



A Brand New Urine Test for Mycotoxin Exposure

Mycotoxins: A Major Cause of Many Chronic Illnesses

Mycotoxins are some of the most prevalent toxins in the environment. Mycotoxins are metabolites produced by fungi like mold, which can infest buildings, vehicles, and foodstuffs. A majority of mycotoxin exposures are through food ingestion or airborne exposure. In the European Union, 20% of all grains harvested have been found to be contaminated with mycotoxins. Unfortunately, mycotoxins are resistant to heat and many processing procedures.

Fungi are able to grow on almost any surface, especially if the environment is warm and wet. Inner wall materials of buildings, wall paper, fiber glass insulation, ceiling tiles, and gypsum support are all good surfaces for fungi to colonize. These fungi then release mycotoxins into the environment causing symptoms of many different chronic diseases. Diseases and symptoms linked to mycotoxin exposure include fever, pneumonia-like symptoms, heart disease, rheumatic disease, asthma, sinusitis, cancer, memory loss, vision loss, chronic fatigue, skin rashes, depression, ADHD, anxiety, and liver damage. With our new GPL-MycotoX Profile, we can identify mycotoxin exposures and make recommendations for detoxification treatments that have been effective.

Advantages of the GPL-MycotoX Profile

- GPL-MycotoX screens for seven different mycotoxins, from four species of mold, in one urine sample.
- GPL-MycotoX is the most comprehensive and competitively priced mycotoxin test available.
- GPL-MycotoX uses the power of advanced mass spectrometry (MS/MS), which is necessary to detect lower levels of these fungal toxins. This test is optimal for follow up testing to ensure that detoxification therapies have been successful.
- GPL-MycotoX pairs perfectly with the Organic Acids Test (OAT), GPL-TOX (Toxic Non-Metal Chemical Profile), Phospholipase A₂ Activity Test, and the Glyphosate Test. This gives you comprehensive testing to assess exposure to common environmental toxins and the damage that can be caused by this exposure, all at a great value, and all from one urine sample.



Markers in the GPL-MycoTOX Profile

Aflatoxin M1 (AFM1)

Aflatoxin M1 (AFM1) is the main metabolite of aflatoxin B1, which is a mycotoxin produced by the mold species *Aspergillus*. Aflatoxins are some of the most carcinogenic substances in the environment. Aflatoxin susceptibility is dependent on multiple different factors such as age, sex, and diet. Aflatoxin can be found in beans, corn, rice, tree nuts, wheat, milk, eggs, and meat. In cases of lung aspergilloma, aflatoxin has been found in human tissue specimens. Aflatoxin can cause liver damage, cancer, mental impairment, abdominal pain, hemorrhaging, coma, and death. Aflatoxin has been shown to inhibit leucocyte proliferation. Clinical signs of aflatoxicosis are non-pruritic macular rash, headache, gastrointestinal dysfunction (often extreme), lower extremity edema, anemia, and jaundice. The toxicity of Aflatoxin is increased in the presence of Ochratoxin and Zearalenone.

Ochratoxin A (OTA)

Ochratoxin A (OTA) is a nephrotoxic, immunotoxic, and carcinogenic mycotoxin. This chemical is produced by molds in the *Aspergillus* and *Penicillium* families. Exposure is primarily through contaminated foods such as cereals, grape juices, dairy, spices, wine, dried vine fruit, and coffee. Exposure to OTA can also come from inhalation exposure in water-damaged buildings. OTA can lead to kidney disease and adverse neurological effects. Studies have shown that OTA can cause significant oxidative damage to multiple brain regions and the kidneys. Dopamine levels in the brain of mice have been shown to be decreased after exposure to OTA.

Sterigmatocystin (STG)

Sterigmatocystin (STG) is a mycotoxin that is closely related to aflatoxin. STG is produced from several species of mold such as *Aspergillus*, *Penicillium*, and *Bipolaris*. It is considered to be carcinogenic, particularly in the cells of the GI tract and liver. STG has been found in the dust from damp carpets. It is also a contaminant of many foods including grains, corn, bread, cheese, spices, coffee beans, soybeans, pistachio nuts, and animal feed. In cases of lung aspergilloma, STG has been found in human tissue specimens. The toxicity of STG affects the liver, kidneys, and immune system. Tumors have been found in the lungs of rodents that were exposed to STG. Oxidative stress becomes measurably elevated during STG exposure, which causes a depletion of antioxidants such as glutathione, particularly in the liver.

