

The Great Plains Laboratory
GPL Academy
Practitioner Workshops

BEYOND THE BASICS:
ADVANCED ORGANIC ACIDS TESTING STRATEGIES

KURT WOELLER, DO

The OAT, Fungal Markers, and Chronic Candidiasis

1

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GPL Academy
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BEYOND THE BASICS:
ADVANCED ORGANIC ACIDS TESTING STRATEGIES

I, Kurt N. Woeller, DO, have the following commercial relationships to disclose:

- Founder of Integrative Medicine Academy
- Consultant for Great Plains Laboratory

2

Disclaimer

- ▶ The material contained within this presentation is not intended to replace the services and/or medical advice of your personal licensed health care professional.
- ▶ This material is for educational purposes only
- ▶ This information is not meant to encourage diagnosis and treatment of disease.
- ▶ Any application of suggestions set forth in the following portions of this presentation is at the reader's discretion.
- ▶ Implementation and/or experimentation with any supplements, herbs, dietary changes, medications, and/or lifestyle changes, etc., is done so at your sole risk and responsibility.

3

3

Lecture Overview

- ▶ Chronic candida and various health complaints
- ▶ Why is candida so complex?
- ▶ Examples of fungal toxicity:
 - *Arabinose*
 - *Pentosidine*
 - *Acetaldehyde*
 - *Mold exposure & mycotoxins*
- ▶ Biofilm (introduction)
- ▶ Treatment options

4

4

Fungi

(Biological Group Of Organisms)


▶ **Yeast:**







- ex: *Candida*,
Saccharomyces.

▶ **Mold:**

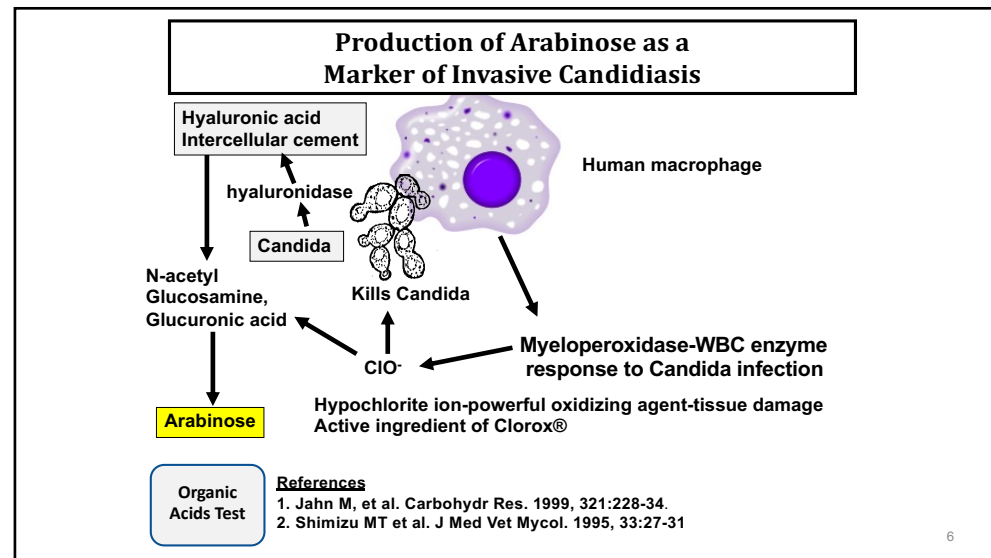
- ex: *Aspergillus*,
Penicillium.

▶ **Mushrooms**

Examples of Fungi 

- Mushrooms 
- Molds 
- Mildews 
- Smuts 
- Rusts 
- Yeasts 

5



6

Jessop C, Chronic Fatigue Syndrome Conference, Chronic Fatigue Syndrome Quarterly, April 15, 1989, San Francisco, CA.

Common Symptoms

Chronic Fatigue: 100%
 Cold Extremities: 100%
Impaired Memory: 100%
Frequent Urination: 95%
Depression: 94%*
Sleep Disorder: 94%
Balance Problems: 89%
Muscle Twitching: 80%
 Dry Mouth: 68%
 Muscle Aches: 68%
 Headache: 68%
 Sore Throat: 20%

7

7

Family Practice
 © Oxford University Press 2001

Vol. 18, No. 3
 Printed in Great Britain

Effectiveness of nystatin in polysymptomatic patients. A randomized, double-blind trial with nystatin versus placebo in general practice

Heiko Santelmann, Even Laerum, Joergen Roennevig^a and Hans E Fagertun^b

Santelmann H, Laerum E, Roennevig J and Fagertun HE. Effectiveness of nystatin in polysymptomatic patients. A randomized, double-blind trial with nystatin versus placebo in general practice. *Family Practice* 2001; **18**: 268-266.

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8

In the 116 patients selected by the FRDQ-7 questionnaire, nystatin therapy reduced overall symptoms significantly as compared with placebo, even after correction for sugar- and yeast-free diet.

Nystatin showed the most striking effect for mental, abdominal and urogenital complaints. Since we did not perform microbiological studies in the patients and the positive effect of nystatin may be due to its effect on other fungi, a connection between *C.albicans* and FRD remains unproved.

Nystatin is well known for its antifungal effect on *C.albicans* which is found in all segments of the gastrointestinal tract in 10–80% of humans,^{14,15,19} as well as on other yeasts and moulds.

9

9

95% Predictive of Positive Response to Nystatin

SCORE:

0 = none
 1 = occasional or mild
 2 = frequent or moderately severe
 3 = severe or disabling

FRDQ-7 Questionnaire

1. Have you, at any time in your life, taken broad spectrum antibiotics? (0 or 3)
2. Have you taken tetracycline or other broad-spectrum antibiotics for one month or longer? (0 or 3)
3. Are your symptoms worse on damp, muggy days or in moldy places? (0 or 3)
4. Do you crave sugar? (0 or 3)
5. Do you have a feeling of being "drained?" (0, 1, 2 or 3)
6. WOMEN: Are you bothered with vaginal burning, itching or discharge? (0, 1, 2 or 3)
 MEN: Do you have burning, itching or discharge from the penis? (0, 1, 2 or 3)
7. Are you bothered by burning, itching or tearing of your eyes? (0, 1, 2 or 3)

TOTAL SCORE FOR FRDQ-7:

Score 0-3 = FRD unlikely
 Score 4-9 = FRD probable
 Score 10-21 = FRD almost certain

10

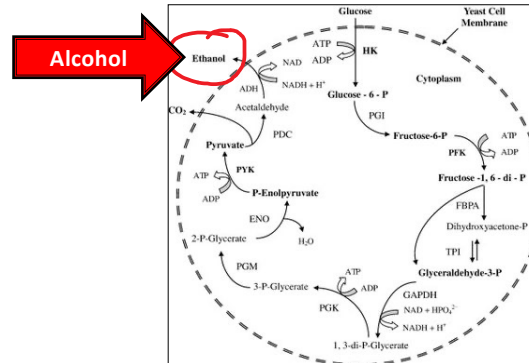
**List of Common Clinical Observations Seen in Autism
That Appear *(in part)* Related to
Candida Overgrowth**

- ▶ Silly/goofy/giddy, inappropriate laughter – “acts drunk.”
- ▶ Sugar and carbohydrate cravings intensified
- ▶ Heightened sensory seeking behavior, anxiety, and emotional instability.
- ▶ Strange behavior such as seeking pressure, hanging upside down, heightened seeking of masturbation.

11

11

Alcohol-related behavior has been observed



**Plants, yeast and bacteria – can ferment compounds into
acetaldehyde and finally into alcohol.**

12

12

Benefits Seen With Antifungals

- Increased focus and concentration
- Improved receptive and expressive language
- Reduced bowel symptoms
- Reduced headaches, body pains, and bladder symptoms
- Increased eye contact and socialization
- Reduced self-stimulatory behavior
- Reduced aggressive and self-abusive behaviors
- Reduced candida symptoms such as thrush
- Reduced skin rashes

13

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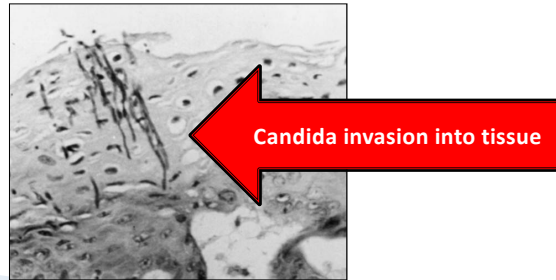
Candida Pathogenicity Mechanisms



14

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François L. Mayer, et. al. *Candida albicans* pathogenicity mechanisms. Virulence. Feb 15, 2013; 4(2): 119-128.



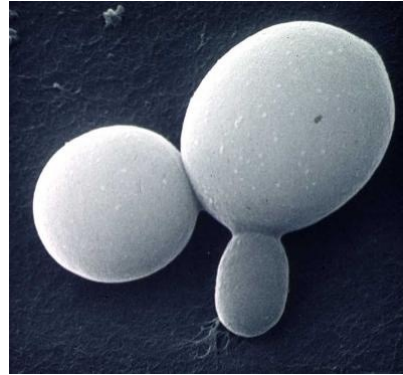
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Candida Overview

- ▶ Considered a commensal organism that is a normal part of the human flora, e.g. mouth, gastrointestinal tract.
- ▶ Estimates are that *candida* exists in approximately 80% of the human population without causing harm:
 - **Without harm?**
- ▶ Common issues linked to *candida* overgrowth are thrush (oral *candida*), vaginal infections, skin and nail plate infections.
- ▶ HIV, cancer and other immunocompromised diseases have greater risk of *candida* pathogenicity.

16

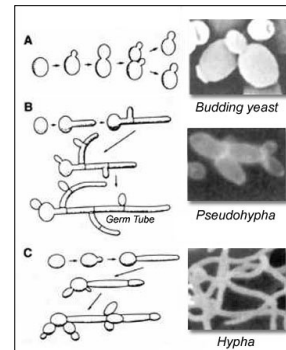
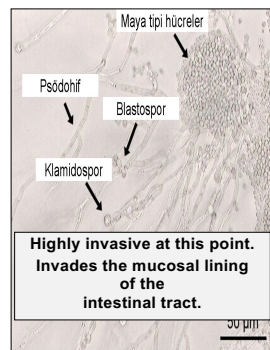
Unicellular Candida



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Unicellular Yeast to Hypha Formation



18

18

Candida Transformation

- ▶ To infect host tissue, the unicellular form of *Candida* switches to a more invasive multicellular form based on environmental changes (e.g., pH, food supply, temperature, CO₂) at the tissue level - *much of which it can control*.
- ▶ *Candida* can alter extracellular pH by uptake of various amino acids and produce ammonia.

19

19

Candida Transformation

- ▶ *Candida* can alter its metabolism for lipids and amino acids upon encountering and engulfment by macrophages.
- ▶ Phagocytized *Candida* can pierce through immune cells and escape gaining access to all organ tissue throughout the body.

