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CDC, NATIONAL CENTER FOR ENVIRONMENTAL HEALTH

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SUMMARY

In response to a technical assistance request from the Centers for Disease Control and Prevention (CDC), National Center for Environmental Health (NCEH), the National Institute for Occupational Safety and Health (NIOSH) investigators planned and coordinated bioaerosol sampling in 42 Cleveland area homes to quantify the presence of *Stachybotrys atra* (S. *arta*) fungi and associated mycotoxins. This work was done to support NCEH in the investigation of acute pulmonary hemorrhage (hemosiderosis) among infants in Cleveland, Ohio. Air, bulk, and surface samples were collected to quantify airborne dust concentrations, concentrations of *Stachybotrys atra* fungi, and tricothecene mycotoxin concentrations. Samples were collected in both case homes (those with hemosiderosis cases) and control homes (those without cases of hemosiderosis).

Fungal organisms including *Stachybotrys atra* were present at quantifiable concentrations in the air and on surfaces in some Cleveland area homes sampled. Those homes with cases of acute pulmonary hemorrhage (the case homes) had higher concentrations of total airborne fungi. Significantly higher concentrations of *S. atra* fungi were also quantified in the air and on home surfaces of case homes by both viable and nonviable bioaerosol sampling methods. Collectively, these data suggest that those infants with hemosiderosis were exposed to higher concentrations of fungi including *S. atra* in their home environment.

Bioaerosol sampling in Cleveland area homes revealed the presence of *Stachybotrys atra* fungi in residential settings. Those homes with infant cases of acute pulmonary hemorrhage (hemosiderosis) had higher concentrations of total fungi and *S. atra* as measured by both viable and nonviable sampling methods.

KEY WORDS: Fungi, Mycotoxins, *Stachybotrys atra*, Acute Pulmonary Hemorrhage.

INTRODUCTION

On December 9, 1994, the National Institute for Occupational Safety and Health (NIOSH), Division of Respiratory Disease Studies (DRDS), received a technical assistance request from the Centers for Disease Control and Prevention (CDC), National Center for Environmental Health (NCEH) regarding the investigation of acute pulmonary hemorrhage among infants in Cleveland, Ohio.[1] NIOSH was asked to provide technical assistance in the quantification of molds and mycotoxins in Cleveland area homes in support of research into the etiology of this respiratory disease. Working with the NCEH and the Cleveland Department of Health, most environmental surveys of Cleveland area homes were completed during December 13 to 16, 1994. Additional Cleveland area homes were sampled by the Cleveland Department of Health as new cases of disease were identified; this sampling occurred from January to April of 1995. Considering the urgency of this investigation, preliminary sampling results were communicated directly to NCEH as individual analyses were completed. On August 25, 1995, NCEH scheduled a meeting of project investigators for the review of preliminary findings; a NIOSH investigator presented preliminary sampling results to NCEH during this meeting. This report provides the results from environmental sampling through April of 1995 (the results presented during the August 1995 CDC Meeting) and serves to formally close this technical assistance project. The results for any additional sampling completed after April of 1995 will be provided separately.

METHODS

Environmental surveys were completed in 36 Cleveland area homes during the initial December 1994 surveys; samples were collected in six additional homes during January through April of 1995 as subsequent cases of acute pulmonary hemorrhage were diagnosed by local health officials. Bioaerosol sampling was done at both case and control homes to evaluate the presence of *Stachybotrys atra* (*S.atra*) fungi and other environmental analytes considered risk factors in the etiology of acute pulmonary hemorrhage in infants. The selection of case and control homes was done by NCEH (Case homes were those households in which a case of acute pulmonary hemorrhage had been diagnosed). NIOSH investigators were blinded as to case status until sampling and analysis were completed. **Air**, **bulk**, and **surface** samples were collected from each sampling site as described below. The samples collected for viable microorganisms were maintained at 4 degrees Centigrade (^{0}C) prior to analysis.

The **air** samples were collected using area sampling methods in each home over a period of 1 to 8 hours. The samples were collected from the room where the infant was reported to have spent the most time. Simulated household activities were done at each home in efforts to uniformly produce conditions suitable to the release of dusts from ventilation systems and household surfaces; these activities included vacuuming carpets, banging furnace ducts, and walking on carpets. The residents of each home

sampled were compensated by the Cleveland Department of Health to leave their residence during sampling when the simulated exposure activities were done. Air samples were collected for total dust, *S.atra* spores, and viable fungi. Air sampling methods are described below:

Total dust samples were collected in air using a 37 millimeter (mm) mixed copolymer filter media with a 0.8 micrometer (µm) pore size. The filter was supported on a back-up pad in an open-face filter cassette. Samples were collected at a flow rate of 3.0 liters per minute (lpm) using a field calibrated personal sampling pump for 6 to 8 hours. Each filter was analyzed gravimetrically before and after sampling using an electrobalance. Sample mass was measured to the nearest 0.01 milligram (mg) and concentrations are presented as milligrams of dust per cubic meter of air (mg/m^3).[2-4]

Airborne S.atra Spores were collected by total dust sampling on 25 mm cellulose ester membrane filters with a 0.8 µm pore size. The filters were supported on a back-up pad in a 25 mm cassette and sampled in an open-face configuration. Samples were collected at a flow rate of 1.0 lpm or 2.0 lpm for a sampling period of approximately 6 to 8 hours. The samples were analyzed for *S. atra* spores by light microscopy.[2,4-7] After sampling, each filter was removed from the filter cassette, cut in half using a knife, positioned on a glass microscope slide, and cleared using acetone flash vaporization. Approximately 3 microliters (µl) of triacetin was added to the top of each filter section and a coverslip was placed over the filter. The outline of the filter section was marked on the glass slide using a glass marking pen. The entire area of each filter section was scanned using brightfield microscopy at approximately 200x magnification to identify the presence of *S.atra* spores. A standard reference slide of *S.atra* spores was prepared to aid in the identification of spores. Spore identification was based on color, shape, morphology, and size. A calibrated ocular scale was used for measuring spore size. Due to the light loading of spores, each filter was evaluated as to the presence or absence of *S.atra* spores. The presence of spores was recorded as PRESENT, POSSIBLE, AND NONE OBSERVED. Each sample was counted blind by two independent microscopists and the results of the two counts were used to make a determination as to the presence or absence of *S.atra* spores in each sample.

Viable fungi in air were collected using two different sampling methods. Samples were collected on 25 mm polycarbonate filters with a 0.8 µm pore size (Filter Methods).[7-10] The filters were supported on a back-up pad in a 25 mm cassette and sampled in an open-face configuration. The samples were collected at a flow rate of approximately 2.0 lpm during a sampling period of approximately 1 hour. Fungi from these filters were studied by serial dilution. Prior to rinsing spores from the filters, the back-up pads were moistened through the filter outlet with 0.5 milliliter (ml) sterile phosphate buffered saline (PBS). A total of 5 ml of sterile PBS containing 0.1% Tween® 80 was added in three portions to the filter inlet and the filter cassettes were shaken on a reciprocal shaking platform for 30 minutes after the first addition of PBS. Fluid was removed between additions and the fluids combined. Recovered fluid levels were reconstituted

to 5 ml before dilution and plating. Diluted filter fluids were plated in 0.1 ml aliquots and spread with a sterile bent glass rod on the following media: rose bengal streptomycin agar (RBS), cellulose agar (CELL), 2% malt extract agar (2M), and dichloran glycerol agar (DG18).[10-13] The plates were then incubated at 24 ^{0}C for 10 days. Colonies were counted on a Quebec colony counter. Fungi observed were classified into the following categories: Total fungi, *Aspergillus*, *Cladosporium*, *Penicillium*, S*tachybotrys*, and other fungi. Concentrations are reported as colony forming units per cubic meter of air sampled (CFU/m^3).[4,10]