Mycotoxins and human disease: a largely ignored global health issue

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Aflatoxins and fumonisins (FB) are mycotoxins contaminating a large fraction of the world's food, including maize, cereals, groundnuts and tree nuts. The toxins frequently co-occur in maize. Where these commodities are dietary staples, for example, in parts of Africa, Asia and Latin America, the contamination translates to high-level chronic exposure. This is particularly true

adverse health effects is incomplete and the known risks are poorly communicated to policy makers in regions where the contamination is greatest. Second, in comparison, for example, to vaccination programmes, malaria control or improved sanitation, the perceived value of interventions to reduce mycotoxin contamination in low-income countries may be relatively low. Third, the approaches needed to control mycotoxin contamination, although potentially simple, are multifaceted, requiring consideration at numerous points pre- and post-harvest. Fourth, the highest exposures occur in communities that produce and consume their own food and thus regulatory measures to control exposure are largely ineffective. Fifth, the mycotoxin problem sits at the interface of agriculture, health and economics. In order to appreciate the full burden to a country of contamination of its food by mycotoxins requires an inter-sectoral approach at government level,

Roridin E

Roridin E is a macrocyclic trichothecene produced by the mold species *Fusarium*, *Myrothecium*, and *Stachybotrys* (i.e. black mold). Trichothecenes are frequently found in buildings with water damage but can also be found in contaminated grain. This is a very toxic compound, which inhibits protein biosynthesis by preventing peptidyl transferase activity. Trichothecenes are considered extremely toxic and have been used as biological warfare agents. Even low levels of exposure to macrocyclic trichothecenes can cause severe neurological damage, immunosuppression, endocrine disruption, cardiovascular problems, and gastrointestinal distress.

Verrucarin A

Verrucarin A (VRA) is a macrocyclic trichothecene mycotoxin produced from *Stachybotrys*, *Fusarium*, and *Myrothecium*. Trichothecenes are frequently found in buildings with water damage but can also be found in contaminated grain. VRA is a small, amphipathic molecule that can move passively across cell membranes. The primary tissues affected by VRA are intestinal and gastric mucosa, bone marrow, and spleen. VRA causes damage to human cells by inhibiting protein and DNA synthesis, disrupting mitochondrial functions, and by producing oxidative stress (due to generation of free radicals). Exposure to VRA can cause immunological problems, vomiting, skin dermatitis, and hemorrhagic lesions.

Enniatin B1

Enniatin B1 is a fungal metabolite categorized as cyclohexa depsipeptides toxin produced by the fungus *Fusarium*. This strain of fungus is one of the most common cereal contaminants. Grains in many different countries have recently been contaminated with high levels of enniatin. The toxic effects of enniatin are caused by the inhibition of the acyl-CoA cholesterol acyltransferase, depolarization of mitochondria, and inhibition of osteoclastic bone resorption. Enniatin has antibiotic properties and chronic exposure may lead to weight loss, fatigue, and liver disease.

Zearalenone (ZEA)

Zearalenone (ZEA) is a mycotoxin that is produced by the mold species *Fusarium*, and has been shown to be hepatotoxic, haematotoxic, immunotoxic, and genotoxic. ZEA is commonly found in several foods in the US, Europe, Asia, and Africa including wheat, barley, rice, and maize. ZEA has estrogenic activity and exposure to ZEA can lead to reproductive changes. ZEA's estrogenic activity is higher than that of other non-steroidal isoflavones (compounds that have estrogen-like effects) such as soy and clover. ZEA exposure can result in thymus atrophy and alter spleen lymphocyte production as well as impaired lymphocyte immune response, which leads to patients being susceptible to disease.