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Source: *Neuroscience News*

21

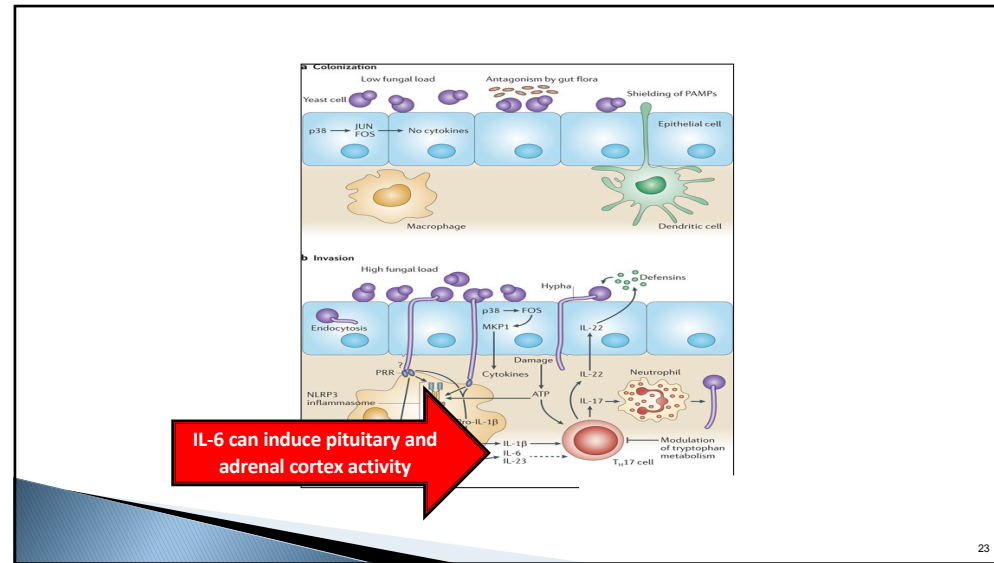
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Adhesin and Invasin Proteins

- ▶ *Candida* has specialized proteins which allow it to adhere to other microorganisms, abiotic surfaces, and host cells. These adhesion proteins are also involved in Biofilm formation.
- ▶ Invasin protein allows for two different ways for *candida* to penetrate host cells:
 - **Active penetration** – hyphal driven process with various protease secretions allowing cell penetration.
 - **Induced endocytosis** – expressed proteins on the cell surface induce engulfment of the *candida* cell.

22

22



23

Clinical Trial > J Clin Endocrinol Metab. 1994 Oct;79(4):1212-4. doi: 10.1210/jcem.79.4.7962296.

Interleukin-6 stimulates the hypothalamus-pituitary-adrenocortical axis in man

E Späth-Schalbe¹, J Born, H Schrezenmeier, S R Bornstein, P Stromeyer, S Drechsler, H L Fehm, F Porzolt

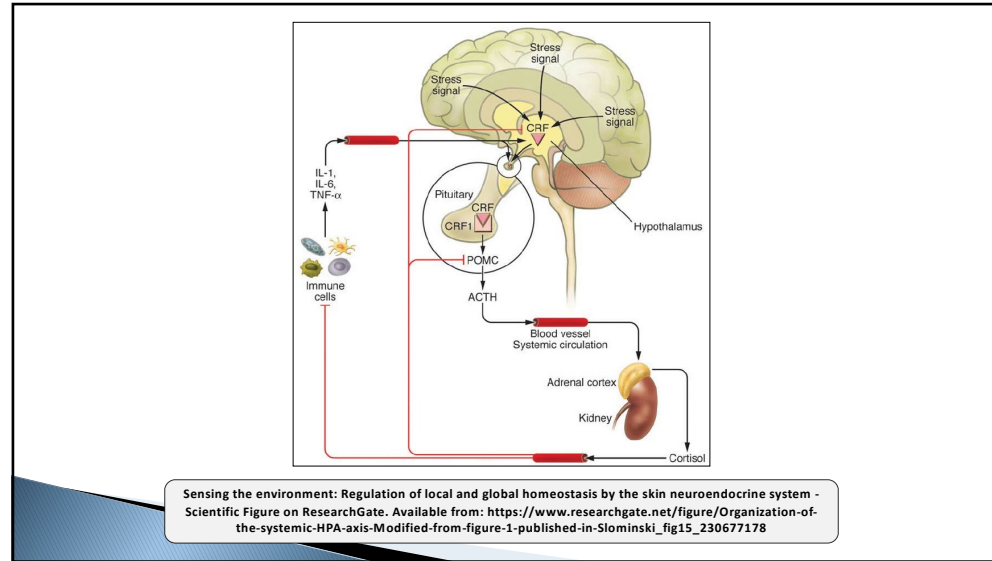
Abstract

A recent study in humans, animal studies, and in vitro data have suggested that interleukin-6 (IL-6) stimulates the secretory activity of the hypothalamus-pituitary-adrenocortical (HPA) axis. In a phase II study, one female and six male patients with metastatic renal cell carcinoma received IL-6 to evaluate a possible antitumor effect of IL-6. This offered the possibility of investigating the influence of IL-6 on the HPA axis in man. The subjects were studied 1 day before, on day 1, and on day 21 of IL-6 therapy (150 micrograms administered sc every day at 0900 h). Blood samples were taken at 0900, 1100, 1300, 1600, and 2000 h the day before, on day 1 of IL-6 therapy, 24 h after the first IL-6 injection, and on day 21 of IL-6 treatment. Plasma ACTH and cortisol levels promptly followed the rise of IL-6, which peaked 4 h after administration. They were significantly ($P < 0.05$) higher at 1100 and 1300 h on day 1 of IL-6 therapy compared with the corresponding plasma levels the day before IL-6 treatment. Cortisol concentrations remained significantly increased at 1600 and 2000 h after IL-6 administration. Twenty-four hours after the first IL-6 administration, IL-6, ACTH, and cortisol levels had reached preinjection values. Although plasma cortisol levels were similar on days 1 and 21, ACTH levels were lower on day 21 (than on day 1), but significantly elevated at 1100 h compared with levels on the day before the first IL-6 injection. Results confirming the very recent data of another study demonstrate a stimulating effect of IL-6 on the HPA axis in man. They support the notion that IL-6 is one of the cytokines involved in the interaction between the immune system and the HPA axis.

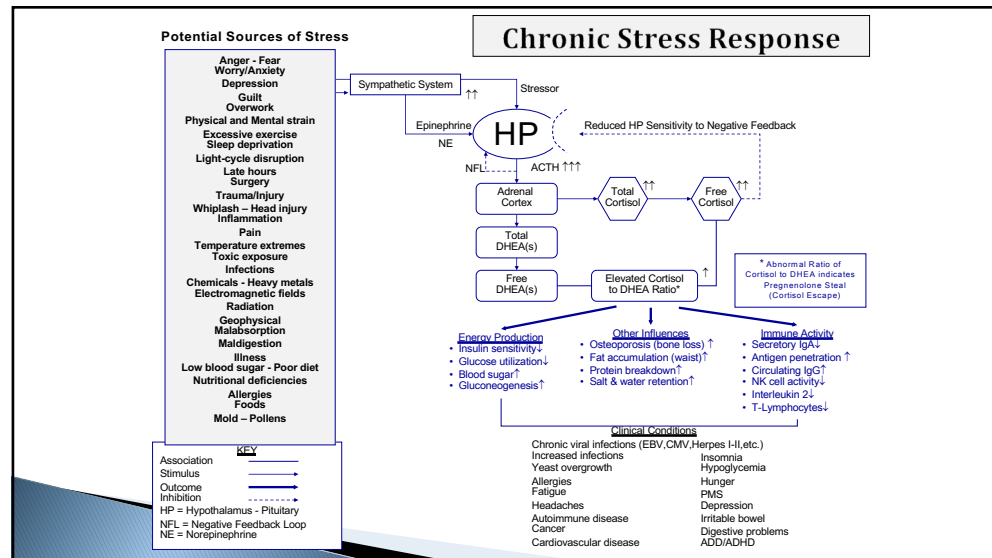
"Plasma ACTH and cortisol levels promptly followed the rise of IL-6..."

"Results confirming... demonstrate a stimulating effect of IL-6 on the HPA axis in man."

24

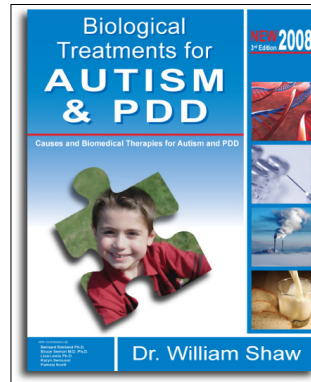


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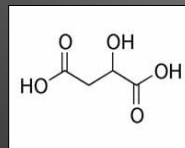
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Following Information on Yeast/Fungal Toxicity, including Arabinose, etc.

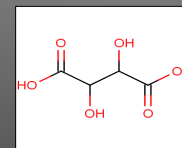


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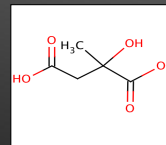
Analog



Malic Acid (MA)

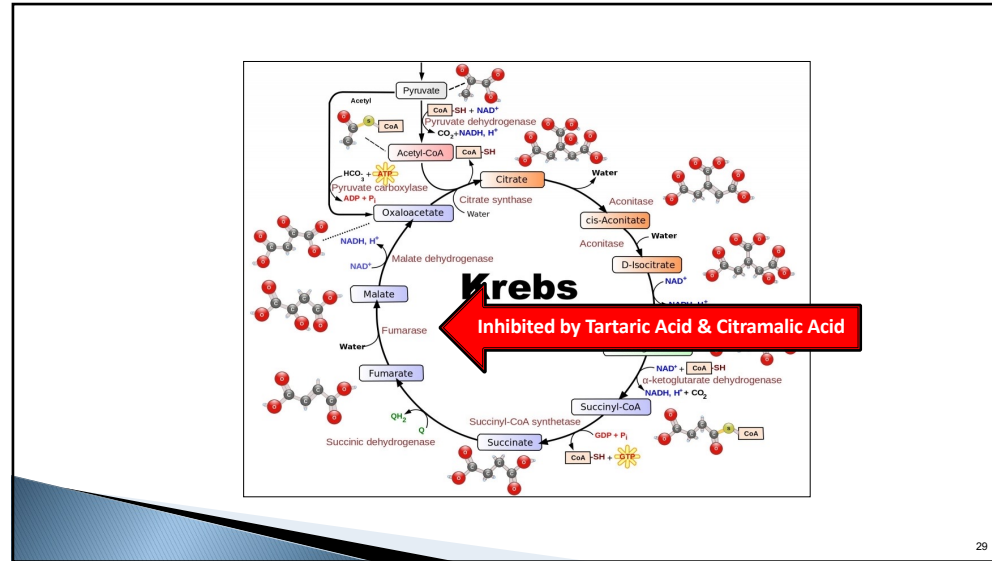


Tartaric Acid – analog to MA

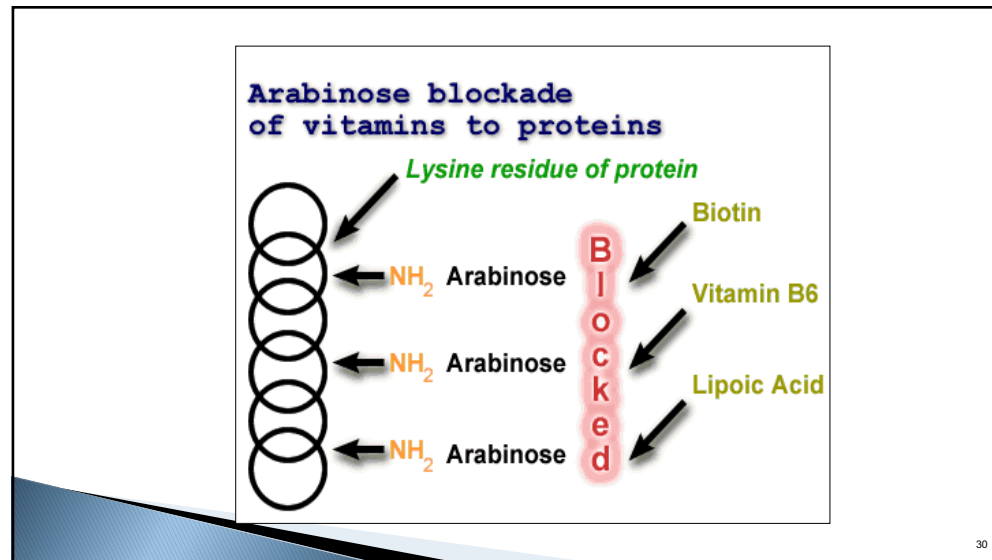


Citramalic Acid – analog to MA

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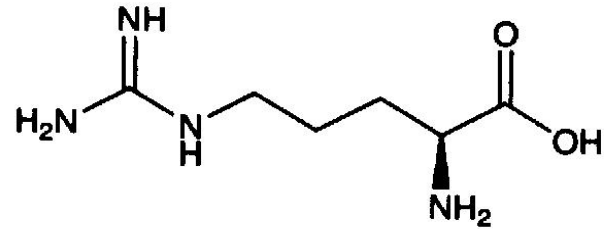