Airborne samples for **viable fungi** were also collected from a portion of the homes using the Andersen viable sampler (Impactor Methods). This sampler was operated at a flow rate of 28.3 lpm. Sampling times ranged from approximately 1 to 5 minutes. Media for these samples was prepared by a microbiology laboratory at a Cleveland, Ohio, hospital and consisted of malt extract agar (2% malt extract without glucose or peptone), malt-salt agar (identical to malt extract agar with the addition of 10% NaCl), and cellulose agar. Following incubation, the colonies growing in each sample were enumerated and the concentration of fungi were determined in CFU/m^3.[4,10-16]

Surface samples were collected by scraping materials adhered to household surfaces into sterile centrifuge tubes or plastic bags for microbiological analysis for fungi. Samples were collected from areas of suspected mold growth in each home and returned to the laboratory in Morgantown, West Virginia, for analysis. Serial 10-fold dilutions were prepared after adding 0.5 gram (g) portions of the sample to 49.5 ml PBS containing 0.1% Tween 80. Aliquots of these dilutions were plated as described above except that 2% malt agar was not used. The plates were incubated at 24 ^{0}C for 10 days, the colonies counted, and results expressed as colony forming units per gram of sample material (CFU/g).

Bulk dust samples were collected for mycotoxin analysis. The assays for mycotoxins generally require gram quantities of dust to have quantifiable concentrations of mycotoxin. Several different types of bulk samples were collected as available from each of the homes studied which included particulate adhered to furnace filters, particulate contained inside residential vacuum sweepers bags, and settled particulate on residential surfaces such as porous furnishings, ventilation ducts and vents, drapery, and others. The furnace filters and vacuum sweeper bags were collected and placed in double plastic garbage bags for containment during transit to the laboratory. The furnace filters and vacuum bags were promptly replaced at each residence by the Cleveland Department of Health. The settled dust samples were collected by scraping the particulate into sterile centrifuge tubes or by vacuuming the dust onto a 37 mm cellulose ester filter using a battery operated sampling pump. The furnace filter and vacuum sweeper bag samples were delivered to CDC investigators at the conclusion of the environmental survey to coordinate mycotoxin analysis. The settled dust samples were refrigerated and stored pending subsequent analysis based on the outcome of the analytical results from other bulks (furnace filters or vacuum bags).

RESULTS AND DISCUSSION

Table 1 presents the total dust sampling results in milligrams per cubic meter of air (mg/m^3) for both case and control homes. Each sample is identified by sample date, home code, and sample air volume in cubic meters (m^3). The case homes are indicated by an asterisk following the home code. Table 2 summarizes total dust sampling results by case status. The table presents the mean concentration, standard deviation (STD), geometric mean (GM), geometric standard deviation (GSD), and concentration range. Total dust concentrations measured inside these Cleveland area homes ranged from 0.02 mg/m^3 to a high of 0.27 mg/m^3. The geometric mean concentration from **case** homes was 0.069 mg/m^3 and, from **control** homes, 0.053 mg/m^3. This difference in airborne dust concentrations was not statistically significant ($p>0.011$) by one-way analysis of variance.[17]

Table 3 presents the sampling results for *Stachybotrys atra* spores in air samples. Each sample is identified by sample date, home code, and sample air volume in m^3. The case homes are indicated by an asterisk following the home code. The counting results obtained independently by two microscopists are presented as *S. atra* present = 2, possible = 1, and not present = 0. The sum of the counting results from the two microscopists was used to determine the status of each sample regarding *S. atra* content. *S. atra* was considered present in all samples with a combined score (SUM) of 2 or greater determined by adding the counting results from each microscopists; a determination of *S. Atra* present is indicated by a 'YES' designation in the last table column. Spores of *S. atra* were identified in 19 of the 42 homes sampled. Table 4 summarizes the *S. atra* spore count results by case status. (Please note in Table 3 that some of the infants lived at 2 homes and in these instances, exposure status was determined to be yes if the sample from either home contained *S. atra* spores). *S. atra* spores were identified in 10 of the 12 case home samples (83%) and in 8 of the 27 control homes sampled (30 %). This difference is statistically significant as measured by Chi-square analysis ($p<0.005$). The crude odds ratio for this outcome was 11.9; the 95% conference interval on this odds ratio did not include unity.[18]

Table 5 presents the sampling results for total viable fungi in air samples collected by filter methods. Table 6 presents the sampling results for viable *S. atra* fungi in air by filter methods. Concentrations are reported in CFU/m^3 for each agar type. Each sample is identified by sample number, home code, home case status, and the type of media used. Table 7 provides a summary of the mean airborne concentrations of fungi by case status. Mean concentrations as CFU/m^3 are presented as an average from all types of agar media for several genera of fungal organisms including: *Aspergillus*, *Cladosporium*, *Penicillium*, *S. atra*, and total fungi. The ratio of airborne concentrations of viable fungi in case versus control homes is also provided in the table. Concentrations of viable fungi were generally higher in case homes, as indicated in

Table 7. Total fungal concentrations ranged from below minimum detectable concentrations, (MDC =approximately 70 CFU/m^3 depending on sample volume) to a high of 19,870 CFU/m^3. The average concentration for total fungi was 3,300 CFU/m^3 in case homes and 697 CFU/m^3 in control homes; the ratio of total fungal concentrations in case versus control homes was 4.7. This difference in total airborne fungal concentrations was statistically significant ($p<0.0001$) by one-way analysis of variance.[17] Fungi of the genus *Aspergillus* were the most abundant in the air samples. *Aspergillus* fungal concentrations in air were 1,306 CFU/m^3 in case homes and 444 CFU/m^3 in control homes. *Penicillium*, *Cladosporium*, and *S. atra* fungi were the next most abundant fungal organisms in that order. *S. atra* concentrations ranged from below the LOQ (approximately 70 CFU/m^3) to 641 CFU/m^3. The mean *S. atra* concentration in air samples from case homes was 35.1 CFU/m^3 and 3.78 CFU/m^3 in control homes. The ratio of *S. atra* fungal concentrations in case versus control homes was 9.3. Although, most of the samples were below the LOQ and consequently, there is more uncertainty in these mean results and the associated ratio of means. The difference in airborne S. atra concentrations by case status was statistically significant ($p<0.003$) by one-way analysis of variance on log transformed concentrations and also by a Wilcoxin nonparametric analysis ($p<0.01$).[17] *S. atra* fungi were identified by Filter methods in 5 of 13 case homes (38%) and 4 of 26 control homes (15%) for a crude odds ratio of 3.4. This odds ratio was not considered statistically significant since the 95 percent confidence interval included unity by a simple, unmatched case control design.[18]

Due to the urgency of this HETA work, we were unable to prepare sampling media (agar plates) for the Andersen sampler in advance of the field survey. The local hospital staff that prepared the agar plates for this sampler did not have access to rose bengal or dichloran, agents which are used in the agar to prevent excessive fungal spreading. As a result, many of the Andersen samples were overgrown at analysis; *S. atra* grows slower than many types of fungi and is thereby more susceptible to overgrowth by other fungal organisms. Also, due to limitations in personnel and equipment, Andersen samples were collected at only a portion of the sites included in this study. Consequently, the results from viable fungal air samples collected with the Andersen Viable Sampler are not included in this report.

