeld, A.S., Bailey & Scott's Diagnostic Microbiology, 11th ed., Mosby, St. Louis, pp. 711-797, 2002.
- [4] Kiyoshi, I., Masahito, H., Masahito, K., Takashi, Y., Nazuko, N., Tsuyoshi, H. and Shogo, T., Analysis of Fungi Detected in Human Cadavers, Legal Medicine, Vol.8, No.3, pp.188-190, 2006.
- [5] Koneman, E.W., Allen, S.D., Janda, W.M., Schreckenberger, P.C. and Winn, W.C., Color Atlas and Textbook of Diagnostic Microbiology, 4th ed., J.B. Lippincott, Philadelphia, pp. 791-878, 1992.
- [6] Larone, D.H., Medically important fungi : A guide to identification, 3rd ed., ASM press, Washington DC, pp.209-252, 1995.
- [7] Murray, P.R., Baron, E.J., Jorgensen, J.H., Tenover, M.C. and Tenover, R.H., Manual of Clinical Microbiology, 8th ed., ASM Press, Washington DC, pp.1653-1855, 2003.
- [8] Sarsilmaz, M., Arifoglu, Y., Tuncer, S. and Aksit, D., Appropriate Concentration of Antimicrobial Agents used in Cadaver

Pools, Microbial Bulletin, Vol.26, pp.349-395, 1992.

- [9] Tarlo, S.M., Wai, Y., Dolovich, J. and Summerbell, R., Occupational Asthma

Induced by Chrysonilia Sitophila in the Logging Industry, J Allergy Clin Immunol, Vol.97, No.6, pp.1409-1413, 1996.