



**REALTIME**  
**LABORATORIES INC.**

Cutting edge. Breaking barriers.

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*RealTime Laboratories Technical Brief*

**EMMA**

(Environmental Mold & Mycotoxin Assessment)

vs.

**ERMI**

(Environmental Relative Moldiness Index)

**REALTIME LABORATORIES, INC.**

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# All Homes and Buildings Contain Mold

The real question should be which molds. Are they potentially pathogenic (capable of causing disease in immunocompromised patients or diabetics) or toxigenic, producing mycotoxins which may have many deleterious effects on the human body, including being known to cause some cancers. There are currently two primary mold detection methods being used by environmental inspectors to determine mold burden and the need for extensive and expensive remediation: Spore Counts and ERMI (Environmental Relative Moldiness Index).

Spore counts generally give an indication of the mold spore count inside the home compared to outside of the home. It is subject to errors due to factors such as the wind outside, but can give a good indication of inside spore count. This may be important if the occupant is asthmatic or allergic to the mold spores, but for most people it has little meaning. If the test does not tell which mold is present, whether it is toxigenic and whether there are mycotoxins present, it is not a good indicator of the “health hazard” of the home.

The ERMI test was developed by the EPA to assess the water damage history of a home by analyzing the presence of 36 different mold spores: 26 that are found in water damaged homes and 10 that are not. By comparing the counts of the two, an ERMI score is determined which can be low to high. This has become one of the most widely used tests in the environmental mold assessment business and remediation decisions are being made based on the scores.

There are a number of significant problems associated with ERMI.

- It was developed to give a picture of the history of the home, not its current condition
- We have seen ERMI scores that are low, but where the primary organism was *Stachybotrys*, the “Black Mold” that produces the highly toxic macrocyclic trichothecenes. Based on strictly the low ERMI score, the occupant could have a false sense of safety, and continue to breathe the hazardous mycotoxins.
- We have seen high ERMI scores (9.5) where the only organism was *Eurotium*, neither a pathogen nor a toxigenic mold. Unless you are highly allergic to this organism, there would be no reason to spend money on remediation, yet the ERMI score is being used for that purpose in many cases.
- We have seen low ERMI scores where both *Mucor* and *Rhizopus* were detected, both of which can cause a serious illness called Mucormycosis in certain individuals (cancer patients, transplant patients, diabetics)
- ERMI does not measure mycotoxin production, the most critical indicator of potential health hazards in the home.

Even the Office of the Inspector General of the EPA wrote a report entitled “Public may be making indoor mold clean-up decisions based on an EPA tool developed only for research applications” that warned about the use of ERMI score for remediation decisions.

In the assessment of the need for remediation, we go back to the two most critical questions:

- Are the organisms found in the home pathogenic and/or toxigenic?
- What, if any mycotoxins are being produced?

The answer to these cannot be determined by spore counts or ERMI, but can be answered by EMMA. EMMA detects the presence of 10 mold spores that are either toxigenic or pathogenic and assesses the mycotoxin levels using the RTL 15 Mycotoxin test. This one analysis, at a cost similar to ERMI, gives an indication of the hazard of the home better than any test currently being used.

# EMMA

## Environmental Mold and Mycotoxin Assessment

### EXPLANATION GUIDE

Read what the experts have to say

In order to help you understand the results of your EMMA test, information on organisms and/or mycotoxins found are described below along with links to reference sources.

#### ORGANISM

- *Aspergillus fumigatus*
- *Aspergillus flavus*
- *Aspergillus niger*
- *Aspergillus versicolor*
- *Aspergillus ochraceus*
- *Penicillium brevicompactum*
- *Stachybotrys chartarum*
- *Chaetomium globosum*
- *Mucor*
- *Rhizopus*

#### MYCOTOXIN/PATHOGEN

- Gliotoxin
- Aflatoxin
- Ochratoxin
- Sterigmatocystin
- Ochratoxin
- Mycophenolic Acid
- Macrocyclic Trichothecenes
- Chaetoglobosins
- Potential Pathogen
- Potential Pathogen

**Mycotoxins:** World Health Organization (WHO) in its publication: Mycotoxins: Children's Health and the Environment defines mycotoxins as "Natural products produced by fungi that evoke a toxic response when introduced in low concentrations to higher vertebrates by a natural route." *Note:* There is no definition of what "low concentration" means. Also, humans are "higher vertebrates" and inhalation is a "natural route" <http://www.who.int/ceh/capacity/mycotoxins.pdf>

**Aflatoxins:** NIH, National Cancer Institute web site: "Which cancers are associated with exposure to aflatoxins? Exposure to aflatoxins is associated with an increased risk of liver cancer." <https://www.cancer.gov/about-cancer/causes-prevention/risk/substances/aflatoxins>.

