Mold and Human Allergies

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Outline

• Molds
  • Overview
  • Species relevant to humans
  • Health effects on humans
  • Allergens
• Allergic Effects on humans
  • Allergic responses in humans
  • Specific responses in humans
  • Medical evaluation
  • Treatment
Overview

- 50,000 to 250,000 species of fungi
- Small fraction have human health effects
- Primary human health effect is as allergens
- < 200 are human infectious pathogens
Species Relevant to Humans

- Outdoor
  - Allergens
    - *Cladosporium, Alternaria*
  - Other
    - *Blastomyces, Coccidioides, Cryptococcus, Histoplasma*

- Indoor
  - Allergens
    - *Penicillium, Aspergillus*
  - Other
    - *Aspergillus*
Health Effects on Humans

- Allergy
- Asthma
- Allergic bronchopulmonary aspergillosis (ABPA)
- Hypersensitivity pneumonitis
- Infection
Allergic Response in Humans

- Epidemiology
- Pathophysiology
- Clinical effects
Epidemiology

- 10% of US population has antibodies to fungal antigens
- Half of these individuals (5% of US population) have clinical illness
- 25% of allergic rhinitis in US is due to fungal allergies
- ~ $2 billion annual cost (direct and indirect) in US due to fungal allergic disease
Pathophysiology

- Allergen is processed by antigen presenting cell
- Allergen stimulates HLA-DR and HLA-DQ lymphocytes in nasal epithelium
- CD4+ cells release cytokines
  - IL-4 and IL-13 are secreted, causing B-lymphocytes to release IgE
  - IL-5 is secreted
- IgE stimulates mast cell secretion of histamine
Clinical Effects

- Allergic Rhinosinusitis
- Asthma
Allergic Rhinosinusitis

- **Symptoms**
  - sneezing, rhinorrhea, itchy nose, itchy eyes, cough, fatigue
- **Signs**
  - allergic salute, infraorbital edema/darkening, mouth breathing, nasal polyps
- **Timing**
  - intermittent, seasonal, perennial
Asthma

- Symptoms
  - shortness of breath, chest tightness, cough
- Signs
  - wheezing, respiratory distress
- Timing
  - intermittent usually
Medical Evaluation: Mold Exposure

- History
- Physical examination
- Specific evaluation
  - Allergy testing
  - Laboratory tests
  - Imaging tests
  - Pulmonary function tests
Mold Effects on Human Health

- Allergic rhinosinusitis
- Asthma
- Allergic bronchopulmonary aspergillosis
- Hypersensitivity pneumonitis
- Infection
Allergic Rhinosinusitis

- History
- Physical examination
  - Including nasal swab
- Testing
  - Allergy (skin) testing
    - prick test
    - intradermal
    - scratch
  - Blood test
    - RAST (radioallergosorbent test)
Skin Testing (Prick)
Skin Testing (Prick)
Asthma

- History
- Physical examination
- Testing
  - Pulmonary function tests
# Spirometry

## Patient Information
- **Name**: DOE, JOHN
- **ID**: 0000000001
- **Age**: 43
- **Height**: 5 ft 9 in
- **Weight**: 170 lbs, BMI 25.2
- **Gender**: MALE
- **Ethnic**: CAUCASIAN
- **Smoker**: NO
- **Asthma**: NO

## Test Information
- **Test Date**: 01/14/2002
- **Test Time**: 10:36am
- **Test Mode**: DIAGNOSTIC
- **Predicted Ref**: NHANES III
- **Value Select**: BEST VALUE
- **Tech ID**: 
- **Automated QC**: ON
- **BTPS (IN/EX)**: -.--/ 1.04

## Test Results

Your FEV1 is 103% Predicted

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Baseline</th>
<th>Best</th>
<th>Trial2</th>
<th>Trial3</th>
<th>Trial4</th>
<th>Pred</th>
<th>%Pred</th>
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</thead>
<tbody>
<tr>
<td>FVC (L)</td>
<td></td>
<td>4.77</td>
<td>4.77</td>
<td>4.64</td>
<td>0.76*</td>
<td>5.05</td>
<td>95</td>
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<tr>
<td>FEV1 (L)</td>
<td></td>
<td>4.10</td>
<td>4.10</td>
<td>3.99</td>
<td>0.53*</td>
<td>3.99</td>
<td>103</td>
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<tr>
<td>FEV1/FVC</td>
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<td>0.86</td>
<td>0.86</td>
<td>0.70</td>
<td>0.79</td>
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<td>PEF (L/min)</td>
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<td>710.77</td>
<td>740.96</td>
<td>41.14*</td>
<td>590.89</td>
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<tr>
<td>FEF25-75 (L/s)</td>
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<td>4.77</td>
<td>4.73</td>
<td>0.40*</td>
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<tr>
<td>FET (s)</td>
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<td>3.73</td>
<td>3.73</td>
<td>5.05</td>
<td>2.76</td>
<td>----</td>
<td>----</td>
</tr>
</tbody>
</table>

* Indicates Below LLN or Significant Post Change

**Baseline**
- FEV1 Var = 0.11L 2.6%;
- FVC Var = 0.13L 2.8%;

**Interpretation**
- Normal Spirometry

**Session Quality**: A
Flow Volume Loop

Legend
--- Baseline Trial 2
* Predicted
Chest X-ray
Allergic Broncholpulmonary Aspergillosis

- History
- Physical examination
- Testing
  - Pulmonary function testing
  - Imaging (serial)
  - IgE antibodies
Hypersensitivity Pneumonitis

- History
- Physical examination
- Testing
  - Pulmonary function testing
  - Imaging
    - Chest x-ray
    - Chest CT scan
  - Hypersensitivity pneumonitis panel
  - Bronchoscopy
Infection

- History
- Physical examination
- Testing
  - Imaging
    - Chest x-ray
    - Chest CT scan
  - Blood work
    - Complete blood count
  - Bronchoscopy
Treatment

• Allergic rhinosinusitis
  • Avoidance of allergens
  • Pharmocotherapy
    • Decongestants
    • Histamine (H₁) blockers
    • Cromolyn sodium
    • Intranasal steroid
  • Immunotherapy
Treatment (in addition to avoidance)

- Asthma
  - inhaled steroids, bronchodilators
- Allergic bronchopulmonary aspergillosis
  - inhaled steroids, bronchodilators
- Hypersensitivity pneumonitis
  - systemic steroids
- Infection
  - antifungal agents
Summary

• Health effects of mold
  • Allergic rhinosinusitis
  • Other
    • Asthma, ABPA, hypersensitivity pneumonitis, infection
• Evaluation
  • History, physical examination, specific testing
• Treatment