The exact mechanism by which molds and particularly mycotoxins induce neurotoxicity is yet unclear. As a result of the assault of mycotoxins on the nervous system and the degenerative process, proteins, which act as antigens to provoke humoral responses in the form of IgG, IgM and IgA, are liberated. It can therefore be said that promising candidates for monitoring neurotoxicity caused by mycotoxins are the presence of autoantibodies against neurotypic and gliotypic proteins.

While the mechanisms have yet to be elucidated, we believe that antibodies against neuron-specific antigens and their cross-reactive epitopes may play a role in the pathogenesis of neurotoxicity induced by mycotoxins.

Immunotoxicity Induced by Molds and Mycotoxins

The exposure of animals to molds has shown a significant effect on the immune system. In animals, this was manifested as increased susceptibility to infectious diseases.It is important to note that almost all mycotoxins have an immunosuppressive effect, although the exact target within the immune system may differ. Many are also cytotoxic, so that they have route of entry effects that may be damaging to the gut, the skin, or the lungs. Such cytotoxicity may affect the physical defense mechanisms of the respiratory tract, decreasing the ability of the airways to clear particular contaminants (including bacteria or viruses). It may also damage alveolar macrophages, thus preventing the clearance of contaminants from the deeper lung cavity.

Studies on the adverse immunological effects of fungal bio-aerosol on individuals were conducted at our laboratory facility and both cellular and humoral immune abnormalities were detected. The cellular abnormalities included abnormal T-cell function, B-cell function, and NK cell activity, as well as abnormal helper-suppressor ratios and cytokine production. Humoral abnormalities were observed in levels of anti-nuclear antibodies, anti-tissue antibodies, anti-neuronal antibodies, anti-thyroid antibodies, anti-adrenal antibodies, rheumatoid factor, immune complexes, C3 and C4 complements, and fungal and mycotoxin antibodies.

Symptomatology of Patients Exposed to Toxigenic Molds

Soon after exposure to molds and their byproducts, patients are most likely to exhibit one of the following neurological and behavioral symptoms: *allergy, blurred vision, fatigue, general cognitive deficits, headache, hyperthyroidism, loss of balance, memory loss, migraine, multiple chemical sensitivity, nausea, nosebleeds, painful lymph nodes, rashes, rhinitis, sinusitis.*

Symptomologies are rather similar to those experienced by patients with Chronic Fatigue Syndrome with a history of exposure to toxic environmental chemicals. Therefore, patients with Chronic Fatigue, Fibromyalgia, and Chemical Sensitivity Syndromes should also be examined for possible exposure to toxigenic molds at the home, as well as work environments.

Symptomatology of Patients Exposed to Toxigenic Molds

- Allergy
- Blurred vision
- Fatigue
- General cognitive deficits
- Headache
- Hyperthyroidism
- Loss of balance
- Memory loss
- Migraine
- Multiple chemical sensitivity
- Nausea
- Nosebleeds
- Painful lymph nodes
- Rashes
- Rhinitis
- Sinusitis

Laboratory Tests

After Exposure to Toxigenic Molds

1. Allergy evaluation by skin or an in-vitro test for the detection of IgE mediated allergies are not enough for patients exposed to toxigenic molds in water-damaged building environments.

2. Depending on the individual immune response to toxigenic mold antigens, some people may respond by producing IgG, while others may produce IgM and IgA antibodies against different fungal antigens.

3. The measurement of IgG, IgM and IgA antibodies against toxigenic mold is necessary for the detection of exposure to mold spore antigens and mycotoxins.

4. Intranasal and enteric exposure to mold antigens and mycotoxins leads to the production of specific IgA antibodies in saliva and other secretions.

5. In addition to IgG, IgM and IgA antibodies in the blood, the measurement of total specific salivary IgA against mold antigens and mycotoxins is necessary in order to increase the sensitivity and specificity of mold exposure detection.

6. Different parameters pertaining to the cellular (T-cell, B-cell, helper/suppressor cell numbers, NK cell activity, T- and B-cell function, apoptosis) and the humoral immune system (immunoglobulins, C3 and C4 complement, immune complexes, ANA, thyroid and other tissue antibodies) should be measured for documentation of immune competency dysfunction in patients exposed to toxigenic molds.