Table 8 presents the sampling results for viable *S. atra* fungi in surface and bulk samples. Concentrations are reported in CFU/g for each agar type. Each sample is identified in the table by sample number, home code, home case status, and the type of media used. Table 9 provides a summary of the mean concentration of viable surface and bulk fungi by case status. Mean concentrations as CFU/g are presented as an average from all types of agar media for several genera of fungal organisms including: *Aspergillus*, *Cladosporium*, *Penicillium*, *S. atra*, and total fungi. The ratio of surface concentrations of viable fungi in case versus control homes is also provided in the table.

The mean concentration of total fungal organisms in case homes was 26,345,000 CFU/g and 19,185,000 CFU/g in control homes for a ratio of 1.4. Surface concentrations of *Aspergillus* and *Cladosporium* fungi were higher in control homes as contrasted to case homes. In striking contrast to this, *S. atra* fungi were much more abundant in the samples from case versus control homes with a ratio of 156. Although, most of the samples were below the LOQ and consequently, there is more uncertainty in these mean results and the associated ratio of means. The mean concentration of S. atra in surface samples collected in case homes was 10,587,000 CFU/g and in the control homes 68,000 CFU/g. This difference was statistically significant by one-way analysis of variance on log transformed concentrations ($p<0.03$) and also by a Wilcoxin nonparametric analysis.($p< 0.04$) .[17]

CONCLUSIONS

Fungal organisms including *S. atra* were present at quantifiable concentrations in the air and on surfaces in some Cleveland area homes sampled during the December 1994 to April 1995 sampling frame. Those homes with cases of acute pulmonary hemorrhage (the case homes) had higher concentrations of total airborne fungi. Significantly higher concentrations of *S. atra* fungi were quantified in the air and on home surfaces of case homes by both viable and nonviable bioaerosol sampling methods. Collectively, these data suggest that those infants with hemosiderosis were exposed to higher concentrations of fungi including *S. atra* in their home environment. Environmental health control recommendations to address potential exposure hazards from fungi including *S. atra* in these residential settings will be coordinated through the CDC, NCEH, and the Cleveland Department of Health.

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1. The Centers for Disease Control and Prevention, National Center for Environmental Health.
2. The Cleveland Department of Health.

This report will serve to close-out this health hazard evaluation for the National Center for Environmental Health.

TABLE 1
TOTAL DUST CONCENTRATIONS
CONCENTRATIONS IN mg/m^3

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National Center for Environmental Health

SAMPLE	DATE	HOME	VOLUME (m^3)	CONC (mg/m^3)
22891	12-15-94	19	1.17	0.08
22879	12-15-94	16	1.05	0.04
22864	12-14-94	5*	1.10	0.10
22886	12-14-94	50*	1.30	0.05
22862	12-15-94	43*	1.33	0.08
22900	12-14-94	1*	1.44	0.05
22865	12-15-94	41	1.70	0.03
22908	12-14-94	38	1.11	0.05
22888	12-14-94	35	1.25	0.07
22869	12-14-94	34	1.10	0.06
22878	12-15-94	13	1.35	0.06
22896	12-15-94	25	1.19	0.08
22881	12-15-94	26	1.04	0.04
22861	12-14-94	15	1.09	0.07
22887	12-15-94	28		VOID
22877	12-15-94	7*	1.28	0.05
22906	12-14-94	12	1.13	0.03
22904	12-14-94	39*	1.07	0.07
22894	12-15-94	42	1.09	0.06
22860	12-14-94	36	1.08	0.07
22892	12-14-94	24	0.95	0.13
22902	12-14-94	23	1.07	0.05
22882	12-15-94	37		VOID
22871	12-14-94	18	1.08	0.02
22899	12-14-94	10	0.99	0.08
22889	12-14-94	33	1.24	0.06
22876	12-16-94	32	1.21	0.07
22863	12-17-94	52	1.30	0.04
22893	12-16-94	4*	1.40	0.06

TABLE 1 (Continued)

TOTAL DUST CONCENTRATIONS
CONCENTRATIONS IN mg/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	DATE	HOME	VOLUME (m^3)	CONC (mg/m^3)
22895	12-16-94	6*	1.02	0.06
22872	12-16-94	51	1.13	0.04
22903	12-16-94	20	0.99	0.05
22868	12-16-94	22	1.31	0.05
22909	12-16-94	11	1.07	0.07
22897	12-16-94	53	1.14	0.04
22874	12-22-94	3*	1.10	0.12
22873	1-6-95	054B*	1.00	0.06
22901	1-6-95	54A*	1.16	0.02
22880	1-26-95	55A*	0.41	0.27
85	4-27-95	57A*	0.93	0.08

mg/m^3 =Milligrams per cubic meter of air.
* = indicates the case homes.

TABLE 2
MEAN TOTAL DUST CONCENTRATIONS BY CASE STATUS
CONCENTRATIONS IN mg/m^3

HETA 95-0160
National Center for Environmental Health

STATUS	N	MEAN	STD	GM	GSD	MIN	MAX
CASE	13	0.082	0.06	0.069	1.81	0.02	0.27
CONTROL	25	0.057	0.02	0.053	1.50	0.02	0.13

N=Number of samples, STD=standard deviation, GM=Geometric mean, GSD=Geometric Standard Deviation.

TABLE 3
***STACHYBOTRYS ATRA* SPORE COUNTS FROM AIR SAMPLES**

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National Center for Environmental Health

SAMPLE	DATE	HOME	VOLUME (m^3)	COUNT #1	COUNT #2	SUM	STATUS
53	12-15-94	19	0.39	1	2	3	YES
46	12-15-94	16	0.35	1	0	1	NO
6	12-14-94	5*	0.37	2	2	4	YES
11	12-14-94	50*	0.43	0	1	1	NO
10	12-15-94	43*	0.44	1	1	2	YES
19	12-14-94	1*	0.48	2	2	4	YES
47	12-15-94	41	0.57	0	1	1	NO
9	12-14-94	38	0.37	0	1	1	NO
16	12-14-94	35	0.42	0	0	0	NO
4	12-14-94	34	0.37	0	0	0	NO
50	12-15-94	13	0.45	1	2	3	YES
48	12-15-94	25	0.40	0	1	1	NO
39	12-15-94	26	0.35	0	0	0	NO
15	12-14-94	15	0.36	0	1	1	NO
1	12-15-94	28	--	0	0	0	NO
30	12-15-94	7*	0.43	2	2	4	YES
14	12-14-94	12	0.38	0	0	0	NO
7	12-14-94	39*	0.36	0	2	2	YES
31	12-15-94	42	0.36	0	1	1	NO
12	12-14-94	36	0.36	1	0	1	NO
5	12-14-94	24	0.32	1	1	2	YES
2	12-14-94	23	0.36	0	0	0	NO
33	12-15-94	37	--	1	2	3	YES
8	12-14-94	18	0.36	0	0	0	NO
18	12-14-94	10	0.33	0	2	2	YES
13	12-14-94	33	0.41	0	0	0	NO
24	12-16-94	32	0.40	1	1	2	YES
42	12-16-94	52	0.43	1	2	3	YES

TABLE 3 (Continued)
***STACHYBOTRYS ATRA* SPORE COUNTS FROM AIR SAMPLES**

HETA 95-0160
National Center for Environmental Health

SAMPLE	DATE	HOME	VOLUME (m^3)	COUNT #1	COUNT #2	SUM	STATUS
43	12-16-94	4*	0.47	1	1	2	YES
29	12-16-94	6*	0.34	0	1	1	NO
40	12-16-94	51	0.38	0	0	0	NO
44	12-16-94	20	0.33	0	0	0	NO
45	12-16-94	22	0.44	0	2	2	YES
49	12-16-94	11	0.36	0	0	0	NO
37	12-16-94	53	0.37	0	0	0	NO
34	12-22-94	3*	0.37	0	2	2	YES
22	1-6-95	54A*	0.77	0	0	0	NO
32	1-6-95	54B*	0.66	1	1	2	YES
38	1-26-95	55A*	0.72	0	1	1	NO
25	1-26-95	55B*	0.82	2	2	4	YES
94038	4-27-95	57A*	0.37	--	2	2	YES
26	2-21-95	57B*	0.33	2	2	4	YES

* = indicates the case homes

STATUS = Classification as to the presence of *S. atra* based on the counting results from two microscopists. For each microscopist, a count of 0 = *S. atra* not present, 1 = possibly present, and 2 = present as determined from the evaluation of a one-half filter section. The overall STATUS is determined by the sum of the scores from both microscopists and a sum of 2 or more is recorded as YES, *S. atra* present.