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Arginine

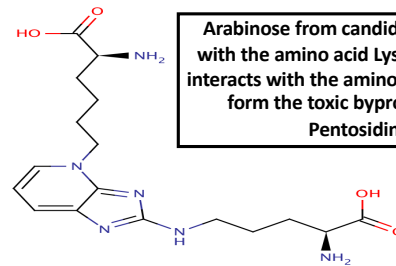


Arginine is involved in blood pressure control, immune function, ammonia detoxification, growth hormone release, insulin regulation and more.

31

31

Pentosidine



Arabinose from candida can complex with the amino acid Lysine which then interacts with the amino acid Arginine to form the toxic byproduct called Pentosidine.

Arabinose-Lysine Complex + Arginine
= **Pentosidine**

32

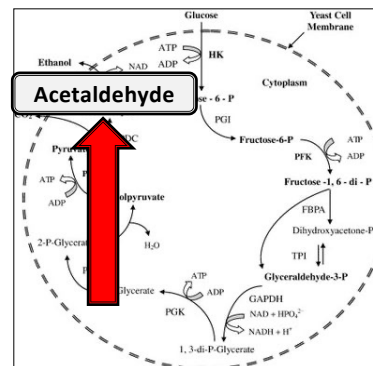
32

Pentosidine

- ▶ Decrease enzyme activity
- ▶ Cross-Linked Proteins – decrease flexibility of structural proteins of collagen and muscle.
- ▶ Possible damage to myelin
- ▶ Autoimmune reactions to dysfunctional proteins
- ▶ Cardiovascular and kidney problems
- ▶ **Advanced Glycation End (AGE) Product:**
 - *Proteins, amino acids and lipids that become altered when exposed to sugars, e.g. Hemoglobin A1c (HbA1c).*

33

33



Plants, yeast and bacteria – can ferment glucose into Acetaldehyde and finally into alcohol.

34

34

The Pivotal Role of Aldehyde Toxicity in Autism Spectrum Disorder: The Therapeutic Potential of Micronutrient Supplementation



Supplementary Issue: Parental Nutritional Metabolism and Health and Disease of Offspring

Frances Jurnak

Emerita Professor, Department of Physiology & Biophysics, School of Medicine, University of California, Irvine, CA, USA.

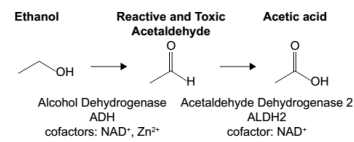
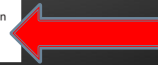


Figure 2. Ethanol metabolism. Ethanol is metabolized to the reactive and toxic acetaldehyde by ADH isozymes. Acetaldehyde is metabolized to acetic acid by acetaldehyde dehydrogenase 2 (ALDH2). An accumulation of acetaldehyde manifests as unpleasant symptoms, including facial flushing, nausea, and rapid heart beat.



35

DRUG METABOLISM REVIEWS
 Taylor & Francis
 Aldehyde toxicity and metabolism: the role of aldehyde dehydrogenases in detoxification, drug resistance and carcinogenesis
 Abstract: Aldehydes are carbon compounds found ubiquitously in the environment...
 Introduction: Aldehydes are one of the members of toxic substances that are frequently encountered by the body...
 Article history: Received 2 August 2018, Accepted 24 November 2018
 Keywords: Aldehyde toxicity, metabolic enzyme, aldehyde dehydrogenase

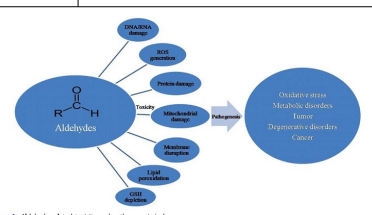
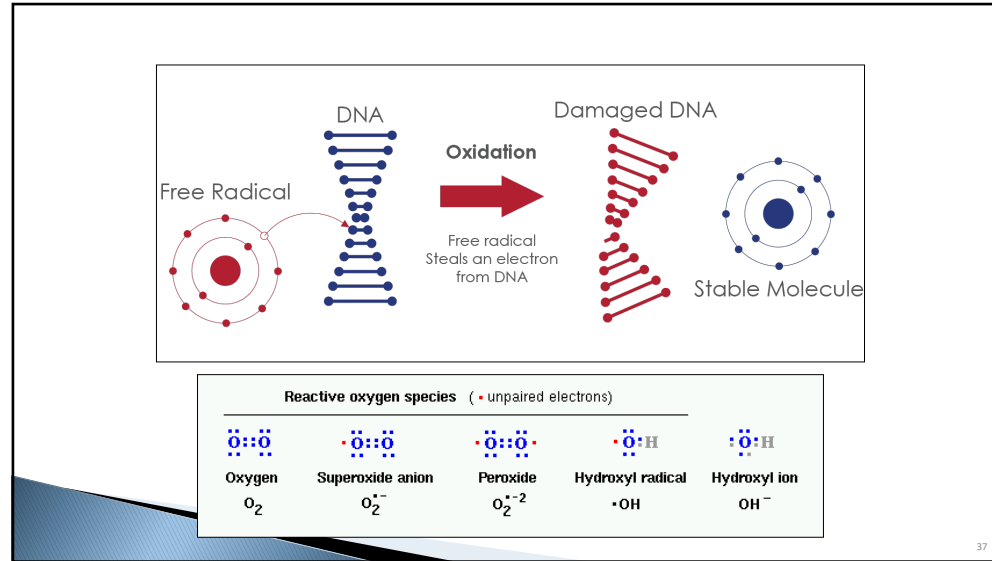
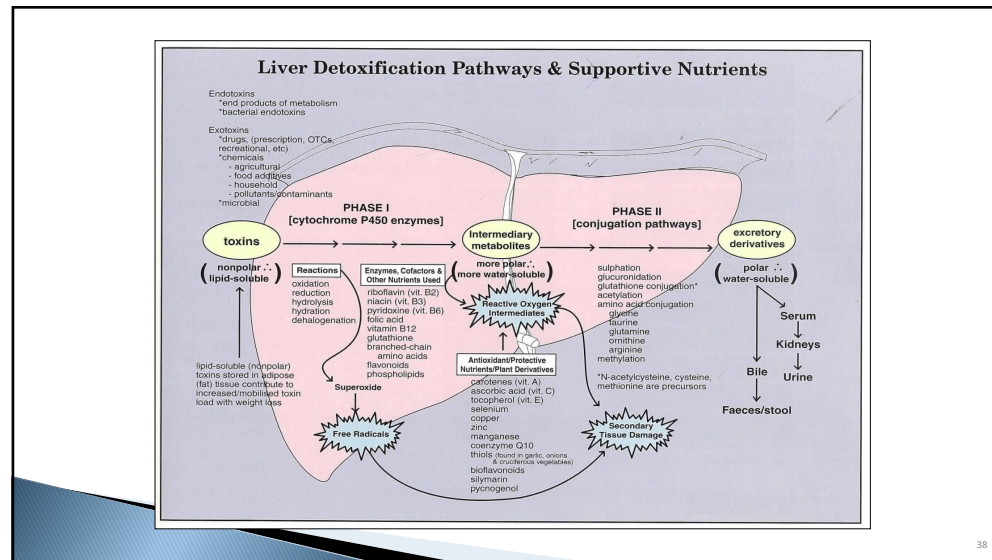


Figure 1. Aldehyde related toxicity and pathogenesis in humans.

36



37



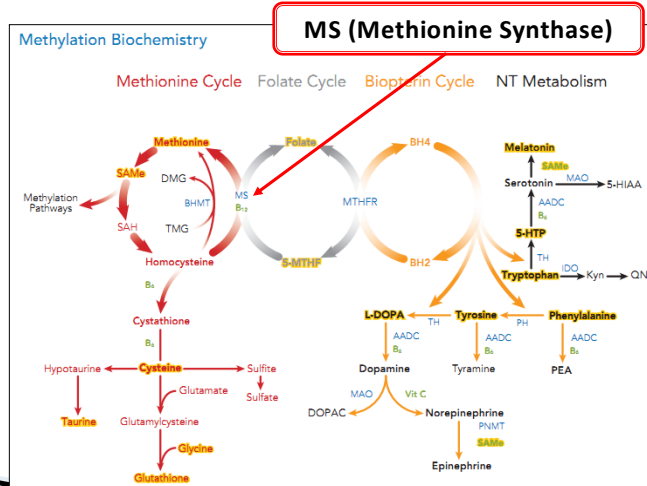
38

Kenyon SH, et. al. *The effect of ethanol and its metabolites upon methionine synthase activity in vitro.* Alcohol. 1998 May;15(4):305-9.

The association of alcoholism with macrocytic anemia has led to investigation of the role of cobalamin-dependent methionine synthase in mediating alcohol toxicity. Several studies have found that long-term ingestion of large quantities of ethanol causes inhibition of liver methionine synthase activity in vivo: however, ethanol has not been found to inhibit the enzyme directly. The effect of ethanol and its breakdown products, acetate and acetaldehyde, on highly purified rat liver methionine synthase was tested in vitro. Enzyme activity was not inhibited by ethanol or acetate. **Acetaldehyde was found to inhibit methionine synthase activity**, with an apparent IC50 of 2 mM. The reported inhibition by acetaldehyde was found to become irreversible over time.



Acetaldehyde-induced inhibition of liver methionine synthase activity is thus proposed as the most likely explanation of the reported in vivo effect of ethanol upon methionine synthase.