Aflatoxins as a Cause of Hepatocellular Carcinoma

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Aflatoxins, metabolites of the fungi *Aspergillus flavus* and *Aspergillus parasiticus*, are frequent contaminants of a number of staple foods, particularly maize and ground nuts, in subsistence farming communities in tropical and sub-tropical climates in sub-Saharan Africa, Eastern Asia and parts of South America. Contamination of foods occurs during growth and as a result of storage in deficient or inappropriate facilities. These toxins pose serious public health hazards, including the causation of hepatocellular carcinoma by aflatoxin B1. Exposure begins in utero and is life-long. The innocuous parent molecule of the fungus is converted by members of the cytochrome p450 family into mutagenic and carcinogenic intermediates. Aflatoxin-B1 is converted into aflatoxin B1-8,9 exo-epoxide, which is in turn converted into 8,9-dihydroxy-8-(N7) guanyl-9-hydroxy aflatoxin B1 adduct. This adduct is metabolized into aflatoxin B1 formaminopyrimidine adduct. These adducts are mutagenic and carcinogenic. In addition, an arginine to serine mutation at codon 249 of the p53 tumor suppressor gene is produced, abrogating the function of the tumor suppressor gene, and contributing

Species of Mold Tested by GPL-MycoTOX

Aspergillus

Aspergillus is the most prevalent mold group in the environment. It has caused billions of dollars of in damage to crops and livestock. Two of the most common *Aspergillus* mycotoxins are aflatoxin and ochratoxin. The main target of these toxins is the liver. These toxins have been found in all major cereal crops including peanuts, corn, cotton, millet, rice, sorghum, sunflower seeds, wheat, and a variety of spices. They are also found in eggs, milk, and meat from animals fed contaminated grains. Diseases caused by *Aspergillus* are called aspergillosis. The most common route of infection is through the respiratory system. *Aspergillus* can cause severe asthma when the mold colonizes the lung, forming a granulomatous disease.

Penicillium

There are over 200 species of *Penicillium* that have been discovered. *Penicillium chrysogenum* is the most common of these species. It is often found in indoor environments and is responsible for many allergic reactions. *Penicillium* is also a known contaminant in many different food items. Many different types of citrus fruits can become contaminated with *Penicillium*, but it can also contaminate seeds and grains. One reason that *Penicillium* is such a common infestation is because of its ability to thrive in low humidity. In the home, *Penicillium* can be found in wallpaper, carpet, furniture, and fiberglass insulation. The most common mycotoxin produced by *Penicillium* is ochratoxin (OTA). Ochratoxin is nephrotoxic, which means that it damages the kidneys. It is also carcinogenic.

Stachybotrys

Stachybotrys is a greenish-black mold. This mold can grow on materials with high cellulose and low nitrogen content such as gypsum board, paper, fiberboard, and ceiling tiles. *Stachybotrys* is known for its production of the highly toxic macrocyclic trichothecene mycotoxins. Two of the more common mycotoxins produced by *Stachybotrys* are roridin E and verrucarin. In addition to these mycotoxins, the fungus produces nine phenylspirodrimanes, as well as cyclosporine, which are potent immunosuppressors. These immunosuppressors along with the mycotoxin trichothecenes may be responsible for the high toxicity of *Stachybotrys*.

Fusarium

Fusarium's major mycotoxins are zearalenone (ZEN) and fumonisin. *Fusarium* fungi grow best in temperate climate conditions. They require lower temperatures for growth than *Aspergillus*. *Fusarium* grows worldwide on many different types of grains including corn and wheat. Exposure to mycotoxins from *Fusarium* can lead to both acute and chronic effects. These symptoms can include abdominal distress, malaise, diarrhea, emesis, and death. ZEN possesses estrogenic effects and has been implicated in reproductive disorders.



Recommendations for Treatment of Mycotoxins

If you or a patient has done a GPL-Mycotox Profile and the results show moderate to high levels of mycotoxins there are things you can do to help the body eliminate the toxins and prevent future exposures. The first step is to eliminate or reduce exposure to mold. The majority of exposures result from contaminated food, skin contact, and inhalation of spore-borne toxins, which is often caused by water-damaged buildings. Inhalation of spore-borne toxins can be limited by detecting and eliminating damp and moldy environments, both indoor and outdoor.