TABLE 4
***STACHYBOTRYS ATRA* SPORES IN CASE AND CONTROL HOMES**

HETA 95-0160
National Center for Environmental Health

	CASE	CONTROL
S. ATRA DETECTED	10	8
S. ATRA NOT DETECTED	2	19

CRUDE ODDS RATIO = AD/BC = (10 x 19)/(8 x 2) = 11.9
CONFIDENCE INTERVAL (95%) = 1.99 TO 71.7

TABLE 5
AIRBORNE FUNGAL CONCENTRATIONS BY FILTER METHODS
CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	TOTAL FUNGI[1]
CA39	1	Y	2M	1666.7
CA39	1	Y	CELL	333.3
CA39	1	Y	DG18	2555.6
CA39	1	Y	RBS	1555.6
CA45	1	Y	2M	1555.6
CA45	1	Y	CELL	555.6
CA45	1	Y	DG18	2888.9
CA45	1	Y	RBS	2555.6
CA35	3	Y	2M	1388.9
CA35	3	Y	CELL	648.1
CA35	3	Y	DG18	1018.5
CA35	3	Y	RBS	2500
CA40	3	Y	2M	648.1

TABLE 5 (Continued)
AIRBORNE FUNGAL CONCENTRATIONS BY FILTER METHODS
CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	TOTAL FUNGI[1]
CA40	3	Y	CELL	833.3
CA40	3	Y	DG18	1111.1
CA40	3	Y	RBS	2037
CA26	4	Y	2M	384.6
CA26	4	Y	CELL	0
CA26	4	Y	DG18	512.8
CA26	4	Y	RBS	256.4
CA32	5	Y	2M	1388.9
CA32	5	Y	CELL	694.4
CA32	5	Y	DG18	416.7
CA32	5	Y	RBS	1250
CA43	5	Y	2M	555.6
CA43	5	Y	CELL	416.7
CA43	5	Y	DG18	416.7
CA43	5	Y	RBS	694.4
CA16	6	Y	2M	317.5
CA16	6	Y	CELL	79.4
CA16	6	Y	DG18	79.4
CA16	6	Y	RBS	396.8
CA27	6	Y	2M	0
CA27	6	Y	CELL	0
CA27	6	Y	DG18	158.7
CA27	6	Y	RBS	79.4
CA2	7	Y	2M	2000
CA2	7	Y	CELL	444.4
CA2	7	Y	DG18	1222.2
CA2	7	Y	RBS	1111.1
CA25	7	Y	2M	1333.3

TABLE 5 (Continued)
AIRBORNE FUNGAL CONCENTRATIONS BY FILTER METHODS
CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	TOTAL FUNGI[1]
CA25	7	Y	CELL	888.9
CA25	7	Y	DG18	1333.3
CA25	7	Y	RBS	1555.6
CA13	10	N	2M	126.3
CA13	10	N	CELL	0
CA13	10	N	DG18	0
CA13	10	N	RBS	151.5
CA37	10	N	2M	0
CA37	10	N	CELL	0
CA37	10	N	DG18	25.3
CA37	10	N	RBS	50.5
1214	11	N	2M	0
1214	11	N	CELL	0
1214	11	N	DG18	208.3
1214	11	N	RBS	625
CA8	12	N	2M	0
CA8	12	N	CELL	0
CA8	12	N	DG18	138.9
CA8	12	N	RBS	138.9
CA48	13	N	2M	2361.1
CA48	13	N	CELL	1388.9
CA48	13	N	DG18	3194.4
CA48	13	N	RBS	1944.4
CA1	16	N	2M	2272.7
CA1	16	N	CELL	1363.6
CA1	16	N	DG18	2424.2
CA1	16	N	RBS	1969.7
CA12	18	N	2M	416.7

TABLE 5 (Continued)
AIRBORNE FUNGAL CONCENTRATIONS BY FILTER METHODS
CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	TOTAL FUNGI[1]
CA12	18	N	CELL	277.8
CA12	18	N	DG18	694.4
CA12	18	N	RBS	416.7
CA24	19	N	2M	0
CA24	19	N	CELL	0
CA24	19	N	DG18	666.7
CA24	19	N	RBS	0
CA30	20	N	2M	0
CA30	20	N	CELL	277.8
CA30	20	N	DG18	277.8
CA30	20	N	RBS	0
1213	22	N	2M	694.4
1213	22	N	CELL	416.7
1213	22	N	DG18	555.6
1213	22	N	RBS	694.4
CA38	23	N	2M	0
CA38	23	N	CELL	0
CA38	23	N	DG18	46.9
CA38	23	N	RBS	0
CA36	24	N	2M	769.2
CA36	24	N	CELL	128.2
CA36	24	N	DG18	769.2
CA36	24	N	RBS	769.2
CA46	25	N	2M	1500
CA46	25	N	CELL	0
CA46	25	N	DG18	833.3
CA46	25	N	RBS	666.7
CA47	26	N	2M	92.6

TABLE 5 (Continued)
AIRBORNE FUNGAL CONCENTRATIONS BY FILTER METHODS
CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	TOTAL FUNGI[1]
CA47	26	N	CELL	0
CA47	26	N	DG18	0
CA47	26	N	RBS	0
CA49	28	N	2M	714.3
CA49	28	N	CELL	238.1
CA49	28	N	DG18	714.3
CA49	28	N	RBS	476.2
CA14	32	N	2M	277.8
CA14	32	N	CELL	138.9
CA14	32	N	DG18	0
CA14	32	N	RBS	0
CA11	33	N	2M	301.2
CA11	33	N	CELL	60.2
CA11	33	N	DG18	120.5
CA11	33	N	RBS	261
CA42	34	N	2M	119
CA42	34	N	CELL	119
CA42	34	N	DG18	119
CA42	34	N	RBS	238.1
CA7	35	N	2M	105.5
CA7	35	N	CELL	63.3
CA7	35	N	DG18	105.5
CA7	35	N	RBS	84.4
CA29	36	N	2M	2179.5
CA29	36	N	CELL	2307.7
CA29	36	N	DG18	2948.7
CA29	36	N	RBS	2564.1
CA5	37	N	2M	277.8

TABLE 5 (Continued)
AIRBORNE FUNGAL CONCENTRATIONS BY FILTER METHODS
CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	TOTAL FUNGI[1]
CA5	37	N	CELL	0
CA5	37	N	DG18	416.7
CA5	37	N	RBS	277.8
CA18	38	N	2M	6111.1
CA18	38	N	CELL	2500
CA18	38	N	DG18	6527.8
CA18	38	N	RBS	7083.3
CA31	39	Y	2M	10384.6
CA31	39	Y	2M	10256.4
CA31	39	Y	CELL	4871.8
CA31	39	Y	CELL	6410.3
CA31	39	Y	DG18	8717.9
CA31	39	Y	DG18	13461.5
CA31	39	Y	RBS	11282.1
CA31	39	Y	RBS	13461.5
CA6	39	Y	2M	15256.4
CA6	39	Y	2M	13461.5
CA6	39	Y	CELL	4487.2
CA6	39	Y	CELL	0
CA6	39	Y	DG18	13333.3
CA6	39	Y	DG18	8974.4
CA6	39	Y	RBS	12435.9
CA6	39	Y	RBS	19871.8
CA22	41	N	2M	0
CA22	41	N	CELL	0
CA22	41	N	DG18	138.9
CA22	41	N	RBS	0
CA44	42	N	2M	897.4