<https://neuroendoimmune.wordpress.com/2014/01/14/genetic-control-of-methylation-can-affect-your-health/>

Acetaldehyde Detoxification

$$\text{Acetaldehyde} + \text{NAD}^+ + \text{H}_2\text{O} \rightarrow \text{acetate} + \text{NADH} + 2\text{H}^+$$

▶ Conversion of acetaldehyde to acetic acid to acetyl-CoA requires:

- *NAD*⁺
- **Riboflavin (B2)**
- **Iron**
- **Molybdenum**

Vitamin B2 (Riboflavin) 53 Glutamic acid ≤ 1.1 H 3.5

41

41

N-Acetyl-Cysteine

Cysteine + **Glutamate** → **γ-glutamyl-cysteine**

Glycine + **γ-glutamyl-cysteine** → **Glutathione**

Selective micronutrient deficiencies. Most of the evidence for selective, aldehyde-induced micronutrient deficiencies arises from the alcoholism literature and the study of acetaldehyde, the intermediate of ethanol metabolism. Prolonged ethanol consumption is known to cause oxidative stress³⁹ and induce deficiencies in a number of key nutrients, including but not limited to retinol, glutathione, Zn²⁺, B1, B6, and folate.³⁶ Although the nutrient-deficient status of an alcoholic is often attributed to a nutrient-poor diet or to ethanol-induced malabsorption, the reality is much more complex.³⁷ The mechanism for some micronutrient deficiencies includes direct reactions with the electrophilic acetaldehyde generated during ethanol metabolism. For example, ethanol is known to induce B1³⁸ and B6³⁹ deficiencies and to lower hepatic glutathione levels in alcoholics by several mechanisms. In one B1 mechanism demonstrated in vitro, the electrophilic acetaldehyde attacks the C2 adjacent to the sulfur in the thiophene ring of B1, thereby lowering the bioavailability of B1.⁴⁰ One mechanism for the decrease in hepatic glutathione levels involves the binding of the reactive acetaldehyde, not to glutathione directly, but to the glutathione intermediate cysteinylglycine.⁴¹ Similarly, acetaldehyde also reacts directly with selective amino acids

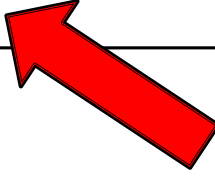
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42

Anni H, Pristatsky P, Israel Y. Binding of acetaldehyde to a glutathione metabolite: mass spectrometric characterization of an acetaldehyde-cysteinylglycine conjugate. *Alcohol Clin Exp Res*. 2003;10:1613-1621.

Mold

- ▶ **Yeast** – ex: *Candida*, *Saccharomyces*
- ▶ **Mold** – ex: *Aspergillus*, *Penicillium*
- ▶ **Mushrooms**



43

MycoTOX
Profile



44

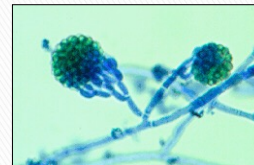
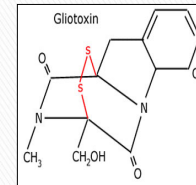
Medically Significant Mycotoxins

- ▶ Aflatoxin-M1
 - ▶ Ochratoxin A
 - ▶ Sterigmatocystin
 - ▶ Zearalenone
 - ▶ Roridin E
 - ▶ Verrucarin A
 - ▶ Enniatin B
- ▶ Gliotoxin
 - ▶ Citrinin
 - ▶ Mycophenolic Acid
 - ▶ Chaetoglobosin A

45

Toxic chemicals produced by certain molds (aka mycotoxins)

- ▶ Can fragment the DNA of lymphocytes (*T-cells*), reduce white blood cells, macrophages and Natural Killer Cell activity.
- ▶ Directly lead to immune suppression, e.g., lower Secretory IgA.
- ▶ Generate free radicals depleting glutathione.
- ▶ **Targets the mitochondria**