**Ochratoxins:** U.S. Department of Health and Human Services 14th Report on Carcinogens (RoC) lists Aflatoxin as "Known to be a Human Carcinogen" and Ochratoxin A as "Reasonably anticipated to be Human Carcinogen". [https://ntp.niehs.nih.gov/ntp/roc/content/listed\\_substances\\_508.pdf](https://ntp.niehs.nih.gov/ntp/roc/content/listed_substances_508.pdf)

**Gliotoxin:** Gliotoxin is an immunosuppressive mycotoxin long suspected to be a potential virulence factor of *Aspergillus fumigatus*. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2043361/>

**Trichothecenes:** CDC Centers for Disease Control and Prevention. Case Definition: Trichothecene Mycotoxin states: "The trichothecene mycotoxins are a group of toxins produced by multiple genera of fungi." They later state: "Systemic symptoms can develop with all routes of exposure (especially inhalation) and might include weakness, ataxia, hypotension, coagulopathy and death." <https://emergency.cdc.gov/agent/trichothecene/casedef.asp>

**Mycophenolic Acid:** Use during pregnancy is associated with increased risks of pregnancy loss and congenital malformations. Females of reproductive potential must be counseled regarding pregnancy prevention and planning. Increased risk of development of lymphoma and other malignancies, particularly of the skin, due to immunosuppression. Increased susceptibility to bacterial, viral, fungal, and protozoal infections, including opportunistic infections. [https://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0045948/#DDIC603035.side\\_effects\\_section](https://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0045948/#DDIC603035.side_effects_section)

**Sterigmatocystin:** Sterigmatocystin is carcinogenic in mice (pulmonary adenocarcinomas) and rats (hepatocellular carcinomas at milligram doses of sterigmatocystin per animal per day for 1 year) following oral administration and is classified as an International Agency for Research on Cancer class 2B carcinogen (i.e., as possibly carcinogenic to humans). <http://aem.asm.org/content/68/8/3886.full>

**Chaetoglobosins:** *Chaetomium globosum*, the most common species within this genus, produces chaetoglobosins A and C when cultured on building material. Relatively low levels of these compounds have been shown to be lethal to various tissue culture cell lines. <https://www.ncbi.nlm.nih.gov/pubmed/17551849>

**Mucor and Rhizopus:** Mucormycosis is a serious infection caused by *Mucor* or *Rhizopus* that typically affects people with weakened immune systems, such as people who have had an organ transplant. Small outbreaks or clusters of Mucormycosis can occur, and CDC usually investigates one to three clusters each year. <https://www.cdc.gov/fungal/diseases/mucormycosis>. *Note:* Gliotoxin, produced by *Aspergillus fumigatus* and Mycophenolic acid, produced by *Penicillium brevicompactum* are both immunosuppressive and can further increase the susceptibility to infection in immunosuppressed individuals.

MOLD	MYCOTOXIN PRODUCED	POTENTIAL HEALTH ISSUES
<i>Aspergillus fumigatus</i>	Gliotoxin	Immunosuppresant.
<i>Aspergillus flavus</i>	Aflatoxin	Can cause liver cancer in humans
<i>Aspergillus niger</i>	Ochratoxin	Suspected carcinogen
<i>Aspergillus versicolor</i>	Sterigmatocystin	Carcinogenic
<i>Aspergillus ochraceus</i>	Ochratoxin	Suspected carcinogen
<i>Penicillium brevicompactum</i>	Mycophenolic acid	Immunosuppresant
<i>Stachybotrys chartarum</i>	Macrocyclic Trichothecenes	Highly toxic to humans
<i>Chaetomium globosum</i>	Chaetoglobosins	Toxic to mammalian cells
<i>Mucor</i>	Potential Pathogen	Can cause Mucormycosis
<i>Rhizopus</i>	Potential Pathogen	Can cause Mucormycosis