TABLE 5 (Continued)
AIRBORNE FUNGAL CONCENTRATIONS BY FILTER METHODS
CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	TOTAL FUNGI[1]
CA44	42	N	CELL	256.4
CA44	42	N	DG18	384.6
CA44	42	N	RBS	128.2
CA21	43	N	2M	238.1
CA21	43	N	CELL	119
CA21	43	N	DG18	357.1
CA21	43	N	RBS	476.2
CA41	50	Y	2M	0
CA41	50	Y	CELL	104.2
CA41	50	Y	DG18	104.2
CA41	50	Y	RBS	208.3
CA9	50	Y	2M	520.8
CA9	50	Y	CELL	312.5
CA9	50	Y	DG18	312.5
CA9	50	Y	RBS	208.3
1216	51	N	2M	277.8
1216	51	N	CELL	138.9
1216	51	N	DG18	138.9
1216	51	N	RBS	277.8
1235	52	N	2M	925.9
1235	52	N	CELL	1203.7
1235	52	N	DG18	2314.8
1235	52	N	RBS	1296.3
1249	53	N	2M	119
1249	53	N	CELL	0
1249	53	N	DG18	0
1249	53	N	RBS	0
CA20	0054A	Y	2M	0

TABLE 5 (Continued)
AIRBORNE FUNGAL CONCENTRATIONS BY FILTER METHODS
CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	TOTAL FUNGI[1]
CA20	0054A	Y	CELL	222.2
CA20	0054A	Y	DG18	222.2
CA20	0054A	Y	RBS	0
CA23	0054A	Y	2M	111.1
CA23	0054A	Y	CELL	111.1
CA23	0054A	Y	DG18	111.1
CA23	0054A	Y	RBS	222.2
CA15	0054B	Y	2M	8055.6
CA15	0054B	Y	2M	7870.4
CA15	0054B	Y	CELL	4537
CA15	0054B	Y	CELL	6018.5
CA15	0054B	Y	DG18	10092.6
CA15	0054B	Y	DG18	11111.1
CA15	0054B	Y	RBS	9907.4
CA15	0054B	Y	RBS	10185.2
CA28	0054B	Y	2M	11574.1
CA28	0054B	Y	2M	10185.2
CA28	0054B	Y	CELL	5648.1
CA28	0054B	Y	CELL	6481.5
CA28	0054B	Y	DG18	11481.5
CA28	0054B	Y	DG18	7407.4
CA28	0054B	Y	RBS	10277.8
CA28	0054B	Y	RBS	12037
1233	0055A	Y	2M	1222.2
1233	0055A	Y	CELL	444.4
1233	0055A	Y	DG18	2444.4
1233	0055A	Y	RBS	666.7
1258	0055A	Y	2M	666.7

TABLE 5 (Continued)
AIRBORNE FUNGAL CONCENTRATIONS BY FILTER METHODS
CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	TOTAL FUNGI[1]
1258	0055A	Y	CELL	111.1
1258	0055A	Y	DG18	888.9
1258	0055A	Y	RBS	555.6
1208	0055B	Y	2M	370.4
1208	0055B	Y	CELL	277.8
1208	0055B	Y	DG18	1111.1
1208	0055B	Y	RBS	370.4
1225	0055B	Y	2M	1481.5
1225	0055B	Y	CELL	740.7
1225	0055B	Y	DG18	1759.3
1225	0055B	Y	RBS	1111.1

[1] Concentrations below the lower limit of Quantification, approximately 70 CFU/m^3, are recorded as 0.
CFU/m^3=Colony forming units per cubic meter of air.

TABLE 6
***S. ATRA* CONCENTRATIONS BY FILTER METHODS**
AIR CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/m^3)[1]
CA39	1	Y	2M	444.4
CA39	1	Y	CELL	0
CA39	1	Y	DG18	0
CA39	1	Y	RBS	333.3
CA45	1	Y	2M	222.2
CA45	1	Y	CELL	111.1
CA45	1	Y	DG18	0
CA45	1	Y	RBS	111.1
CA35	3	Y	2M	0
CA35	3	Y	CELL	0
CA35	3	Y	DG18	0
CA35	3	Y	RBS	0
CA40	3	Y	2M	0
CA40	3	Y	CELL	0
CA40	3	Y	DG18	0
CA40	3	Y	RBS	0
CA26	4	Y	2M	0
CA26	4	Y	CELL	0
CA26	4	Y	DG18	0
CA26	4	Y	RBS	128.2
CA32	5	Y	2M	277.8
CA32	5	Y	CELL	0
CA32	5	Y	DG18	0
CA32	5	Y	RBS	277.8
CA43	5	Y	2M	0
CA43	5	Y	CELL	0
CA43	5	Y	DG18	0
CA43	5	Y	RBS	138.9

TABLE 6 (Continued)
***S. ATRA* CONCENTRATIONS BY FILTER METHODS**
AIR CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/m^3)[1]
CA16	6	Y	DG18	0
CA16	6	Y	RBS	0
CA27	6	Y	2M	0
CA27	6	Y	CELL	0
CA27	6	Y	DG18	0
CA27	6	Y	RBS	0
CA2	7	Y	2M	0
CA2	7	Y	CELL	0
CA2	7	Y	DG18	0
CA2	7	Y	RBS	0
CA25	7	Y	2M	0
CA25	7	Y	CELL	0
CA25	7	Y	DG18	0
CA25	7	Y	RBS	0
CA13	10	N	2M	0
CA13	10	N	CELL	0
CA13	10	N	DG18	0
CA13	10	N	RBS	25.3
CA37	10	N	2M	0
CA37	10	N	CELL	0
CA37	10	N	DG18	0
CA37	10	N	RBS	0
1214	11	N	2M	0
1214	11	N	CELL	0
1214	11	N	DG18	0
1214	11	N	RBS	0
CA8	12	N	2M	0
CA8	12	N	CELL	0

TABLE 6 (Continued)
***S. ATRA* CONCENTRATIONS BY FILTER METHODS**
AIR CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/m^3)[1]
CA8	12	N	DG18	0
CA8	12	N	RBS	0
CA48	13	N	2M	0
CA48	13	N	CELL	138.9
CA48	13	N	DG18	0
CA48	13	N	RBS	0
CA1	16	N	2M	0
CA1	16	N	CELL	0
CA1	16	N	DG18	0
CA1	16	N	RBS	151.5
CA12	18	N	2M	0
CA12	18	N	CELL	0
CA12	18	N	DG18	0
CA12	18	N	RBS	0
CA24	19	N	2M	0
CA24	19	N	CELL	0
CA24	19	N	DG18	0
CA24	19	N	RBS	0
CA30	20	N	2M	0
CA30	20	N	CELL	0
CA30	20	N	DG18	0
CA30	20	N	RBS	0
1213	22	N	2M	0
1213	22	N	CELL	0
1213	22	N	DG18	0
1213	22	N	RBS	0
CA38	23	N	2M	0
CA38	23	N	CELL	0