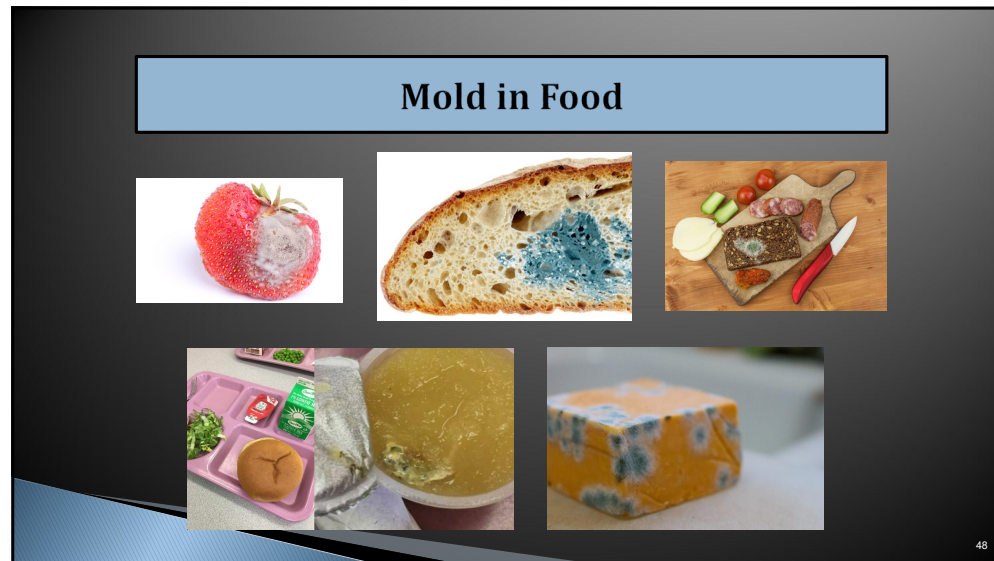


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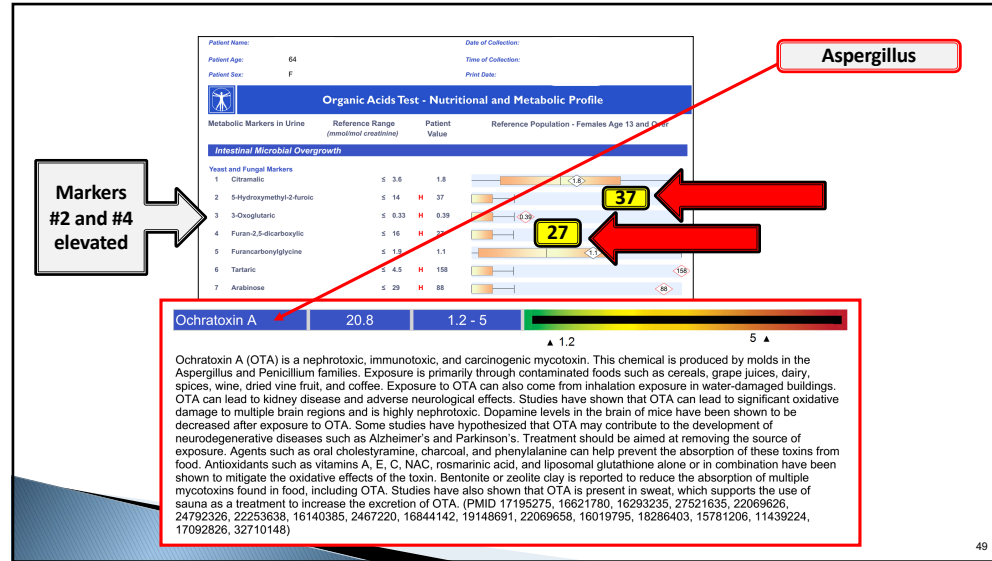
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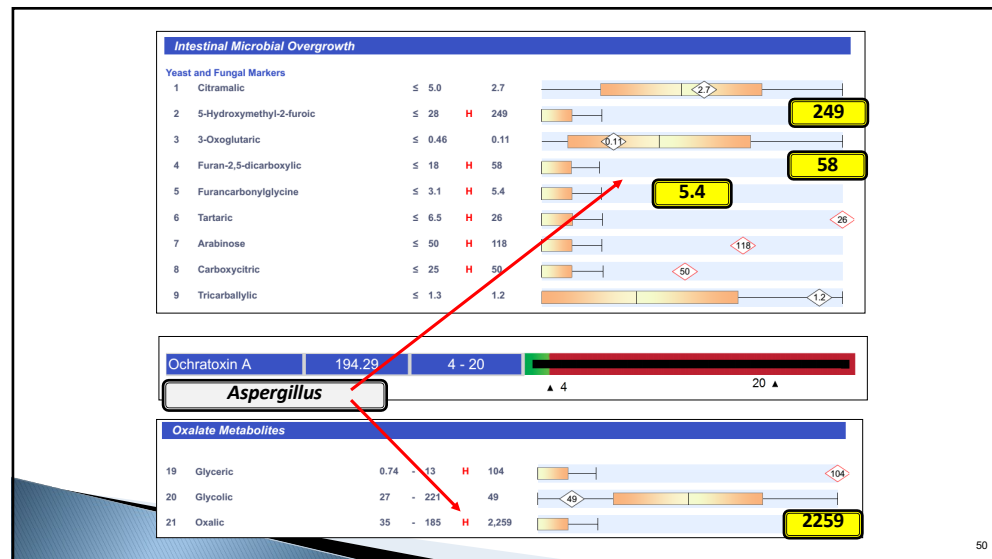
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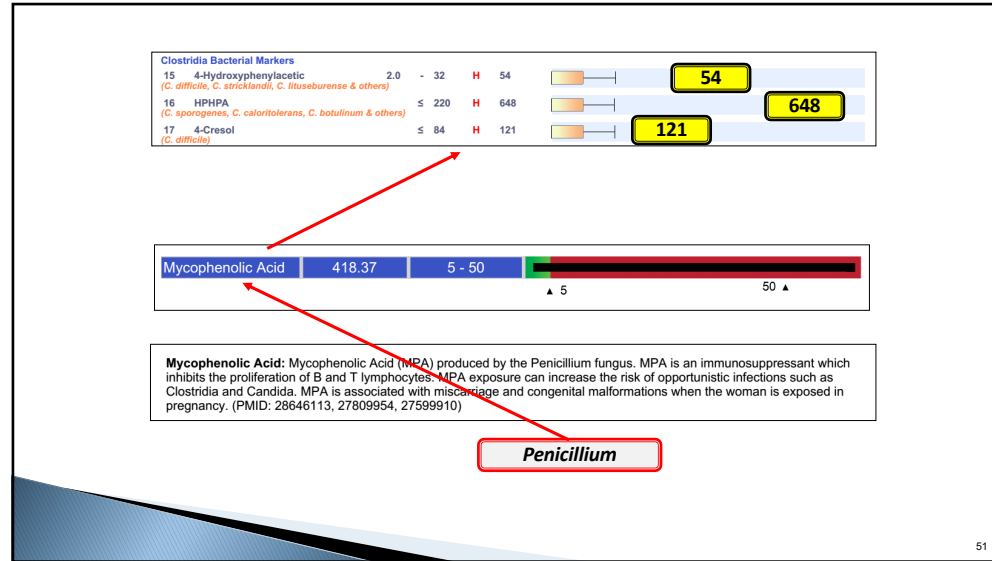
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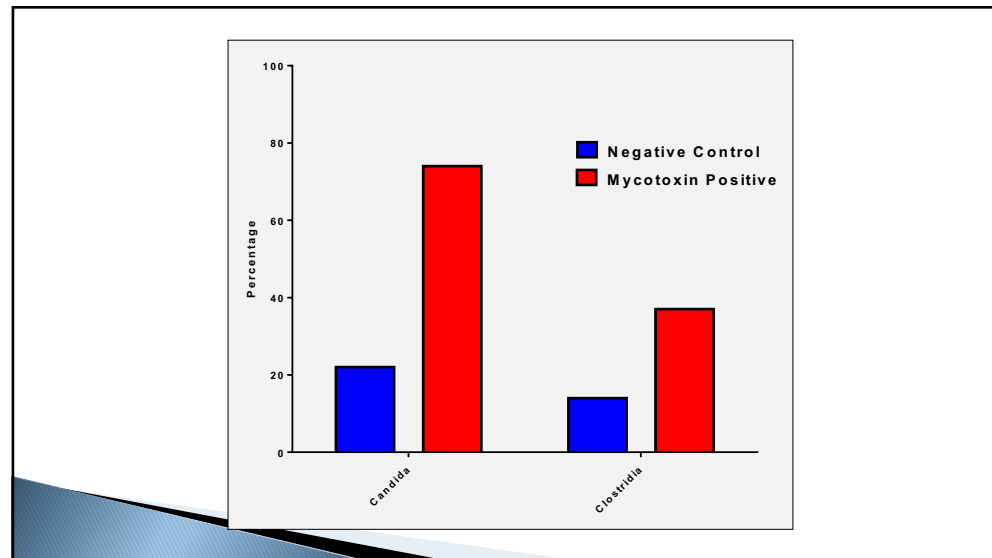
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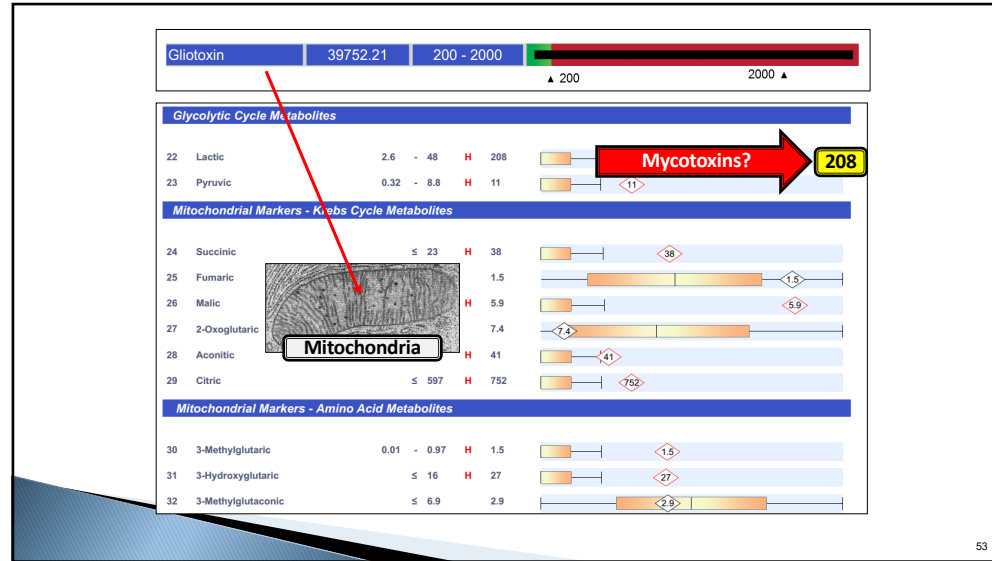
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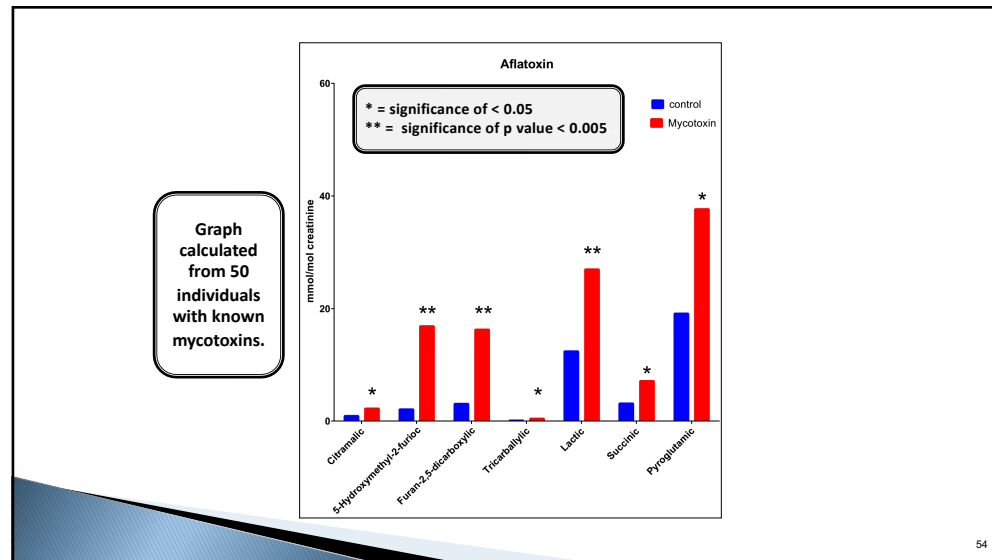
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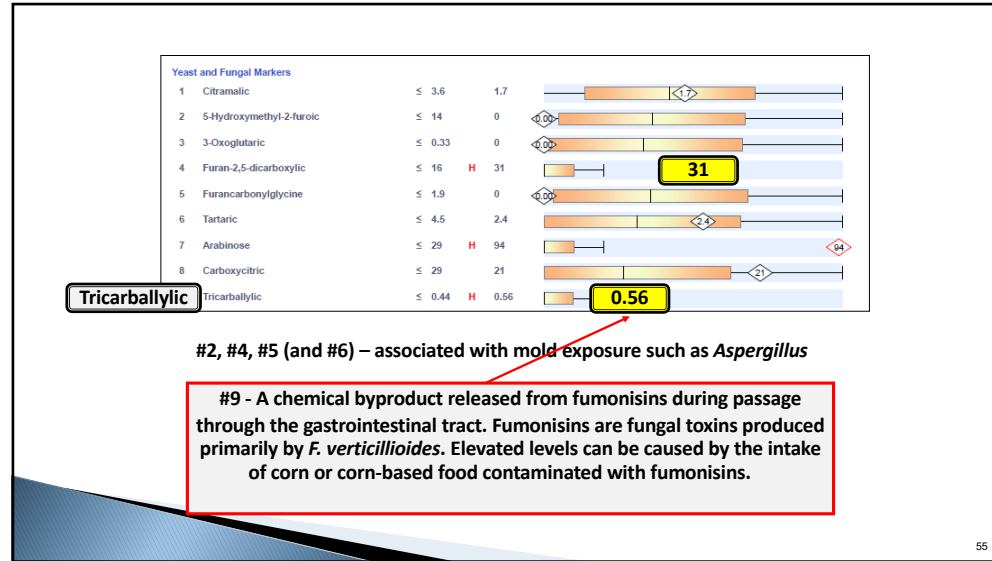
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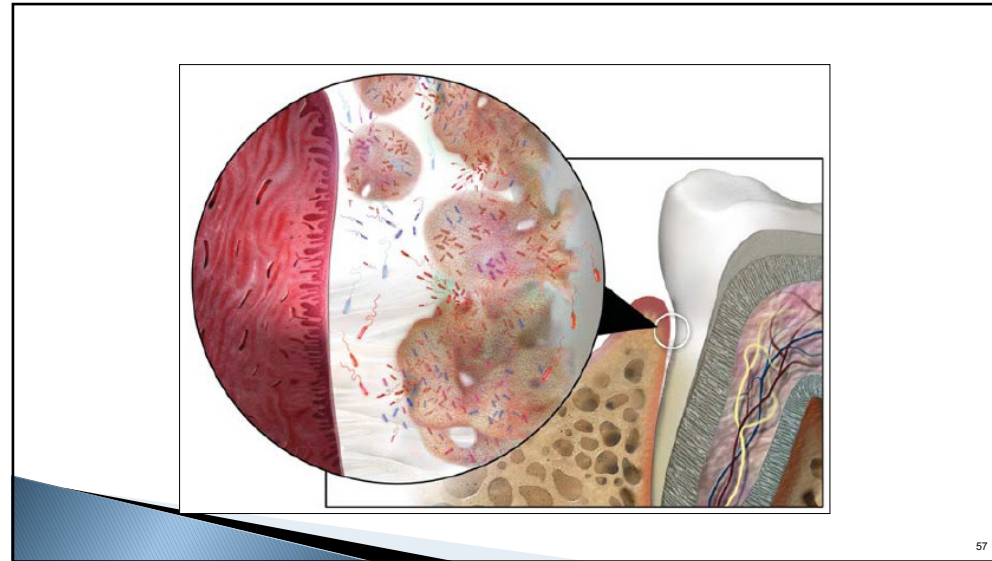
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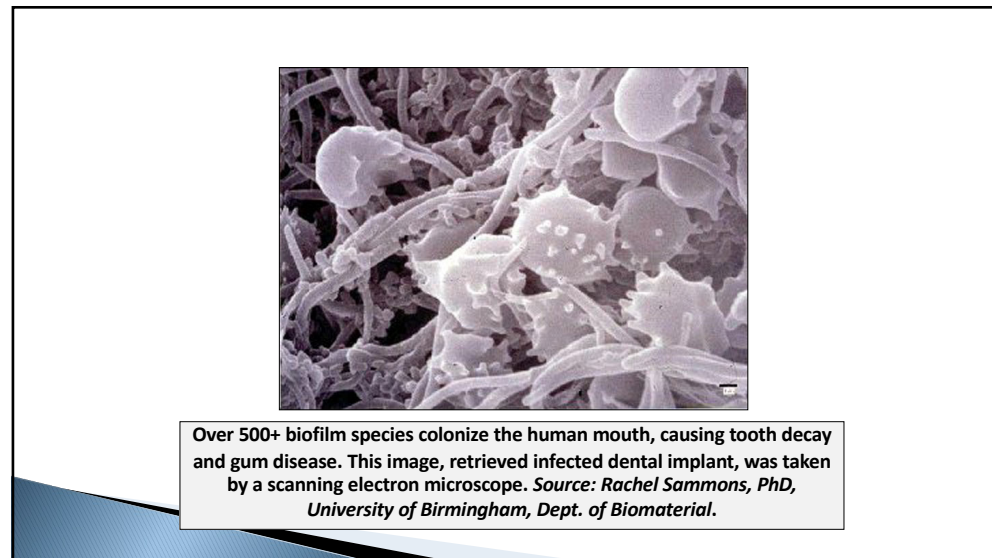
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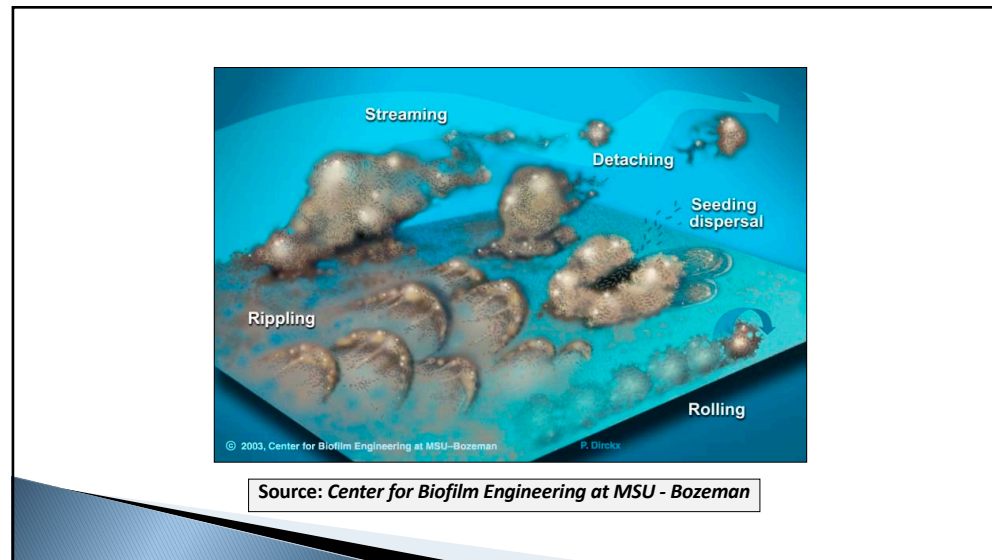
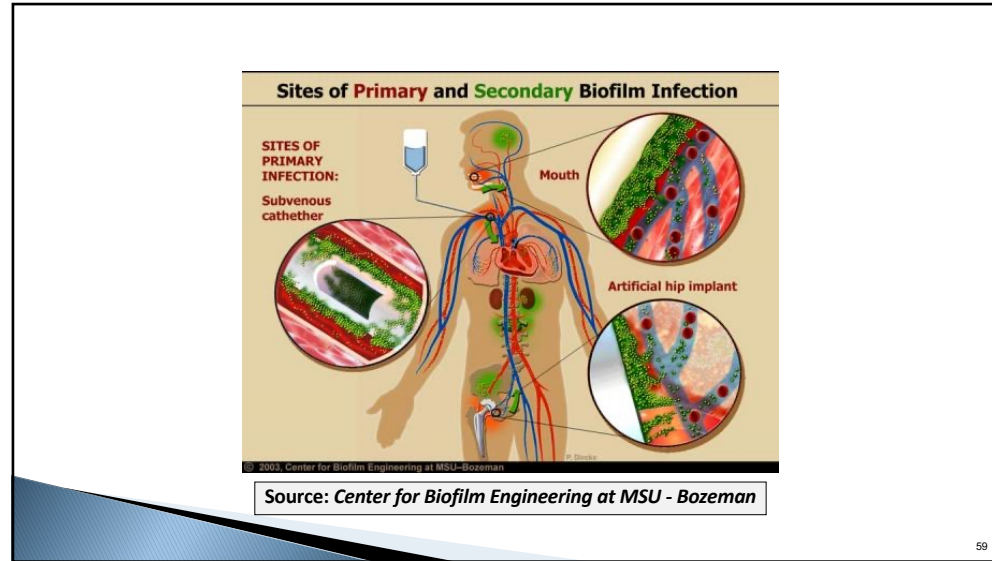


