Monitoring *Aspergillus fumigatus* aerosols from a composting facility

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**Abstract**

The large, outdoor Islip Yard Waste Composting Facility on Long Island, New York was investigated as a source of airborne fungus spores. The Burkard-Hirst volumetric spore trap was used for the first extensive sampling of small mold spores for this application. Samplers were operated continuously from 21 August to 30 November 1992 in the facility and in a suburban community about 540 m from the facility. A control site approximately 10 000 m from the facility was also sampled to establish background levels of fungus spores. The facility site had higher average readings of *Aspergillus fumigatus* spores than did the community and both were higher than the control. *A. fumigatus* was the only fungus among 30 categories tracked that differed significantly between the facility and control sites. It was also isolated repeatedly from the compost. Higher average levels of *A. fumigatus* were measured in the community when winds blew from the facility, and also during times when the compost was moved or mixed at the facility. No correlation was found between wind direction or work times and *A. fumigatus* conidia at the control site. The study shows that this compost facility can produce a measurable increase in the number of airborne *A. fumigatus* conidia both at the edge of the facility and at 540 m downwind. It also demonstrates that the Burkard spore trap can be used for monitoring small, airborne mold spores, but it is a difficult and labor intensive task.

**Keywords:** Airborne spores; *Aspergillus fumigatus*; Burkard sampler; Hirst sampler; Compost; Fungi

1. **Introduction**

This study is to determine the kinds and amounts of fungus spores released by The Islip Yard Waste Composting Facility on Long Island, New York, and to see if the spores reach a nearby residential community, and if wind velocity, wind direction, and agitation of the compost affect their concentrations. It is also a test of using the Burkard-Hirst spore trap for quantifying small, airborne mold spores. The study presented here was part of a larger project attempting to correlate airborne fungus and actinomycete spore fluctuations with symptoms recorded by volunteers (New York State Department of Health, 1994). The present paper is restricted to the measurement and identification of airborne fungus spores from compost, and it concentrates on the most prevalent of compost fungi, *A. fumigatus*.

Composting is increasingly utilized by municipalities to reduce the amount of material sent to landfills. The densely populated township of Islip on Long Island operates one of the largest outdoor composting facilities in New York. When it commenced operations in 1988, it processed 50 000 tons of lawn clippings and leaves into soil for landscaping. It soon became a victim of its own success when residents of a nearby community complained of odors. By 1992, the amount of material processed at the facility was reduced to 25 000 tons by encouraging home composting, but the odor problem persisted. The residents of the nearby community became worried about health effects from the compost, and numerous complaints of fevers, rashes, headaches and other symptoms were received by authorities.

The site available to us for the study is almost 200 miles from our laboratory and it was decided that living samples on agar media like those generated by Andersen samplers would have to be changed several times a day. They would be too awkward to transport, and would require greater laboratory equipment than we had at our disposal, so the decision was made to use a Hirst-type spore trap sampler, the Burkard. Several good studies of airborne spores from different kinds of compost have been made with Andersen samplers (Millner et al., 1977, 1980; Passman, 1983), but to our knowledge, the Burkard had not been used specifically for the small...
mold spores encountered from compost. The advantages of the Burkard are that it does not require media or the growth of hazardous fungi in the laboratory, the sample is changed weekly, samples can be mailed or stored before analysis, and the sample is a long-lasting slide preparation that can be reexamined at any time. The sample is representative of the kinds of particles capable of being inhaled in that it includes both biological and non-biological, viable and non-viable particles. Disadvantages of the Burkard are that skill and practice are needed to identify small spores and that analysis is very labor intensive.

Kane and Mullins (1981) and Millner et al. (1977) examined sewage sludge compost fungi and found *Aspergillus fumigatus* Fresenius to be among the most frequently isolated fungi, and Millner et al. (1980) measured high levels of *A. fumigatus* immediately downwind from a Beltsville, MD sewage sludge compost facility by using six stage, Andersen viable samplers running for 2–30 min per sample. Millner et al. also found airborne *A. fumigatus* to be strongly elevated when the compost was mechanically moved.

Our study differs in having a continuous record of all airborne particulates over a 100-day period at two sites near a yard waste composting facility plus a control site 10 000 m downwind to determine background fungi.

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**Fig. 1.** Long Island, New York sites showing location of samplers. ◆, Islip Yard Waste Composting Facility, 'compost facility'; ★, Union Avenue in the village of Ronkonkoma, 'study community'; ▼, Fisher Avenue in the village of Islip Terrace, 'control site.' From NYSDOH report (1994).