TABLE 6 (Continued)
***S. ATRA* CONCENTRATIONS BY FILTER METHODS**
AIR CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/m^3)[1]
CA38	23	N	DG18	0
CA38	23	N	RBS	0
CA36	24	N	2M	0
CA36	24	N	CELL	0
CA36	24	N	DG18	0
CA36	24	N	RBS	0
CA46	25	N	2M	0
CA46	25	N	CELL	0
CA46	25	N	DG18	0
CA46	25	N	RBS	0
CA47	26	N	2M	0
CA47	26	N	CELL	0
CA47	26	N	DG18	0
CA47	26	N	RBS	0
CA49	28	N	2M	0
CA49	28	N	CELL	0
CA49	28	N	DG18	0
CA49	28	N	RBS	0
CA14	32	N	2M	0
CA14	32	N	CELL	0
CA14	32	N	DG18	0
CA14	32	N	RBS	0
CA11	33	N	2M	0
CA11	33	N	CELL	0
CA11	33	N	DG18	0
CA11	33	N	RBS	0
CA42	34	N	2M	0
CA42	34	N	CELL	0

TABLE 6 (Continued)
***S. ATRA* CONCENTRATIONS BY FILTER METHODS**
AIR CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/m^3)[1]
CA42	34	N	DG18	0
CA42	34	N	RBS	0
CA7	35	N	2M	0
CA7	35	N	CELL	0
CA7	35	N	DG18	0
CA7	35	N	RBS	0
CA29	36	N	2M	0
CA29	36	N	CELL	0
CA29	36	N	DG18	0
CA29	36	N	RBS	0
CA5	37	N	2M	0
CA5	37	N	CELL	0
CA5	37	N	DG18	0
CA5	37	N	RBS	0
CA18	38	N	2M	0
CA18	38	N	CELL	0
CA18	38	N	DG18	0
CA18	38	N	RBS	0
CA31	39	Y	2M	0
CA31	39	Y	2M	0
CA31	39	Y	CELL	128.2
CA31	39	Y	CELL	0
CA31	39	Y	DG18	0
CA31	39	Y	DG18	0
CA31	39	Y	RBS	512.8
CA31	39	Y	RBS	641
CA6	39	Y	2M	0
CA6	39	Y	2M	0

TABLE 6 (Continued)
***S. ATRA* CONCENTRATIONS BY FILTER METHODS**
AIR CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/m^3)[1]
CA6	39	Y	CELL	256.4
CA6	39	Y	CELL	0
CA6	39	Y	DG18	0
CA6	39	Y	DG18	0
CA6	39	Y	RBS	256.4
CA6	39	Y	RBS	0
CA22	41	N	2M	0
CA22	41	N	CELL	0
CA22	41	N	DG18	0
CA22	41	N	RBS	0
CA44	42	N	2M	0
CA44	42	N	CELL	0
CA44	42	N	DG18	0
CA44	42	N	RBS	0
CA21	43	N	2M	0
CA21	43	N	CELL	0
CA21	43	N	DG18	0
CA21	43	N	RBS	0
CA41	50	Y	2M	0
CA41	50	Y	CELL	0
CA41	50	Y	DG18	0
CA41	50	Y	RBS	0
CA9	50	Y	2M	0
CA9	50	Y	CELL	0
CA9	50	Y	DG18	0
CA9	50	Y	RBS	0
1216	51	N	2M	0
1216	51	N	CELL	0

TABLE 6 (Continued)
***S. ATRA* CONCENTRATIONS BY FILTER METHODS**
AIR CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/m^3)[1]
1216	51	N	DG18	0
1216	51	N	RBS	0
1235	52	N	2M	0
1235	52	N	CELL	0
1235	52	N	DG18	0
1235	52	N	RBS	92.6
1249	53	N	2M	0
1249	53	N	CELL	0
1249	53	N	DG18	0
1249	53	N	RBS	0
CA20	0054A	Y	2M	0
CA20	0054A	Y	CELL	0
CA20	0054A	Y	DG18	0
CA20	0054A	Y	RBS	0
CA23	0054A	Y	2M	0
CA23	0054A	Y	CELL	0
CA23	0054A	Y	DG18	0
CA23	0054A	Y	RBS	0
CA15	0054B	Y	2M	0
CA15	0054B	Y	2M	0
CA15	0054B	Y	CELL	0
CA15	0054B	Y	CELL	0
CA15	0054B	Y	DG18	0
CA15	0054B	Y	DG18	0
CA15	0054B	Y	RBS	0
CA15	0054B	Y	RBS	0
CA28	0054B	Y	2M	0
CA28	0054B	Y	2M	0

TABLE 6 (Continued)
***S. ATRA* CONCENTRATIONS BY FILTER METHODS**
AIR CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/m^3)[1]
CA28	0054B	Y	CELL	0
CA28	0054B	Y	CELL	0
CA28	0054B	Y	DG18	0
CA28	0054B	Y	DG18	0
CA28	0054B	Y	RBS	0
CA28	0054B	Y	RBS	0
1233	0055A	Y	2M	0
1233	0055A	Y	CELL	0
1233	0055A	Y	DG18	0
1233	0055A	Y	RBS	0
1258	0055A	Y	2M	0
1258	0055A	Y	CELL	0
1258	0055A	Y	DG18	0
1258	0055A	Y	RBS	0
1208	0055B	Y	2M	0
1208	0055B	Y	CELL	92.6
1208	0055B	Y	DG18	0
1208	0055B	Y	RBS	0
1225	0055B	Y	2M	0
1225	0055B	Y	CELL	0
1225	0055B	Y	DG18	0
1225	0055B	Y	RBS	0

[1] Concentrations below the lower limit of Quantification, approximately 70 CFU/m^3, are recorded as 0.
CFU/m^3=Colony forming units per cubic meter of air.

TABLE 7
AIRBORNE FUNGAL CONCENTRATIONS BY CASE STATUS USING FILTER METHODS
CONCENTRATIONS IN CFU/m^3

HETA 95-0160
National Center for Environmental Health

ORGANISM	STATUS	SAMPLES	MEAN	STD	MIN	MAX	CASE/CONTROL
ASPERGILLUS	CASE	112	1306	1976	ND	8333	2.9
	CONTROL	108	444	985	ND	5416	
CLADOSPORIUM	CASE	112	126	391	ND	2564	5.1
	CONTROL	108	24.9	71.0	ND	417	
PENICILLIUM	CASE	112	1012	1569	ND	7051	8.6
	CONTROL	108	117	271	ND	1667	
STACHYBOTRYS ATRA	CASE	112	35.1	107	ND	641	9.3
	CONTROL	108	3.78	21.6	ND	151	
OTHER FUNGI	CASE	108	814	1647	ND	7051	7.6
	CONTROL	112	107	179	ND	769	
TOTAL FUNGI	CASE	112	3300	4562	ND	7083	4.7
	CONTROL	108	697	1256	ND	19870	

CFU/m^3 =Colony forming units per cubic meter of air.
ND=Below lower limit of Quantification, approximately 70 CFU/m^3.

