Brief Report

A Large Case-series of Successful Treatment of Patients Exposed to Mold and Mycotoxin

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ABSTRACT

Purpose: The goal of this study was to present the results of treatment of 100 chemically sensitive and chronically mold-exposed patients, who continued to be disabled even after decontamination of their houses or work places or they were physically removed from their sources of mold.

Methods: Molds were identified, serum anti-mold immunoglobulin G antibodies were measured, patients were skin-tested, immunologic abnormalities were recorded, and objective neurologic tests were performed in a subset of patients.

Findings: Patient sensitivities and exposures were confirmed by measuring serum immunoglobulin G anti-mold antibodies, intradermal skin testing, and trichothecene toxin breakdown products in the urine. Patients were positive (44%–98%) for individual molds. Abnormalities in T and B cells were found in >80% of patients. Respiratory signs were present in 64% of all patients, and physical signs and symptoms of neurologic dysfunction were present in 70%. Objective autonomic nervous system test results were abnormal in almost 100% of patients tested. Objective neuropsychological evaluations were conducted in 46 of the patients who exhibited symptoms of neurologic impairment and showed typical abnormalities in short-term memory, executive function/judgment, concentration, and hand/eye coordination. Patients (N = 100) with documented mold exposure were divided into 3 groups: (1) those who improved easily, with mold avoidance and antigen injections; (2) those who improved after desensitization to their mold antigens plus additional mycotoxin antigens; and (3) those who had their regular mold antigens, additional mycotoxin antigens, along with regimens that included sauna, oxygen therapy, and nutrients. Approximately 85% of all patients cleared completely; 14% had partial improvement, and 1% remained unchanged.

Implications: Exposure to molds has been increasingly recognized as a major reason for patients presenting with multiple organ symptoms that could not otherwise be explained. Early diagnosis and appropriate treatment could be very successful. (*Clin Ther*. 2018;40:889–893) © 2018 Published by Elsevier HS Journals, Inc.

Key words: immunologic, mold, mycotoxins, neurologic, sauna.

INTRODUCTION

Molds and mycotoxins have been increasingly associated with illnesses due to faulty construction, water leaks, floods, and other forms of moisture accumulation that allow them to grow indoors.[1] Visual and odor inspections, as well as spore counts and culture plates, can be used to determine the level of contamination in a building.[2,3] When houses and buildings were considered to have molds, measurements for the content of molds and mycotoxins confirmed the suspicion.[4,5]

Although there are thousands of molds, a few were chosen for the present study for diagnosis and treatment because of their commonality and propensity to create sensitivity and health problems in humans.[6] These include the molds designated in mold mixes 1 through 4 shown in Table I and were those found in mold counts sampled in the air, especially in Texas and the surrounding states.

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Table I. Common mold mixtures used for desensitization.

Mold mix #1: *Alternaria, Aspergillus niger-fumigatus, Hormodendrum*
Mold mix #2: *Epicoccum, Fusarium, Pulluraria*
Mold mix #3: *Mucor, Phoma, Fomes, Rhodotorula*
Mold mix #4: *Cephalosporium, Helminthosporium, Stemphylium, Geotrichum*

PATIENTS AND METHODS

A total of 100 patients (61 female subjects, 39 male subjects; age range, 21–78 years; mean age, 44.3 years) were studied at the Environmental Health Center–Dallas (Dallas, Texas) from 2003 to 2013. Many of the procedures used were reported previously.[7] Dwellings were analyzed for the presence of mold by an independent investigator. All patients had to vacate their homes at least 1 week before testing and during treatment.

Signs and symptoms were recorded by the author at presentation and subsequent visits as noted. Immune abnormalities were evaluated for T4- and T8-cell counts, performed by using flow cytometry. Immunoglobulins to mold were assayed as previously reported by Vojdani et al.[8] Mold and mycotoxin sensitivity was confirmed by positive skin test results.[9] Urine trichothecenes were measured by using the Croft method.[10] Delayed recall antigens were measured 48 hours' postinjection to assess cell-mediated immunity by using the Multi-Test II kits supplied by Lincoln Diagnostics, Inc (Decatur, Illinois).[11]

The autonomic nervous system was evaluated according to the pupillography method of Ishikawa et al[12] and by the heart rate variability method of Terechtchenko et al.[13] Neuropsychological tests were performed and analyzed as reported previously.[7] Due to financial constraints, patients were not retested after treatment.

Desensitization was conducted by using select mold antigens, dissolved in normal sterile saline without any preservatives (Table I). The antigens were immediately frozen and thawed only when used.

Testing was performed in mold-free rooms outfitted with special filters and constructed with walls and ceilings of sand fused on steel at 2000° F (porcelain) and ceramic floors (Figure). Patients discontinued any medications or supplements before they were tested. Objective signs were recorded within 10 minutes of skin provocation as described previously.[7] A serial antigen dilution of 1/5, 1/25, 1/125, 1/625, or 1/300 was used to determine the correct antigen dose. Antigens were then combined for the individualized treatment dose administered every 4 to 7 days. Histamine was used as a positive control. Intradermal testing reactivity varied from 44% to 98% positive results.

A sauna lasting 10 to 30 minutes daily was used for patients in group 3 to detoxify the body faster.

RESULTS

Symptoms

Patients presented with a multitude of symptoms: (1) immunologic symptoms (hypersensitivity to molds, foods, and chemicals) in l00%; (2) neurologic symptoms (short-term memory loss, imbalance, and dizziness) in 70%; (3) respiratory symptoms (ie, sneezing, rhinorrhea, nasal stuffiness, dyspnea, wheezing) in 64%; (4) musculoskeletal symptoms (ie, muscle and joint aches and tenderness) in 29%; (5) gastrointestinal symptoms (ie, bloating, gas, cramps) in 24%; and (6) cardiovascular symptoms (ie, bruising, hemoptysis, petechiae) in 10%.