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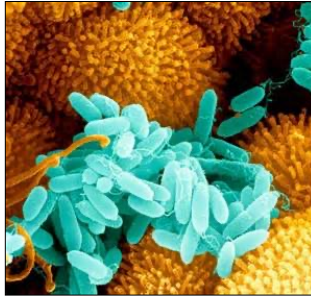


Over 500+ biofilm species colonize the human mouth, causing tooth decay and gum disease. This image, retrieved infected dental implant, was taken by a scanning electron microscope. *Source: Rachel Sammons, PhD, University of Birmingham, Dept. of Biomaterial.*

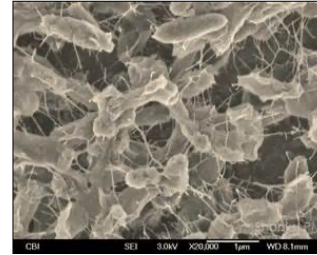
58



Pseudomonas aeruginosa and Cystic Fibrosis



P. aeruginosa in trachea



P. Aeruginosa – forming biofilm

61

61

APMIS Suppl.2013 May;(136):1-51
 “The role of bacterial biofilms in chronic infections.”
 Bjarnsholt, T. et.al.

- ▶ “Bacteria have two life forms during growth and proliferation. In one form, the bacteria exist as single, independent cells (planktonic) whereas in the other form, bacteria are organized into *sessile aggregates*. The latter form is commonly referred to as the biofilm growth phenotype.”
- ▶ “Acute infections are assumed to involve *planktonic bacteria*, which are generally treatable with antibiotics. Successful treatment depends on accurate and fast diagnosis.”
- ▶ “In cases where the bacteria succeed in forming a biofilm, the infection often turns out to be untreatable and will develop into a chronic state.”
- ▶ “The important **hallmarks of chronic biofilm-based infections are extreme resistance to antibiotics and many other conventional antimicrobial agents, and an extreme capacity for evading the host defenses.**”

62

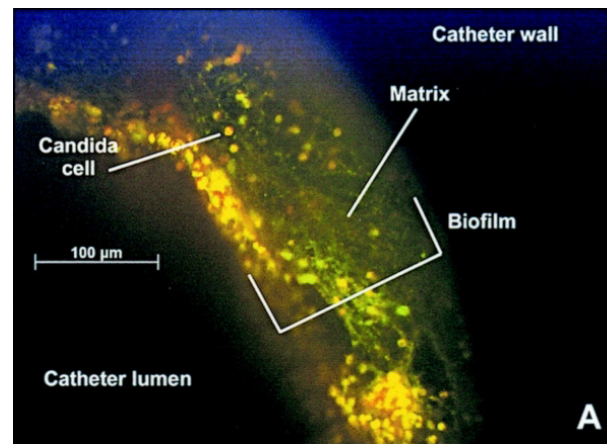
62

Eukaryot Cell. 2005 Apr; 4(4): 633-638.
 "Candida Biofilms: an Update" Gordon Ramage, et. al.

- ▶ "*Candida albicans* remains the fungal species most commonly associated with biofilm formation."
- ▶ "...formation of *candida* biofilms carries important clinical repercussions because of their **increased resistance to antifungal therapy and the ability of cells within biofilms to withstand host immune defenses.**"
- ▶ "Biofilm formation on medical devices can negatively impact the host by causing the failure of the device and by serving as a reservoir or source for future continuing infection."

63

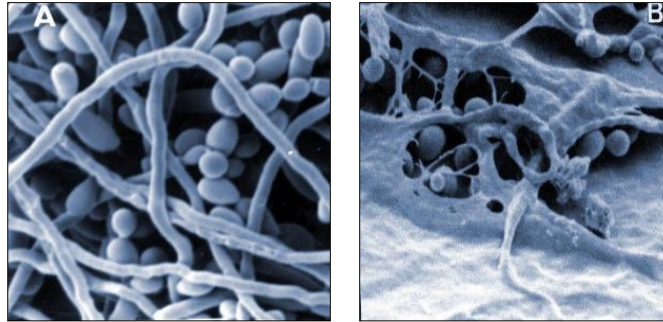
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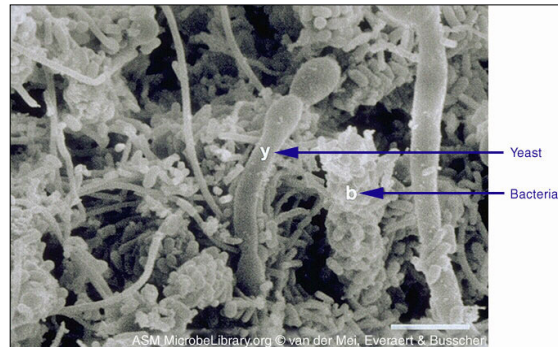
64

Candida Hypha Transformation and Biofilm Development



65

Different Pathogens Can Exist In The Same Biofilm Complex

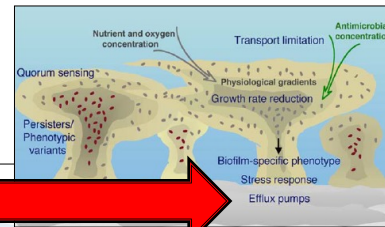


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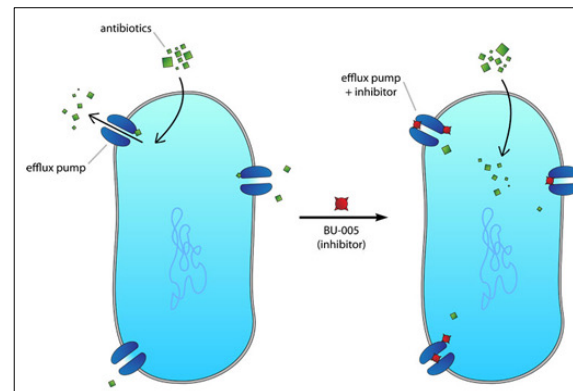
Biofilm Resistance

Biofilms have different levels of resistance:

1. Complex architecture of biofilm
2. The biofilm matrix
3. Metabolic plasticity
4. Efflux pumps



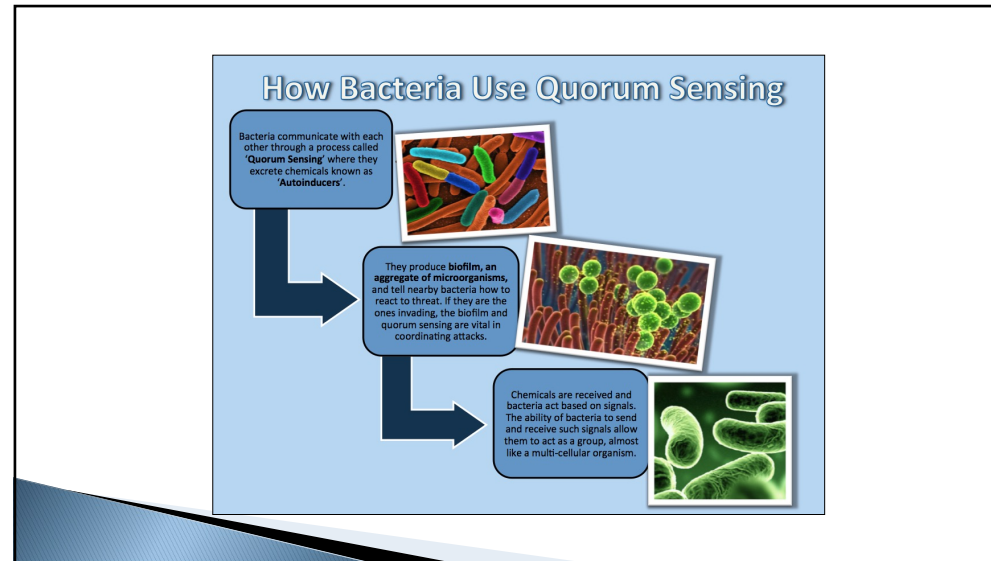
67



Source: <https://www.futurity.org/compound-defeats-drug-resistant-bacteria/>

68

68



69

Front Cell Infect Microbiol. 2017 Mar 23;7:93. doi: 10.3389/fcimb.2017.00093. eCollection 2017.