TABLE 8
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
1	1	Y	CELL	23300
2	1	Y	CELL	167000
3	1	Y	CELL	117000000
4	1	Y	CELL	0
5	1	Y	CELL	10000
1	1	Y	DG18	0
2	1	Y	DG18	0
3	1	Y	DG18	180000000
4	1	Y	DG18	0
5	1	Y	DG18	0
1	1	Y	RBS	33300
2	1	Y	RBS	0
3	1	Y	RBS	133000000
4	1	Y	RBS	0
5	1	Y	RBS	3330
3	3	Y	CELL	0
4	3	Y	CELL	0
5	3	Y	CELL	0
6	3	Y	CELL	0
8	3	Y	CELL	0
9	3	Y	CELL	0
10	3	Y	CELL	0
11	3	Y	CELL	0
12	3	Y	CELL	0
3	3	Y	DG18	0
4	3	Y	DG18	0
5	3	Y	DG18	0
6	3	Y	DG18	0
8	3	Y	DG18	0
9	3	Y	DG18	0
10	3	Y	DG18	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
3	3	Y	RBS	0
4	3	Y	RBS	0
5	3	Y	RBS	0
6	3	Y	RBS	0
8	3	Y	RBS	0
9	3	Y	RBS	0
10	3	Y	RBS	0
11	3	Y	RBS	0
12	3	Y	RBS	0
101	5	Y	CELL	0
102	5	Y	CELL	0
2	5	Y	CELL	0
3	5	Y	CELL	0
4	5	Y	CELL	393000000
101	5	Y	DG18	0
102	5	Y	DG18	0
2	5	Y	DG18	0
3	5	Y	DG18	0
4	5	Y	DG18	770000000
101	5	Y	RBS	0
102	5	Y	RBS	0
2	5	Y	RBS	0
3	5	Y	RBS	0
4	5	Y	RBS	537000000
3	7	Y	CELL	0
4	7	Y	CELL	0
5	7	Y	CELL	0
6	7	Y	CELL	0
7	7	Y	CELL	0
8	7	Y	CELL	0
9	7	Y	CELL	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
3	7	Y	DG18	0
4	7	Y	DG18	0
5	7	Y	DG18	0
6	7	Y	DG18	0
7	7	Y	DG18	0
8	7	Y	DG18	0
9	7	Y	DG18	0
3	7	Y	RBS	0
4	7	Y	RBS	0
5	7	Y	RBS	0
6	7	Y	RBS	0
7	7	Y	RBS	0
8	7	Y	RBS	0
9	7	Y	RBS	0
1	10	N	CELL	0
1	10	N	CELL	333000
1	10	N	DG18	0
1	10	N	RBS	0
1	12	N	CELL	0
2	12	N	CELL	0
3	12	N	CELL	0
3	12	N	CELL	0
1	12	N	DG18	0
2	12	N	DG18	0
3	12	N	DG18	0
1	12	N	RBS	0
2	12	N	RBS	0
3	12	N	RBS	0
3	12	N	RBS	0
1	13	N	CELL	0
2	13	N	CELL	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
3	13	N	CELL	0
4	13	N	CELL	667000
5	13	N	CELL	0
6	13	N	CELL	0
7	13	N	CELL	0
1	13	N	DG18	0
2	13	N	DG18	0
3	13	N	DG18	0
4	13	N	DG18	0
5	13	N	DG18	0
6	13	N	DG18	0
7	13	N	DG18	0
1	13	N	RBS	0
2	13	N	RBS	0
3	13	N	RBS	0
4	13	N	RBS	0
5	13	N	RBS	0
6	13	N	RBS	0
7	13	N	RBS	0
1	15	N	CELL	2000000
2	15	N	CELL	0
1	15	N	DG18	0
2	15	N	DG18	0
1	15	N	RBS	667000
2	15	N	RBS	0
1	16	N	CELL	0
2	16	N	CELL	6670
3	16	N	CELL	1770000
4	16	N	CELL	0
5	16	N	CELL	200000
1	16	N	DG18	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
2	16	N	DG18	0
3	16	N	DG18	0
4	16	N	DG18	0
5	16	N	DG18	0
1	16	N	RBS	6670
2	16	N	RBS	0
3	16	N	RBS	5230000
4	16	N	RBS	3330
5	16	N	RBS	167000
1	23	N	CELL	0
2	23	N	CELL	0
3	23	N	CELL	33300
4	23	N	CELL	0
1	23	N	DG18	0
2	23	N	DG18	0
3	23	N	DG18	0
4	23	N	DG18	0
1	23	N	RBS	0
2	23	N	RBS	0
3	23	N	RBS	0
4	23	N	RBS	0
1	24	N	CELL	0
2	24	N	CELL	0
3	24	N	CELL	33300
4	24	N	CELL	0
5	24	N	CELL	0
6	24	N	CELL	0
1	24	N	DG18	0
2	24	N	DG18	0
3	24	N	DG18	0
4	24	N	DG18	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
5	24	N	DG18	0
6	24	N	DG18	0
1	24	N	RBS	0
2	24	N	RBS	0
3	24	N	RBS	0
4	24	N	RBS	0
5	24	N	RBS	0
6	24	N	RBS	0
1	26	N	CELL	0
1	26	N	DG18	0
1	26	N	RBS	0
A	28	N	CELL	0
B	28	N	CELL	0
C	28	N	CELL	0
D	28	N	CELL	0
E	28	N	CELL	0
F	28	N	CELL	3330000
G	28	N	CELL	0
H	28	N	CELL	0
I	28	N	CELL	0
A	28	N	DG18	0
B	28	N	DG18	0
C	28	N	DG18	0
D	28	N	DG18	0
E	28	N	DG18	0
F	28	N	DG18	0
G	28	N	DG18	0
H	28	N	DG18	0
I	28	N	DG18	0
A	28	N	RBS	0
B	28	N	RBS	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
C	28	N	RBS	0
D	28	N	RBS	0
E	28	N	RBS	0
F	28	N	RBS	0
G	28	N	RBS	0
H	28	N	RBS	0
I	28	N	RBS	0
1	33	N	CELL	0
2	33	N	CELL	0
1	33	N	DG18	0
2	33	N	DG18	0
1	33	N	RBS	0
2	33	N	RBS	0
1	34	N	CELL	0
2	34	N	CELL	0
3	34	N	CELL	0
4	34	N	CELL	0
1	34	N	DG18	0
2	34	N	DG18	0
3	34	N	DG18	0
4	34	N	DG18	0
1	34	N	RBS	0
2	34	N	RBS	0
3	34	N	RBS	0
4	34	N	RBS	0
1	35	N	CELL	0
2	35	N	CELL	0
3	35	N	CELL	0
1	35	N	DG18	0
2	35	N	DG18	0
3	35	N	DG18	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
1	35	N	RBS	0
2	35	N	RBS	0
3	35	N	RBS	0
1	36	N	CELL	6670
2	36	N	CELL	333000
3	36	N	CELL	0
4	36	N	CELL	0
5	36	N	CELL	0
6	36	N	CELL	0
7	36	N	CELL	0
8	36	N	CELL	0
9	36	N	CELL	0
1	36	N	DG18	0
2	36	N	DG18	0
3	36	N	DG18	0
4	36	N	DG18	0
5	36	N	DG18	0
6	36	N	DG18	0
7	36	N	DG18	0
8	36	N	DG18	0
9	36	N	DG18	0
1	36	N	RBS	0
2	36	N	RBS	0
3	36	N	RBS	0
4	36	N	RBS	0
5	36	N	RBS	0
6	36	N	RBS	0
7	36	N	RBS	0
8	36	N	RBS	0
9	36	N	RBS	0
1	37	N	CELL	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
2	37	N	CELL	0
3	37	N	CELL	0
4	37	N	CELL	0
5	37	N	CELL	0
6	37	N	CELL	0
1	37	N	DG18	0
2	37	N	DG18	0
3	37	N	DG18	0
4	37	N	DG18	0
5	37	N	DG18	0
6	37	N	DG18	0
1	37	N	RBS	0
2	37	N	RBS	0
3	37	N	RBS	0
4	37	N	RBS	0
5	37	N	RBS	0
6	37	N	RBS	0
1	38	N	CELL	0
2	38	N	CELL	0
1	38	N	DG18	0
2	38	N	DG18	0
1	38	N	RBS	0
2	38	N	RBS	0
1	39	Y	CELL	0
2	39	Y	CELL	0
1	39	Y	DG18	0
2	39	Y	DG18	0
1	39	Y	RBS	0
2	39	Y	RBS	0
1	41	N	CELL	0
1	41	N	DG18	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
1	41	N	RBS	0
1	42	N	CELL	26700
2	42	N	CELL	333000
3	42	N	CELL	0
1	42	N	DG18	0
2	42	N	DG18	0
3	42	N	DG18	0
1	42	N	RBS	0
2	42	N	RBS	333000
3	42	N	RBS	0
1	43	Y	CELL	0
2	43	Y	CELL	0
3	43	Y	CELL	0
1	43	Y	DG18	0
2	43	Y	DG18	0
3	43	Y	DG18	0
1	43	Y	RBS	0
2	43	Y	RBS	0
3	43	Y	RBS	0
1	50	Y	CELL	33300
2	50	Y	CELL	0
3	50	Y	CELL	0
4	50	Y	CELL	0
5	50	Y	CELL	0
1	50	Y	DG18	0
2	50	Y	DG18	0
3	50	Y	DG18	0
4	50	Y	DG18	0
5	50	Y	DG18	0
1	50	Y	RBS	0
2	50	Y	RBS	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
3	50	Y	RBS	0
4	50	Y	RBS	0
5	50	Y	RBS	0
A	53	N	CELL	10000
B	53	N	CELL	0
C	53	N	CELL	3330
D	53	N	CELL	33300
E	53	N	CELL	0
F	53	N	CELL	10000
G	53	N	CELL	0
A	53	N	DG18	0
B	53	N	DG18	0
C	53	N	DG18	0
D	53	N	DG18	0
E	53	N	DG18	0
F	53	N	DG18	0
G	53	N	DG18	0
A	53	N	RBS	0
B	53	N	RBS	0
C	53	N	RBS	0
D	53	N	RBS	0
E	53	N	RBS	0
F	53	N	RBS	0
G	53	N	RBS	0
1	0054A	Y	CELL	133000
2	0054A	Y	CELL	1670000
3	0054A	Y	CELL	267000
1	0054A	Y	DG18	0
2	0054A	Y	DG18	0
3	0054A	Y	DG18	0
1	0054A	Y	RBS	100000