## About RealTime Laboratories

- Only CAP and CLIA lab in the US accredited to perform Mycotoxin testing on human clinical samples.
- Test validation reports have been published in peer reviewed journals (11).
- Largest test panel of Mycotoxins with 15 of the most common Mycotoxins detected.
- Patented test for Macrocyclic Trichothecenes, considered to be the most toxic Trichothecenes and generally more toxic than simple Trichothecenes.
- Experience. Over 12 years in business, performing over 100,000 Mycotoxin tests.
- Scientific Committee includes world renowned experts in Mold and Mycotoxins.
- Numerous peer reviewed scientific publications and conference presentations on mold and Mycotoxins from RTL medical team and scientific committee.
- Reporting values (ppb) conform to standards used by FDA, WHO, CDC.
- Will bill insurance companies on behalf of patients.
- Accepts Medicare.



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10/13/2016 15:35

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QUAD MYCOTOXIN PANEL REPORT FORM

Customer:

Location:

Accession No:

Date of Service: 9/27/2016

Collected: 9/23/2016

Date of Report: 9/28/2016

Specimen: Env-Dust

Procedure:

TYPE: Ochratoxin A (Procedure by ELISA).  
TYPE: Aflatoxin Group (B1,B2,G1,G2) (Procedure by ELISA).  
TYPE: Tricothecene Group (Macrocyclic) (Procedure by ELISA).  
TYPE: Gliotoxin Derivative(Procedure by ELISA).

Test Results:

Code	Test	Specimen	Value	Result	Not Present if less than	Equivocal if between	Present if greater or equal
D8501	Ochratoxin A	Env-Dust	>10 ppb	Present	1.8 ppb	1.8-2.0 ppb	2.0 ppb
D8502	Aflatoxin Group	Env-Dust	1.762 ppb	Present	0.8 ppb	0.8-1.0 ppb	1.0 ppb
D8503	Tricothecene Group	Env-Dust	4.46 ppb	Present	0.18 ppb	0.18-0.2 ppb	0.2 ppb
D8510	Gliotoxin Derivative	Env-Dust	7.579 ppb	Present	0.5 ppb	0.5-1.0 ppb	1.0 ppb

Project: Tielking  
supply duct (in furnace room)-dust/debris

**Effective September 23, 2016, Gliotoxin Derivative analytic Result Ranges have changed. Please review as your Result may have changed.**

Initials:     JSS    

*Disclaimer: This test was developed and its performance characteristics determined by RealTime Lab. It has not been cleared or approved by the U.S. Food and Drug Administration. The FDA has determined that such clearance or approval is not necessary. This laboratory is certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA-88) as qualified to perform high complexity clinical laboratory testing.*

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Client: RealTime Laboratories, Inc.  
4100 Fairway Drive #600  
Carrollton, TX 75010

Attn: S Muralidhar, Ph.D.

Project:

Location: Supply Duct - Furnace

Sample size: 1.5 mL

EMSL Reference: 611601502

Date Received: 10/10/2016

Date Analyzed: 10/12/2016

Date Reported: 10/13/2016

## Rapid Detection of Molds by Quantitative PCR

based on USA EPA SOP MERB-020, EMSL Test: M050

Sample Number	Species Identification	Spores E. in Sample	Spores E./mL
1	<i>Aspergillus flavus</i>	None Detected	None Detected
	<i>Aspergillus fumigatus</i>	None Detected	None Detected
	<i>Aspergillus niger</i>	35	24
	<i>Aspergillus ochraceus</i>	24	16
	<i>Aspergillus versicolor</i>	227	151
	<i>Chaetomium globosum</i>	333	222
	<i>Mucor and Rhizopus group</i>	23	15
	<i>Penicillium brevicompactum</i>	None Detected	None Detected
	<i>Rhizopus stolonifer</i>	None Detected	None Detected
	<i>Stachybotrys chartarum</i>	7	5

EMSL maintains liability limited to cost of analysis. Interpretation of the data contained in this report is the responsibility of the client. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. The above test report relates only to the items tested. EMSL bears no responsibility for sample collection activities or analytical method limitations.

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