Mold can enter homes through open windows, vents, doorways, and heating and air conditioning systems. Mold grows well on organic products such as paper, wood, cardboard, and ceiling tiles. Mold can also grow on insulation, drywall, wallpaper, carpet, fabric, and upholstery. Mold can be controlled by cleaning and drying after water intrusion; having proper ventilation for showers, laundry, and cooking areas; making sure that windows, roofs, and pipes are free of leaks; and by controlling humidity levels. After moisture problems are alleviated it is recommended that mold removal be performed by a licensed contractor. Attempts to remove mold may cause mold spores to scatter and spread to other areas. In addition, treating mold without proper ventilation could result in health problems caused by the release of mycotoxins from the mold spores.

Treatment for mold exposure should include fluid support to prevent dehydration. The drug Oltipraz can increase glutathione conjugation of mold toxins while inhibiting the toxic effect of P450 oxidation, reducing liver toxicity and promoting safer elimination. A diet of carrots, parsnips, celery, and parsley may reduce the carcinogenic effects of mold. Bentonite clay and zeolite clay are reported to reduce the absorption of mold found in food. Supplementation with chlorophyllin, zinc, A, E, C, NAC, rosmarinic acid, and liposomal glutathione alone or in combination have been shown to mitigate the oxidative effects of mold toxins.

Disorders and Symptoms Associated with Exposure to Mycotoxins

Liver disease	Dizziness
Dermatitis	Confusion
Fever	Irritability
Vomiting	Difficulty concentrating
Anorexia	Allergic rhinitis
Jaundice	Asthma
Headaches	Legionnaires' disease
Nausea	Fibromyalgia
Sore throat	Irritable Bowel Syndrome
Diarrhea	Food allergies
Fatigue	Thyroid irregularities
Blurred vision	Balance problems
Difficulty breathing	Infertility
Vertigo	Seizures

Common Sources of Mold Exposure in the Home



- **Window Sills and Doors**

Windows and doors with leaks, not properly sealed, or those prone to condensation can lead to mold growth on the window sills or around doors.

- **Plumbing**

Check for water leaking from plumbing sources in bathrooms, kitchens, laundry areas, etc. If you see mold near water pipes, waste lines, icemaker lines, or other plumbing fixtures, there is probably a nearby plumbing leak.

- **Bathrooms**

Poorly ventilated bathrooms and even just regular use of well-ventilated bathrooms can lead to excess condensation and moisture. This can create an ideal breeding ground for mold on shower and tub walls, in drains, on bathroom walls, in ventilation fans, and on bathroom windows. If you do not have a ventilation fan in a bathroom, but do have a window, it may help to open the window during and after shower and bath use.

Common Sources of Mold Exposure in the Home

● Closets

Because they are dark, closets can be prime breeding grounds for mold, especially if your home is warm and humid, and/or if you ever put wet or damp clothing or towels in your closet. If you find mold in your closet, wash your clothes and other items immediately.

● Fireplaces and Chimneys

Fireplaces and chimneys are ideal for mold because they are often dark, damp, and poorly ventilated. Those not used often are particularly prone to mold growth. Mold can easily grow on bricks in your chimney or fireplace, then spread to other parts of your home.

● Laundry Rooms

Your laundry room is an ideal place for mold to develop. Moisture build-up and/or faulty washer and dryer connections can lead to mold growth on walls, pipes, and under leaky appliances. Make sure your clothes dryer has an anti-humidity vent. Humidity can also be reduced with a dehumidifier, an open window, or a good ventilation system with a ceiling vent.

● Basements

Basements are dark, tend to be damp, and are often not well ventilated, making the floors and walls (especially if cement) ideal for mold growth. Mold in homes often starts growing in the basement and works its way up to other parts of the home. Basement mold can be difficult to eradicate without first addressing the underlying moisture and ventilation issues allowing the mold to flourish.

● Air Conditioning Systems

Mold in HVAC systems is common and can be quickly spread throughout the home by the forced air in the systems. According to the U.S. EPA, you should routinely inspect your HVAC systems, not just for mold, but for moisture. Check drain pans to be sure they are draining properly. Look at other components including the ducts and blowers, ensuring they are moisture-free. Keep your filters cleaned out regularly to avoid build-up of debris, which in combination with moisture, can lead to mold growth.

