PRACTITIONER TECH SHEET | **Chaetoglobosin**

When you think of Chaetoglobosin, think resistance. It's secreted by Chaetomium globosum, one of the dominant fungal colonizers on moist materials, to protect itself from fungal competitors and pathogens. Chaetoglobosin helps Chaetomium break through our immune resistance against its invasion.

Chaetoglobosins are a subgroup of the class of fungal secondary metabolites called cytochalasin alkaloids, which are acutely toxic to mammals, with animals studies reporting necrosis of the liver, pancreas, and kidneys. They exert their cytotoxicity by capping the growing end of actin microfilaments, thereby destroying the cytoskeleton of mammalian cells and poking holes in the cytoskeleton of cells.

While human studies are limited, animal studies have provided insights into its potential toxicity. Chaetoglobosin has moderate cytotoxic activity across a number of cell types. In addition to its effects on actin, overall negative health impacts include toxicity to the respiratory tract, especially in the nasopharyngeal cavity, neurotoxicity, reproductive toxicity, mitochondrial dysfunction, thyroid impairment, and impaired cell division. It has deleterious effects on hematopoetic cells, leading to myelosuppression and immunosuppression, allowing for more infections with drug resistant species.

Chaetoglobosins are currently being investigated for novel drug development potential in the fields of oncology and infectious disease, since resistance to treatment is a problem in these fields. Chaetoglobosin may break through certain treatment-resistant cancers, being more cytotoxic to certain cells than existing chemo drugs, however, when trialed *in vivo*, it can be fatal.

About 200 metabolites have been identified from Chaetomium species, but only Chaetoglobosins are being screened for in buildings. This means that there are far more harmful substances in a building infested with Chaetomium than the one we are monitoring, including cytochalasan and antimicrobial indole alkaloids.

There is limited information on how Chaetoglobosin is metabolized in humans or animals, but due to its nonpolar nature and insolubility in water, we can make some inferences from other well-studied nonpolar toxicants, which result in increased bile acid and lipid synthesis in the liver in order to enhance detoxification. Supporting bile acids and lipase may be a useful direction for Chaetoglobosin detoxification.

Inhalation appears to be the most efficient way to absorb this toxin. In animal studies, few negative health effects were demonstrated with oral administration, suggesting limited gastrointestinal absorption, stating that it may be of little significance as a food- or feed-borne toxin.

MOLD SOURCES
Chaetomium spp, Cylindrocladium floridanum, Stenocarpella spp, and some Aspergillus and Penicillium spp

COLOR
Tends to be faint pink, but will vary depending on substrate. May appear as "black mold".

FAVORITE BUILDING MATERIAL
Wood-based materials, drywall, wallpaper, textiles, even some reports of growth on concrete and plastic.

SIGNS
Reduced TGF-beta

SYMPTOMS
Rapid aging
Eye, skin, and respiratory irritation
Skin rashes and thinning
Chronic sinusitis
Chronic productive cough
Fatigue
Cognitive fatigue
Sarcopenia, poor muscle tone
Muscle weakness, exercise intolerance
Hypothyroid
Recurrent infections, especially of the skin, lungs, and mucosal surfaces
Neutropenia
Thrombocytopenia
Splenomegaly
Chemical sensitivity
Unstable blood glucose
Reduced sperm motility

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Chaetoglobosin complicates the diagnosis of chronic inflammatory response syndrome (CIRS), as it is an inhibitor of TGF-beta in humans and may falsely lower lab results. Similar to other CIRS findings however, it effectively inhibits angiogenesis through downregulation of VEGF-binding hypoxia-inducible factor (HIF)-1α.

HEALTH IMPACTS

Cytotoxic, myopenic, immunosuppressive, myelosuppressive, neurotoxic, toxic to the respiratory tract, genotoxic, reproductive toxin, metabolic disrupting. Acute exposure may lead to liver, kidney, and pancreas injury.

Cells. Cytotoxicity by binding to actin, potentially inhibiting cell division, neurite pathfinding, endocytosis, cell motility, and formation of cell surface projections. This can lead to cell death as well as a multitude of other cellular dysfunctions.

Muscle. Chaetoglobosin-affected actin filaments have a modified interaction with myosin, weakening it, and decreasing actin-myosin cross-bridges, moving into a form of actin myopathy which negatively affects muscle contraction.

Respiratory. Cytotoxic activity against human nasopharyngeal epidermis. Ciliostatic activity in the lungs, with potential to impair the respiratory cilia from clearing Chaetomium spore invasion in as little as 24 hours. Plays a role in pathogen associated molecular patterns (PAMPs) that contribute to the non-allergy based respiratory symptoms.

Immunosuppressive. Inhibit neutrophil motility and phagocytic function, and have demonstrated necrosis of thymus and spleen in animal models. Induce cell pyroptosis in immune cells, which is essentially “death by fire” instead of programmed cell death, by creating pores in the cell membrane.