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
2	0054A	Y	RBS	667000
3	0054A	Y	RBS	0
1	0054B	Y	CELL	0
2	0054B	Y	CELL	0
3	0054B	Y	CELL	0
4	0054B	Y	CELL	0
5	0054B	Y	CELL	100000
6	0054B	Y	CELL	1630000
7	0054B	Y	CELL	367000
8	0054B	Y	CELL	5670000
9	0054B	Y	CELL	11700000
1	0054B	Y	DG18	0
2	0054B	Y	DG18	0
3	0054B	Y	DG18	0
4	0054B	Y	DG18	0
5	0054B	Y	DG18	0
6	0054B	Y	DG18	0
7	0054B	Y	DG18	0
8	0054B	Y	DG18	0
9	0054B	Y	DG18	0
1	0054B	Y	RBS	0
2	0054B	Y	RBS	0
3	0054B	Y	RBS	0
4	0054B	Y	RBS	0
5	0054B	Y	RBS	800000
6	0054B	Y	RBS	2930000
7	0054B	Y	RBS	367000
8	0054B	Y	RBS	78300000
9	0054B	Y	RBS	19700000
1	0055A	Y	CELL	0
2	0055A	Y	CELL	3330

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
3	0055A	Y	CELL	0
5	0055A	Y	CELL	0
1	0055A	Y	DG18	0
2	0055A	Y	DG18	0
3	0055A	Y	DG18	0
5	0055A	Y	DG18	0
1	0055A	Y	RBS	0
2	0055A	Y	RBS	0
3	0055A	Y	RBS	0
5	0055A	Y	RBS	0
2	0055B	Y	CELL	0
3	0055B	Y	CELL	3330
4	0055B	Y	CELL	0
2	0055B	Y	DG18	0
3	0055B	Y	DG18	0
4	0055B	Y	DG18	0
2	0055B	Y	RBS	0
3	0055B	Y	RBS	13300
4	0055B	Y	RBS	0
1	0057A	Y	CELL	23300
2	0057A	Y	CELL	0
3	0057A	Y	CELL	66700
4	0057A	Y	CELL	0
5	0057A	Y	CELL	0
6	0057A	Y	CELL	0
7	0057A	Y	CELL	0
8	0057A	Y	CELL	333000
9	0057A	Y	CELL	0
10	0057A	Y	CELL	0
11	0057A	Y	CELL	0
12	0057A	Y	CELL	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
13	0057A	Y	CELL	0
1	0057A	Y	DG18	0
2	0057A	Y	DG18	0
3	0057A	Y	DG18	0
4	0057A	Y	DG18	0
5	0057A	Y	DG18	0
6	0057A	Y	DG18	0
7	0057A	Y	DG18	0
8	0057A	Y	DG18	0
9	0057A	Y	DG18	0
10	0057A	Y	DG18	0
11	0057A	Y	DG18	0
12	0057A	Y	DG18	0
13	0057A	Y	DG18	0
1	0057A	Y	RBS	0
2	0057A	Y	RBS	0
3	0057A	Y	RBS	0
4	0057A	Y	RBS	0
5	0057A	Y	RBS	0
6	0057A	Y	RBS	0
7	0057A	Y	RBS	0
8	0057A	Y	RBS	0
9	0057A	Y	RBS	0
10	0057A	Y	RBS	0
11	0057A	Y	RBS	0
12	0057A	Y	RBS	0
13	0057A	Y	RBS	0
1	0057B	Y	CELL	0
2	0057B	Y	CELL	3330
3	0057B	Y	CELL	33300
1	0057B	Y	DG18	0

TABLE 8 (Continued)
***S. ATRA* CONCENTRATIONS IN SURFACE SAMPLES**
CONCENTRATIONS IN CFU/g

HETA 95-0160
National Center for Environmental Health

SAMPLE	HOME	CASE	MEDIA	*S. ATRA* (CFU/g)[1]
2	0057B	Y	DG18	0
3	0057B	Y	DG18	0
1	0057B	Y	RBS	0
2	0057B	Y	RBS	0
3	0057B	Y	RBS	0

[1] Concentrations below the lower limit of Quantification, approximately 165 CFU/g, are recorded as 0.
CFU/g=Colony forming units per gram of material.

TABLE 9
SURFACE FUNGAL CONCENTRATIONS BY CASE STATUS
CONCENTRATION IN THOUSANDS OF CFU/g

HETA 95-0160
National Center for Environmental Health

ORGANISM	STATUS	N	MEAN (CFU/g x 10^3)	STD (x 10^3)	MIN	MAX (x 10^3)	CASE/ CONTROL
ASPERGILLUS	CASE	213	2,886	19,009	ND	180,000	0.8
	CONTROL	228	3,593	11,959	ND	83,300	
CLASOSPORIUM	CASE	213	1,217	6,130	ND	41,700	0.2
	CONTROL	228	6,943	48,900	ND	678,300	
PENICILLIUM	CASE	213	1,341	4,890	ND	43,300	1.6
	CONTROL	228	843	2,950	ND	26,400	
STACHYBOTRYS	CASE	142	10,587	71,449	ND	770,000	156
	CONTROL	153	68	450	ND	5,233	
OTHER FUNGI	CASE	213	10,314	31,900	ND	250,000	1.3
	CONTROL	228	7,738	29,746	ND	270,000	
TOTAL	CASE	213	26,345	80,200	ND	770,000	1.4
	CONTROL	228	19,185	65,400	ND	740,000	

CFU/g= colony forming units per gram of surface or bulk material.
ND= Below the lower limit of Quantification, approximately 165 CFU/g.