7. Mold antigens and/or mycotoxins can compromise the blood-brain barrier and induce a neurodegenerative process of protein and antigen liberation, provoking IgG, IgM or IgA against different neuronal antigens.

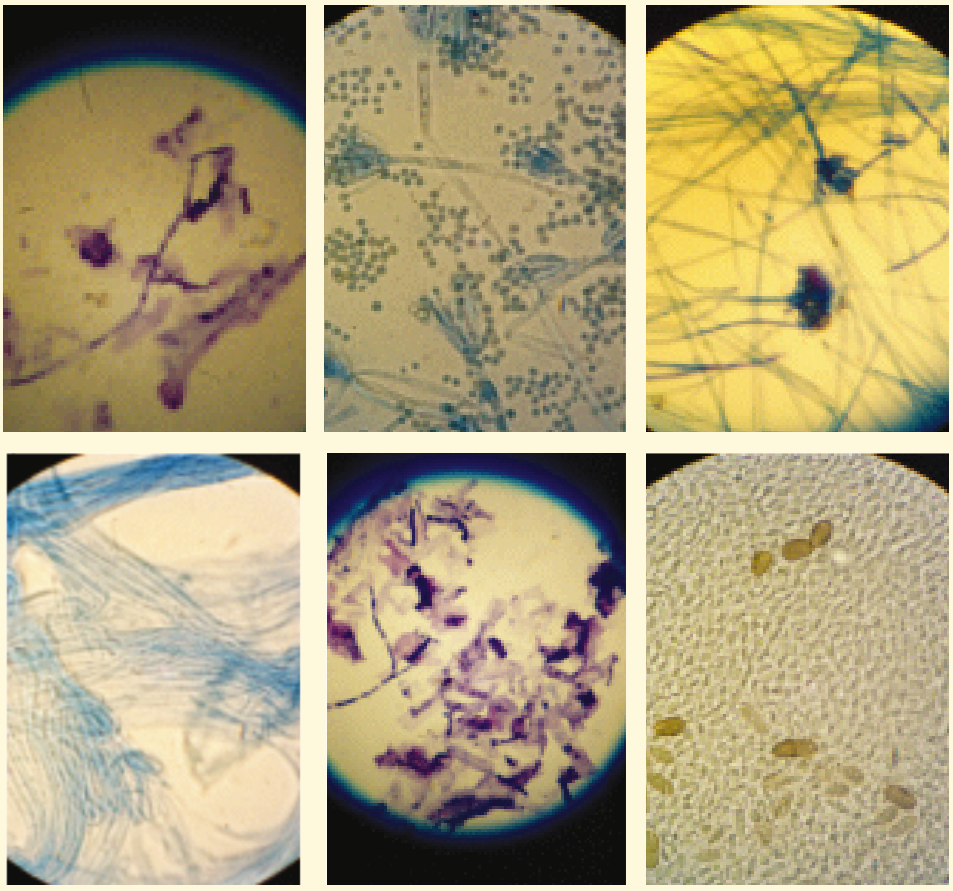
8. Detection of autoantibodies against myelin basic protein (MBP), myelin associated glycoprotein (MAG), gangliosides, sulfatide, chondroitin sulfate, glutamate receptor, cerebellar, Purkinje cells, neuron-axon filament protein, glial fibrillary acidic protein, tubulin, and other neurological antigens, indicating a neurotoxicity process initiated by toxigenic molds, may result in: chronic sensory neuropathy, demyelinating sensorimotor neuropathies or Multiple Sclerosis-Like Syndrome.