Mold Exposure

Results of the indoor mold cultures are given in Table II. Most patients reacted to at least 4 molds. The remaining patients were also positive for the

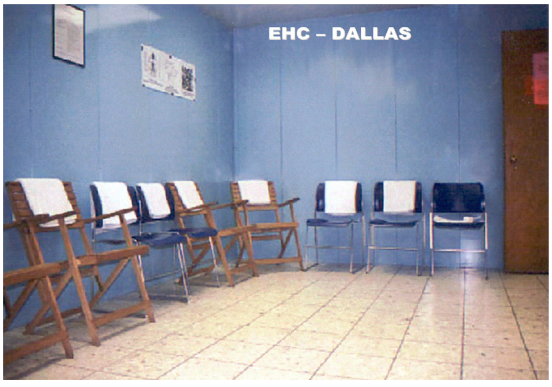

Figure. This room (all porcelain sand fused on steel at 2000°F, ceramic and nontoxic grout, and hardwood) was used for intradermal challenge. EHC = Environmental Health Center–Dallas.

Table II. Indoor mold cultures.

Rhizopus	*Curvularia* species
Sporobolomyces	*Cladosporium herbarum*
Trichoderma	*Cladosporium fulvum*
Stachybotrys	*Streptomyces*
Monilia Soto	Penicillin
Drechslera	
Aspergillus mix (greater numbers of other species than fumigatu)	

Ascomycetes molds *Leptosphaeria* (98%) and *Phaeosphaeria* (98%). For subgroups of patients studied, intradermal test results were positive for certain mycotoxins (Table III): aflatoxin in 21 (79%) of 27 patients; trichothecene in 25 (100%) of 25; and *Fusarium* in 22 (91 %) of 24. As a comparison, 30 patients (aged 21–60 years) were selected for moderate sensitivity to molds. Of these patients, 20% were positive to intradermal tests for molds and 1% were positive to the mycotoxins.

Serum Mold Antibody Assays

The serum mold antibody results correlated with positive intradermal skin test results in 25% of patients. However, between positive urine mycotoxins and positive trichothecene serum, antibodies were present in 98% of the 78 patients studied.

White Blood Cell Counts

CD4 counts were low in 32% and high in 40% of patients. CD8 counts were low in 22% of patients and high in 11%.

Cell-mediated Immunity

Delayed antigen recall (*Proteus*, tuberculin, *Candida, Streptococcus, Staphylococcus*, diphtheria, and tetanus) was positive for ≤3 fewer antigens in 59 (71%) of 83 patients measured.

Table III. Mycotoxins.

Aflatoxin
Fusaric acid
Trichothecene
Gliotoxin
Ochratoxin

Evaluation of Autonomic Nervous System Function

There were abnormalities in 87.9% of the patients studied, primarily in the speed of reaction to light and heart rate. These findings suggest autonomic nervous system dysfunction.

Neurocognitive Data

Mild to moderate deficits occurred in 55% of patients, primarily on measures of executive function, psychomotor problem-solving, and incidental memory using the Halstead-Reitan Neuropsychological Test Battery. Results of the Wechsler Memory Scale–Third Edition were within normal limits except for mild impairments in visual memory.

Treatment Results

Group A patients (25%) cleared with mold avoidance and intradermal antigen administration every 4 days for 3 months. Group B patients (25%) cleared with the approach used for group A plus administration of an additional group of antigens (Table I) every 4 days (self-administered) for 3 months. Group C patients (25%) who had mycotoxins in their urine continued with injections of additional antigens every day for 18 months. Group D comprised the most difficult to treat patients: 20% required continuous treatment for ≥18 months, and 5% did not improve.

DISCUSSION

In our experience with treating >10,000 patients over the last 30 years,[15–20] early diagnosis and treatment are critical for the successful improvement of patients exposed to mold and mycotoxins.[21] Mold avoidance and antigen intradermal treatment is the first line of defense and seems to provide sufficient relief in the majority of patients.

Another important factor in a successful treatment outcome is the response of the immune system to the antigen injections. However, in many patients, there was T-cell deficiency or poor function, requiring gamma globulin supplementation before they cleared.[14] In certain cases, oxygen treatment, along with intravenous and oral nutrient therapy, was also needed. Nevertheless, treatment is specific for each

individual and requires exact strengths and amounts of antigen derived from the intradermal skin testing. Increasing doses may be necessary for better results.

Unfortunately, reliable technology to effectively quantitate mycotoxin exposure and virulence is presently unavailable[22] Neurologic involvement from mold/mycotoxin exposure was evidenced not only by abnormal physical findings but also by the abnormal results in objective neurofunctional measurements. The neurologic involvement seen in our patient series has been reported by other investigators.[23]

Even though 1 type of mold (*Stachybotrys*) and 1 class of mycotoxins (trichothecene) seemed primarily involved in these patients, a load of other, even nonpathogenic molds, could also have detrimental effects. A high correlation was seen between the number of molds to which a patient was exposed (4+ per patient) and the number of positive skin test results (44%–98%).

There are obviously a number of limitations in the present study. First, the patients varied considerably in the length of exposure and extent of symptoms; second, there was no control intervention; and third, there were no follow-up objective measurements.

CONCLUSIONS

Patients exposed to molds and mycotoxins evaluated by using various means were shown to have both subjective and objective abnormalities. Most patients were treated successfully with avoidance and desensitization. Increased awareness of the potential detrimental effects of exposure to molds, better means of detection, and prompt treatment could significantly improve the health of most patients.

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CONFLICTS OF INTEREST

Dr. Rea has indicated that he has no conflicts of interest regarding the content of this article.

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