Neurotoxicity. Crosses the blood brain barrier and acts as an antagonist to neuropeptides in humans.

Reproductive. Causes spermatocyte degeneration in the testicles. Inhibits sperm motility by a sublethal ciliostatic mechanism, very likely by inhibiting sugar transport affecting glycolytic and mitochondrial energy production.

Genotoxic. According to PubChem, Chaetoglobosins have been shown to inhibit human RNA and DNA replication as well as repair genes critical for cell survival.

Metabolic. Does not appear to directly target mitochondria but rather glucose transport into the cell, with the net effect of causing mitochondrial membrane depolarization even at low concentrations. Competitively binds to glucose transporters, preventing glucose from entering cells. This leads to energy depletion and subsequent toxic effects, without directly targeting mitochondrial function.

Thyroid hormone production may be impaired due to tyrosine deficiency induced by Chaetoglobosin over-utilization. In a research production lab, Chaetoglobosins are made by adding tyrosine to the Chaetomium culture medium.

TREATMENT OPTIONS

*Note: the doses listed are intended for when each item is used as a standalone therapy. When multiple items are combined, they often work synergistically, meaning lower doses can typically achieve similar effectiveness due to their complementary effects.

Therapeutic Diet:

- Proline- and tyrosine-rich animal and fish protein (muscle, glands, and skin)
- Organic dairy
- Cruciferous vegetables (sulforaphane as Nrf2 activator) - enhance cellular resilience

People with Chaetomium toxicity may develop sensitivity to alkaloids in foods and beverages, such as those containing the alkaloids caffeine and theobromine, which include coffee, cacao, and tea. Other alkaloid containing foods include tomatoes (tomatine) and potatoes (solanine).

Therapeutic Movement:

Use techniques similar to Inclusion Body Myositis (IBM), which also involves a decrease in the number of attached actin-myosin cross-bridges during activation. Utilize therapeutic strategies that augment muscle fiber contractile strength to increase or preserve muscle mass. This includes resistance training that progressively increases resistance over time, incorporating compound exercises, and lifting heavier weights with lower repetitions.

Binder. Bind Chaetoglobosin by binding bile.

Insoluble fiber. 2-4 Tbsp daily with food.

One of the few times to consider colesevelam (Welchol) bid for 1 month, away from meals.

Optimize fat-soluble nutrients — phospholipids, vitamins A, D, E, K (due to its nonpolar nature, will disrupt absorption)

Take with ox bile or bile salts/TUDCA to enhance absorption.

Cytoskeleton:

Bioplasma cell salts. 10 pellets under tongue throughout the day.

Amino acids - proline (1g), glycine (1g), tyrosine (500mg), taurine (500mg) as tolerated. [actin: proline & glycine, repletion: tyrosine (Chaetomium uses it to make chaetoglobosin), bile: taurine and glycine]

Green tea catechins: Helps maintain cytoskeleton integrity. Actin filament stabilization, cilia movement, anti-proliferative.

Nicotinamide riboside. Plays a role in regulating the cytoskeleton by acting as a source of electrons for NADPH oxidases, directly modifying the cytoskeleton (actin, tubulin, and intermediate filaments) and cytoskeleton-associated proteins.

Immune:

Thymus and spleen glandular. 500mg daily.

Larch (Larix occidentalis). 6gm qd-bid.

Enhances natural killer (NK) cell cytotoxicity while being anti-inflammatory. Enhances beneficial gut microflora and increase the production of short-chain fatty acids.

Protective/Detox:

Resveratrol. Minimum therapeutic dose: 1 gram transresveratrol daily.

Chemopreventive.

Milk thistle. 500mg bid.

Hepatoprotective.

Turmeric. 350mg qd.

Promote proliferation of certain stem cells and normal cells at low doses. May help mitigate the immunosuppressive effects of chaetoglobosin by activating and supporting adaptive immune responses.

Grape seed extract. 200mg qd-bid.

Melatonin. Start 1mg nightly and titrate to 5mg as tolerated. Dose at dinnertime to avoid morning grogginess.

Anti-inflammatory and immunomodulatory. It could potentially help protect lymphoid organs from necrosis.

Antimicrobial:

Thyme. Good antifungal choice for Chaetomium, as not only is it a potent broad-spectrum antimicrobial, but it also increases mucociliary-beating frequency, overcoming Chaetoglobosin's action to paralyze cilia.

Garlic. Combats both of Chaetomium's resistances; first by being an immune modulator which boosts resistance to infection, and second by combining well with antifungal agents to reduce drug resistance.

Nasal rehabilitation. Humic acid, Lactobacillus sakeii and caseii. Chaetoglobosin is soluble in DMSO, which may be added to antimicrobial nasal treatments for biofilm.

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