● Roofs

Check your roof for leaks regularly, especially during and after periods of heavy rain or snow. The leaks can cause water damage to your ceilings, and lead to mold growth in your home, especially in attics or crawl spaces. Algae or moss, especially on wood shingles, can eat through the shingles, priming the area for mold growth. Mold stains can also form on roof shingles that are in permanent shade. If left alone, these stains can discolor your roof and damage the shingles over time.

● Refrigerators

While mold grows best in warm, humid environments, it can tolerate the cold environment of a refrigerator. To assess potential mold growth in your refrigerator, look for mold on your food, dark mildew stains on the compartments of the fridge, and take notice of any foul or musty odors. Be sure to check the refrigerator door seals and the drain pan too, as these are places mold can often grow.

● Foods

Examine food before you buy it. Foods commonly contaminated by mold include fresh produce, grains, cereals, corn, bread, cheese, spices, coffee beans, nuts, dried fruit, grape juice, and wine. Fresh meat and poultry are usually mold free, but cured and cooked meats may not be. Check your refrigerator regularly for spills or older items, which can create an ideal environment for mold to develop. When you see mold on the surface of foods, it may go much deeper. Heavy mold growth may create root threads that can move into the food, which may be quite toxic.

Testing that Pairs Well with GPL-MycoTOX

When you order the GPL-MycoTOX Profile, we recommend adding any of the following tests that will provide additional information about markers correlated with mycotoxin exposure, most of which can be added to the same urine sample:

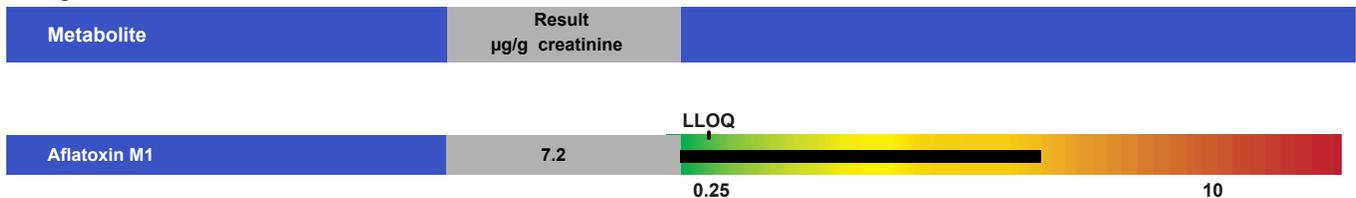
- Organic Acids Test
- GPL-TOX (Toxic Non-Metal Chemical Profile)
- Phospholipase A₂ Activity Test
- Glyphosate Test

Specimen Requirements for GPL-MycoTOX

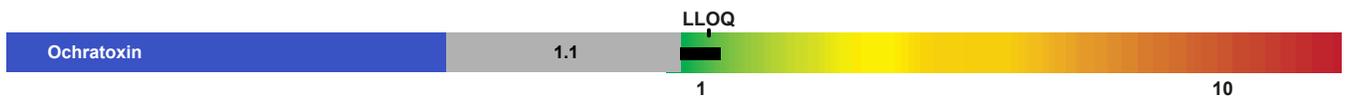
10 mL of the first morning urine before food or drink is suggested. Fasting for 12 hours may increase the excretion of mycotoxins from the adipose tissue. However, fasting is not recommended if running this test in combination with other urine tests.

Sample Report and Interpretations

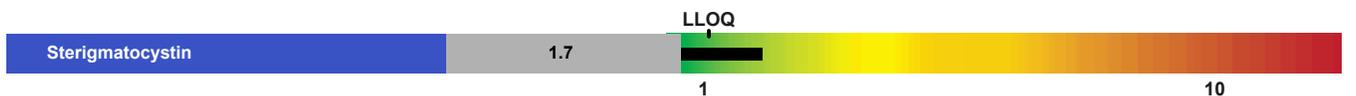
Mycotoxins



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