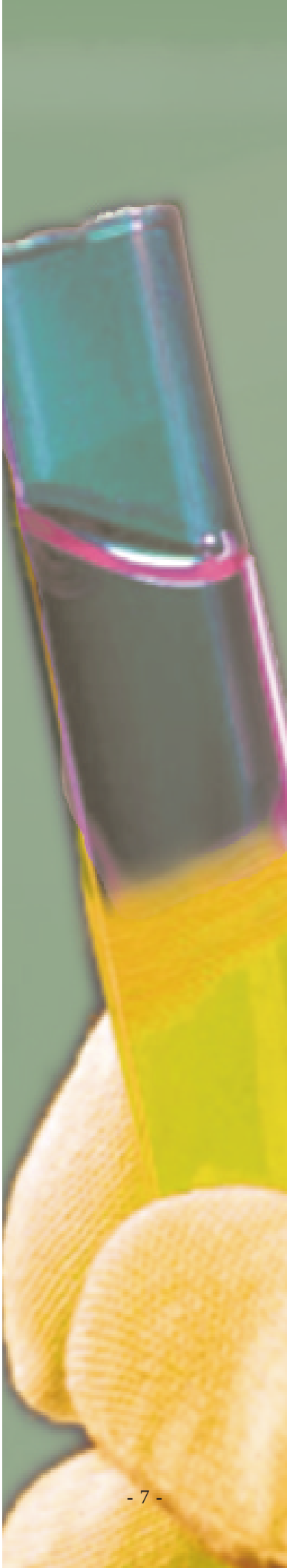
9. Prolonged and intense exposure to toxigenic molds and mycotoxins is associated with disorders of the respiratory and central nervous systems, the mucous membrane, mucosal immunity, as well as cellular and humoral immune dysfunction.

Conclusion

In conclusion, we believe that mold-specific antibodies, when accompanied by mycotoxin antibodies, can indeed be effectively used as biomarkers to assess exposure to molds and mycotoxins. However, appropriate medical history, physical exam, environmental laboratory examination, and documentation of high viable microbial activity by means of testing for mold and mycotoxinsspecific IgG, IgM, IgA and IgE antibodies in blood or saliva, as well as other diagnostic procedures, such as monitoring abnormal immune parameters can assist in the diagnosis of fungal hypersensitivity and non-hypersensitivity reaction. Extraction of the patients from the mold environment and improvements in laboratory testing and in the patient's clinical conditions will be the best strategy for the demonstration of the cause and effect relationship.

Photos of Various Molds





IgG, IgA, IgM and IgE Antibodies in Blood and IgA Antibodies in Saliva Against *Molds and Mycotoxins*

MOLD ANTIBODIES PANEL

IgG, IgM, IgA and IgE Antibodies in Blood and IgA Antibodies in Saliva against the following:

- Alternaria tenuis
- Aspergillus fumigatus
- Aspergillus niger
- Aspergillus versicolor
- Chaetomium globosum
- Cladosporium herbarum
- Epicoccum nigrum
- Geotrichum candidum
- Penicillium notatum
- Phoma herbarum
- Pullularia pullulans
- Rhizopus nigricans
- Rhodotorula glutinis
- Stachybotrys chartarum
- Others by request

** Specimen Requirements: 2ml serum and/or saliva*

MYCOTOXIN ANTIBODIES PANEL

IgG, IgM, IgA and IgE Antibodies in Blood and IgA Antibodies in Saliva against the following:

- Aflatoxin
- Satratoxin-H
- Tricithecene-B
- Cladosporium HSP70
- Aspergillus Hemolysis
- T-2 Toxin
- Mycophenolic Acid
- Alternariol
- Chaetoglobosins 2
- Vomitoxin

** Specimen Requirements: 2ml serum and/or saliva*

MOLECULAR DETECTION OF MOLDS AND BACTERIA [PCR Testing]

- Aspergillus fumigatus
- Aspergillus niger
- Stachybotrys chartarum
- Legionella pneumophila

** Specimen Requirements: 1ml lung secretions*

IMMUNOTOXICOLOGY PANEL

Evaluation of Patients Exposed to Toxigenic Molds and Mycotoxins

- Lymphocyte Subset Analysis
- Natural Killer Cell Cytotoxic Activity
- T- and B-cell Function
- Autoimmune Panel
- Thyroid Antibodies Panel
- Immune Complexes
- C3 and C4 Complement
- Myelin Basic Protein, Neurofilament, Ganglioside and Sulfatide Antibodies
- Total Secretory IgA in Saliva
- IgG, IgM, IgA and IgE Antibodies against the most common Molds
- IgG, IgM, IgA and IgE Antibodies against Mycotoxins
- Salivary IgA Antibodies against Molds & Mycotoxins

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