Scaffold of Selenium Nanovectors and Honey Phytochemicals for Inhibition of *Pseudomonas aeruginosa* Quorum Sensing and Biofilm Formation.

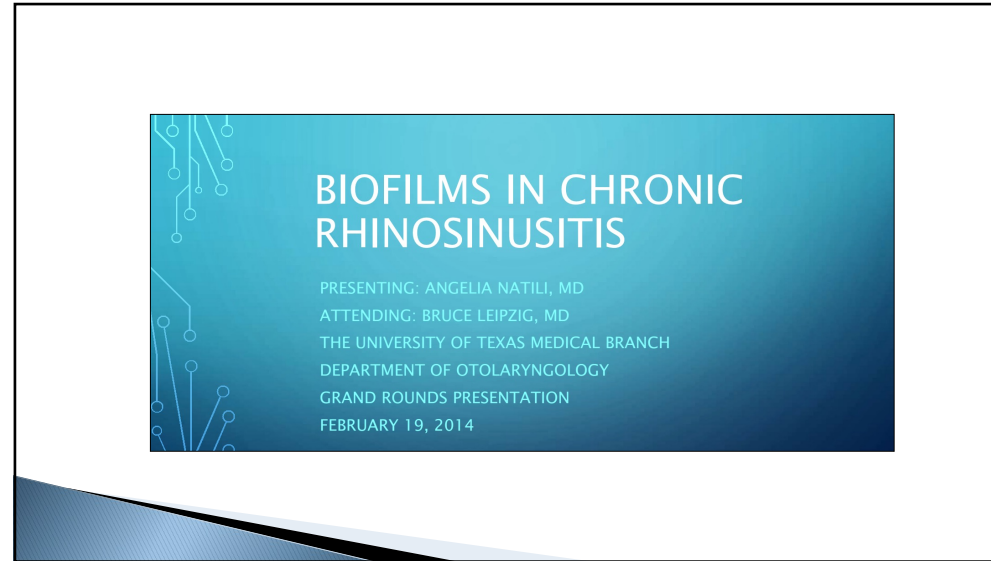
Prateeksha¹, Singh BR², Shoeb M², Sharma S¹, Naqvi AH², Gupta VK³, Singh BN¹.

Author information

Abstract

Honey is an excellent source of polyphenolic compounds that are effective in attenuating quorum sensing (QS), a chemical process of cell-to-cell communication system used by the opportunistic pathogen *Pseudomonas aeruginosa* to regulate virulence and biofilm formation. However, lower water solubility and inadequate bioavailability remains major concerns of these therapeutic polyphenols. Its therapeutic index can be improved by using nano-carrier systems to target QS signaling potentially. In the present study, we fabricated a unique drug delivery system comprising selenium nanoparticles (SeNPs; non-viral vectors) and polyphenols of honey (HP) for enhancement of anti-QS activity of HP against *P. aeruginosa* PAO1. The developed selenium nano-scaffold showed superior anti-QS activity, anti-biofilm efficacy, and anti-virulence potential in both *in-vitro* and *in-vivo* over its individual components, SeNPs and HP. LasR is inhibited by selenium nano-scaffold *in-vitro*. Using computational molecular docking studies, we have also demonstrated that the anti-virulence activity of selenium nano-scaffold is reliant on molecular binding that occurs between HP and the QS receptor LasR through hydrogen bonding and hydrophobic interactions. Our preliminary investigations with selenium-based nano-carriers hold significant promise to improve anti-virulence effectiveness of phytochemicals by enhancing effective intracellular delivery.

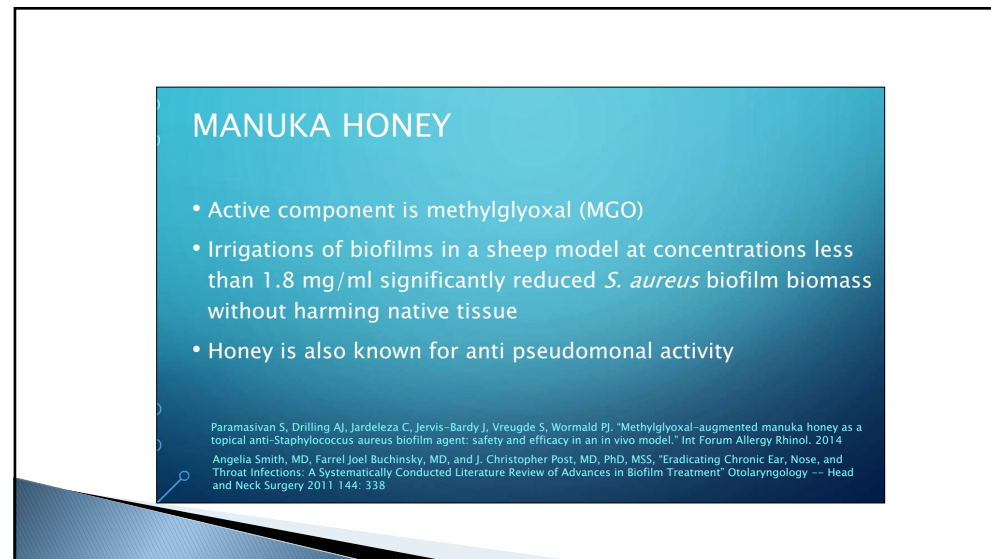
70



BIOFILMS IN CHRONIC RHINOSINUSITIS

PRESENTING: ANGELIA NATILI, MD
 ATTENDING: BRUCE LEIPZIG, MD
 THE UNIVERSITY OF TEXAS MEDICAL BRANCH
 DEPARTMENT OF OTOLARYNGOLOGY
 GRAND ROUNDS PRESENTATION
 FEBRUARY 19, 2014

71



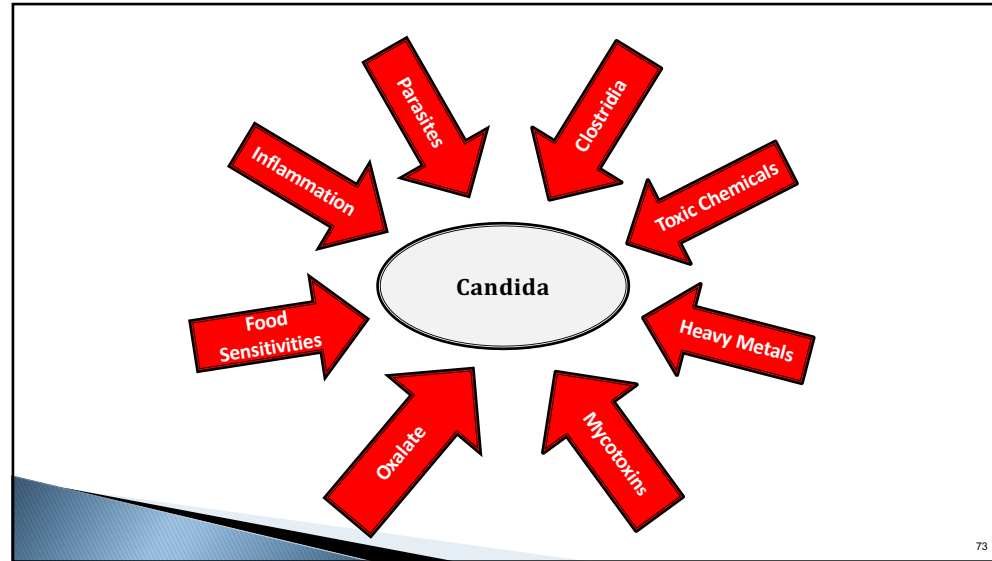
MANUKA HONEY

- Active component is methylglyoxal (MGO)
- Irrigations of biofilms in a sheep model at concentrations less than 1.8 mg/ml significantly reduced *S. aureus* biofilm biomass without harming native tissue
- Honey is also known for anti pseudomonal activity

Paramasivan S, Drilling AJ, Jardeleza C, Jervis-Bardy J, Vreugde S, Wormald PJ. "Methylglyoxal-augmented manuka honey as a topical anti-Staphylococcus aureus biofilm agent: safety and efficacy in an in vivo model." Int Forum Allergy Rhinol. 2014

Angelia Smith, MD, Farrel Joel Buchinsky, MD, and J. Christopher Post, MD, PhD, MSc. "Eradicating Chronic Ear, Nose, and Throat Infections: A Systematically Conducted Literature Review of Advances in Biofilm Treatment" Otolaryngology -- Head and Neck Surgery 2011 144: 338

72



73

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Candida/Yeast Intervention Suggestions By Kurt N. Woeller, D.O.

Mild and/or Sensitive Individual

Bot = Botanical (typically use lower dose)

Nt = Nystatin (meant to be low dose, e.g., 125,000 units to 250,000 units). Nystatin comes in oral suspension at 100,000 units/ml. However, different strength suspensions can be specially prepared by compounding pharmacies, e.g. 250,000 units/ml. Minimal dosing three times daily is suggested.

ALL remedies can be taken with or without food, although away from food is preferred.

NOTE: 5ml = one teaspoon

// = repeat dose

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Breakfast	Bot or Nt	Bot or Nt	Bot or Nt	Bot or Nt	Bot or Nt	Bot or Nt	Bot or Nt
Lunch	//	//	//	//	//	//	//
Dinner	//	//	//	//	//	//	//
Bedtime	Probiotic	Probiotic	Probiotic	Probiotic	Probiotic	Probiotic	Probiotic

74

74

Keys To Chronic Candida Intervention

- ▶ Dietary control through eliminating reactive and toxic foods.
- ▶ Improving digestive system health and microbiome diversity.
- ▶ Eradicating opportunistic infections such as parasites, bacteria, including *clostridia* bacteria.
- ▶ Identifying and elimination of gut colonization of mold
- ▶ Eliminating or reducing environmental toxin exposures such as chemicals and heavy metals.
- ▶ **Consistent and ongoing antifungal intervention through medication and/or botanical remedies.**

75

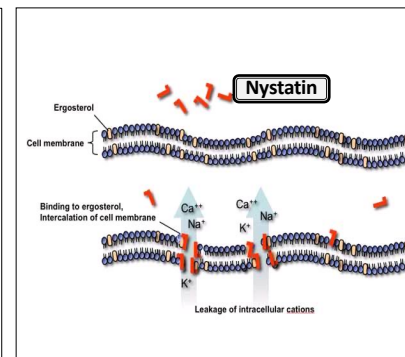
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Nystatin

Nystatin:

- **Tablet** (500,000 units) - 1/2 to 3 tablets 3x/day.
- **Oral Suspension** (100,000 units/ml) – ¼ teaspoon to 3+ teaspoons 3x/day.
- ✓ 5ml = 1 teaspoon

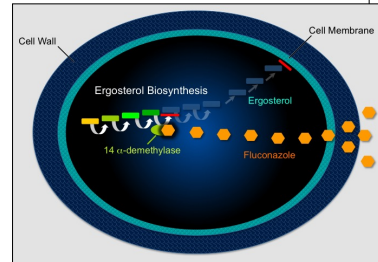
NOTE: can use for prolonged periods of time, e.g. multiple months. In some cases have had to use for 1 to 2+ years.



76

76

Systemic Antifungals



Diflucan (Fluconazole):

- Tablet = 100mg, 150mg, 200mg – used once daily.
- Oral suspension – 10mg/ml or 40mg/ml
- Average daily dose = 5mg/kg/day.
- Length (variable) – 15 to 30 days+
- Can rotate with other antifungals, e.g. Nystatin.
- MUST monitor liver function every 6 to 8 weeks.

Other medications such as **Sporanox** and **Lamisil** can be used similarly (note: *Nizoral* – no longer use).

77

Berberine Complex or Similar Product

Supplement Facts		
Serving size	1 tablet	%DV
Calcium Undecylate	10 mg	*
Sorbic Acid	33 mg	*
Indian Barberry (<i>Berberis aristata</i>) root bark, dried extract, min. 6% berberine	57 mg	*
Coptis (<i>Coptis chinensis</i>) root, dried extract, min. 20% berberine	17 mg	
Green Tea (<i>Camellia sinensis</i>) leaf, dried extract, min. 80% polyphenols	33 mg	*
*Daily Value not established		
A proprietary blend of organic or wild crafted Grapefruit Seed, Garlic Root, Oregon Grape Root, Pau D'Arco, Black Walnut Hulls, Echinacea Root, and Olive Leaves.		




2 to 6 tablets daily

78

78

Candida Defense Formula or Similar Product



Supplement Facts Servings per container 45		
Serving Size	2 capsules	%DV
Biotin	300 mcg	100%
Zinc (as Zinc Undecylenate USP)	20 mg	133 %
Sodium Caprylate	150 mg	*
Zinc Undecylenate USP	150 mg	*
Berberine Hydrochloride	100 mg	*
Cinnamon Bark Extract	100 mg	*
Ginger Root	100 mg	*
Oregano Leaf Extract 10:1	100 mg	*
Pau D'Arco inner bark Extract 5:1	100 mg	*
Rosemary Leaf Extract 10:1	100 mg	*
German Chamomile Flower	50 mg	*

Children	1 to 2 capsules daily or as suggested by your healthcare practitioner.
Adults	2 to 6 capsules daily or as suggested by your healthcare practitioner.

* Daily Value not established.

Other Ingredients: Natural Vegetable capsules, microcrystalline cellulose, magnesium stearate and calcium silicate.


79

79

USP Effectiveness Testing of Biocidin


Demonstrates inhibitory activity of against both gram positive and gram-negative bacteria, yeast and fungus.

Biocidin®
 Bilberry extract, Grape Seed extract, Milk Thistle, Echinacea, Goldenseal, Shiitake, White Willow, Garlic, Black Walnut (hull and leaf), Raspberry, Fumitory, Gentian, Noni, Tea Tree oil, Galbanum oil, Lavender oil, Oregano oil



USP Effectiveness Test Data

Organisms	Initial concentration cfu/ml	0 day (1-2 hours) cfu/ml	7 days cfu/ml	14 days cfu/ml	28 days cfu/ml
Aspergillus niger	19750	6900	0	0	0
Candida albicans	12750	100	0	0	0
Escherichia coli	402500	100	0	0	0
Pseudomonas aeruginosa	765000	100	0	0	0
Staphylococcus aureus	515000	50	0	0	0



80

80

RESEARCH ARTICLE

Antiquorum sensing, antibiofilm formation and cytotoxicity activity of commonly used medicinal plants by inhabitants of Borabu sub-county, Nyamira County, Kenya

Eric Omori Omwenga, Andreas Hensel, Susana Pereira, Alfred Anakalo Shitandi, Francisco M. Goycoolea

Published: November 1, 2017 • <https://doi.org/10.1371/journal.pone.0185722>

ScientificWorldJournal 2018; 2018: 7405736. PMID: PMC6011056
 Published online 2018 Jun 6. doi: [10.1155/2018/7405736](https://doi.org/10.1155/2018/7405736) PMID: 29977171

Antibacterial and Antibiofilm Activities of *Cinnamomum* Sp. Essential Oil and Cinnamaldehyde: Antimicrobial Activities

Diego F. Firmino,¹ Theodora T. A. Cavalcante,² Geovany A. Gomes,³ Nairley C. S. Firmino,⁴ Lucas D. Rosa,⁴ Mário G. de Carvalho,⁵ and Francisco E. A. Catunda Jr.^{2,6}

Evid Based Complement Alternat Med. 2016; 2016: 1572697. PMID: PMC4939345
 Published online 2016 Jun 27. doi: [10.1155/2016/1572697](https://doi.org/10.1155/2016/1572697) PMID: 27429633

Antibacterial and Antibiofilm Activity of Methanolic Plant Extracts against Nosocomial Microorganisms

Eduardo Sánchez,^{1,*} Catalina Rivas Morales,¹ Sandra Castillo,² Catalina Leos-Rivas,¹ Ledy García-Becerra,¹ and David Mizael Ortiz Martínez,¹

BMC Complementary and Alternative Medicine
 December 2012, 12:242 | [Cite as](#)

Antimicrobial, antimycobacterial and antibiofilm properties of *Couroupita guianensis* Aubl. fruit extract

81

81

Biocidin Advanced Formula

Biocidin® efficacy was determined against biofilms. Various concentrations of Biocidin® diluted in saline (0.85% sodium chloride) were tested and viability was assessed. Overall, biofilms were less susceptible than the bulk-liquid (planktonic) populations. This was expected as, once cells disperse from a biofilm into the bulk-liquid they become susceptible to antimicrobials once again.

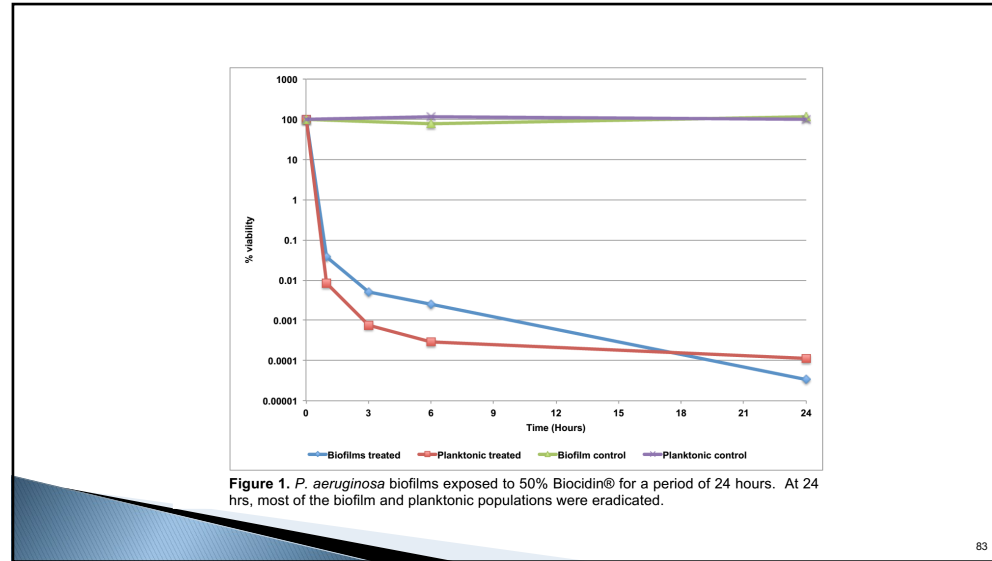
Table 2. % Death following exposure to various concentrations of Biocidin® for a period of 4 hours at 37°C with aeration

		0% biocidin®	25% Biocidin®	50% Biocidin®	75% Biocidin®	100% Biocidin®
<i>S. aureus</i>	Biofilms	0%	92.9%	98.4%	95.0%	89.7%
	Planktonic	0%	99.2%	60.0%	91.9%	99.9%
<i>K. pneumonia</i>	Biofilms	0%	90.7%	78%	82.7%	99.8%
	Planktonic	0%	99.1%	55.9%	91%	99.97%
<i>P. aeruginosa</i>	Biofilms	0%	92.1%	99.99%	99.96%	N/A
	Planktonic	0%	93.3%	99.99%	99.97%	N/A
<i>C. albicans</i>	Biofilms	0%	99.96%	99.99%	99.98%	99.99%
	Planktonic	0%	95.6%	96.3%	95.9%	99.7%

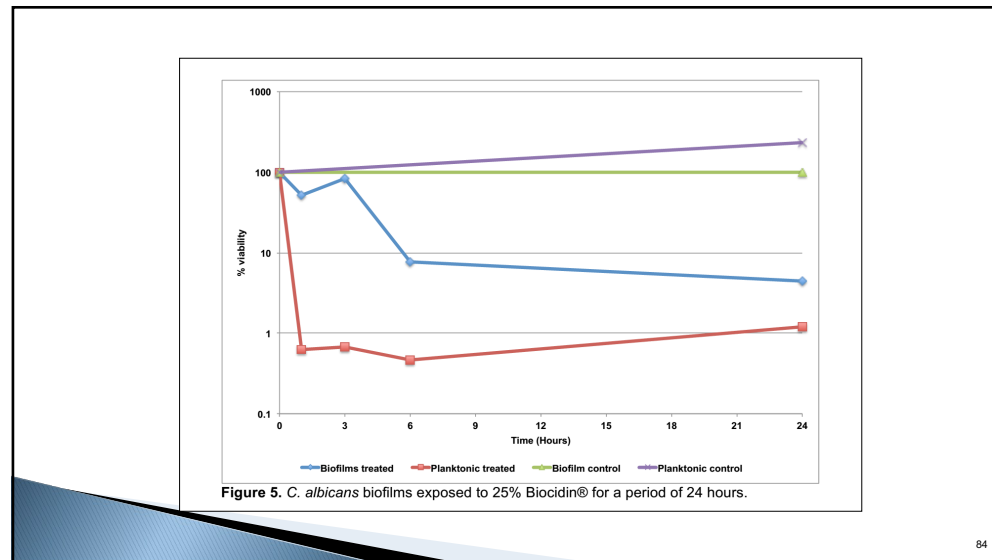
Binghamton University researcher Claudia Marques, Ph.D

82

82



83



84

Dr. Woeller OAT Lecture Support Document



Anti-Biofilm Program (example) By Kurt N. Woeller, D.O.

The following is an outline for a typical anti-biofilm program used for chronic digestive bacterial infections and candida/yeast overgrowth. The supplements listed are available from New Beginnings Nutritionals – <https://nbnus.com> and come from various supplement companies such as BioBotanical Research (*GI Detox+*) and Klaire Labs (*Interfase Plus*).

One thing to keep in mind is that the incorporation of anti-biofilm supplements will increase the complexity of a supplement program being used for the eradication of an intestinal pathogen. Many botanicals themselves have anti-biofilm properties already, so the additional use of anti-biofilm enzymes may not be necessary in every situation.

Step #1 - Use 1 to 2 capsules of **Interfase Plus** 30 to 45 minutes prior to antimicrobial remedy, e.g., Nystatin, Diflucan, Biocidin. For sensitive individuals it is advisable to start with just one dosing of anti-biofilm enzymes per day before adding a second dose.

Step #2 – Give the prebiotic fiber **PureLean** (or other fiber/prebiotic product) one hour away (minimally) from Nystatin (or other antifungal medication) and/or herbal remedy.

85

85



**BEYOND
THE BASICS:**
ADVANCED
ORGANIC ACIDS
TESTING
STRATEGIES

THANK YOU

Next Lecture

The OAT, Clostridia Bacterial
Toxins, and Dopamine Metabolism
Interference

86