Diagnostic Solutions laboratory

Clues On A Stool Test That Your Client May Benefit From Enzymes

GI-MAP®
GI Microbial Assay Plus

Presented by Lisa Pomeroy, ND

Agenda

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- Why we may choose to run a **stool test**
- What **clues** there are on a stool test report that suggest that a client may **benefit from enzyme supplementation**
- When we see these clues, which **type** of enzyme is indicated and **why**
- Q&A

Why run a stool test?

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- Many chronic health issues <u>begin in the gut</u>
  - Hippocrates: *"all disease begins in the gut"*
  - What *happens* in the gut doesn't *stay* in the gut
    - The health of the gut *affects almost every other system in the body*
  - Researchers have found that virtually all of the most prevalent chronic diseases that plague modern society including obesity, Type 2 diabetes, heart disease, neurological disorders, and many cancers have been associated with *alterations in gut microbiota*

- IMPORTANT: Many people have gut problems <u>*without* having any gut symptoms</u>!!
  - Their "gut problems" may be manifesting in a *different body system*
  - Instead of gas, bloating, diarrhea, constipation, or abdominal pain, they have brain fog, fatigue, anxiety, depression, skin issues, joint pain, or autoimmune diseases
  - So, don't limit stool testing to *only* clients with *GI symptoms*!
  - Whenever a client is dealing with *chronic health issues*, strongly consider evaluating the health of the gut with a stool test – even if the GI tract isn't the major body system presenting with symptoms

Choose a high-quality stool test

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- The best way to assess the health status of the gut is through **stool testing**

- A stool (fecal) sample can tell us:
  - whether pathogens are present
  - if there is dysbiosis
  - if the gut is inflamed, bleeding, or hyperpermeable
  - if the level of pancreatic enzymes being secreted into the gut is sufficient to properly digest food
  - if there is fat malabsorption
  - whether gut mucosal immunity is suppressed
  - *and more…*

- Not all stool testing is the same
  - This is NOT a test you want to do through a conventional lab (LabCorp, Quest, etc)
  - Different labs use different techniques to analyze the stool (O&P, culture, PCR, qPCR, etc)
  - I'm very particular about which labs I use for stool testing
    - Unfortunately, many miss pathogens & dysbiosis

Stool test report

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- Okay, you have the client's stool test report…now what?

- Functional medicine often talks about using a "5R Approach" to restore gut health:

  1) REMOVE (pathogens, dysbiosis, etc)
  2) REPLACE (HCL, pancreatic enzymes, bile salts)
  3) REINOCULATE (prebiotics and probiotics)
  4) REPAIR (nutrients and botanicals)
  5) REBALANCE (maintain a healthy work-life balance)

- Today, we're going to talk about how the use of different types of enzymes fits into this approach

Clues that enzymes may be helpful

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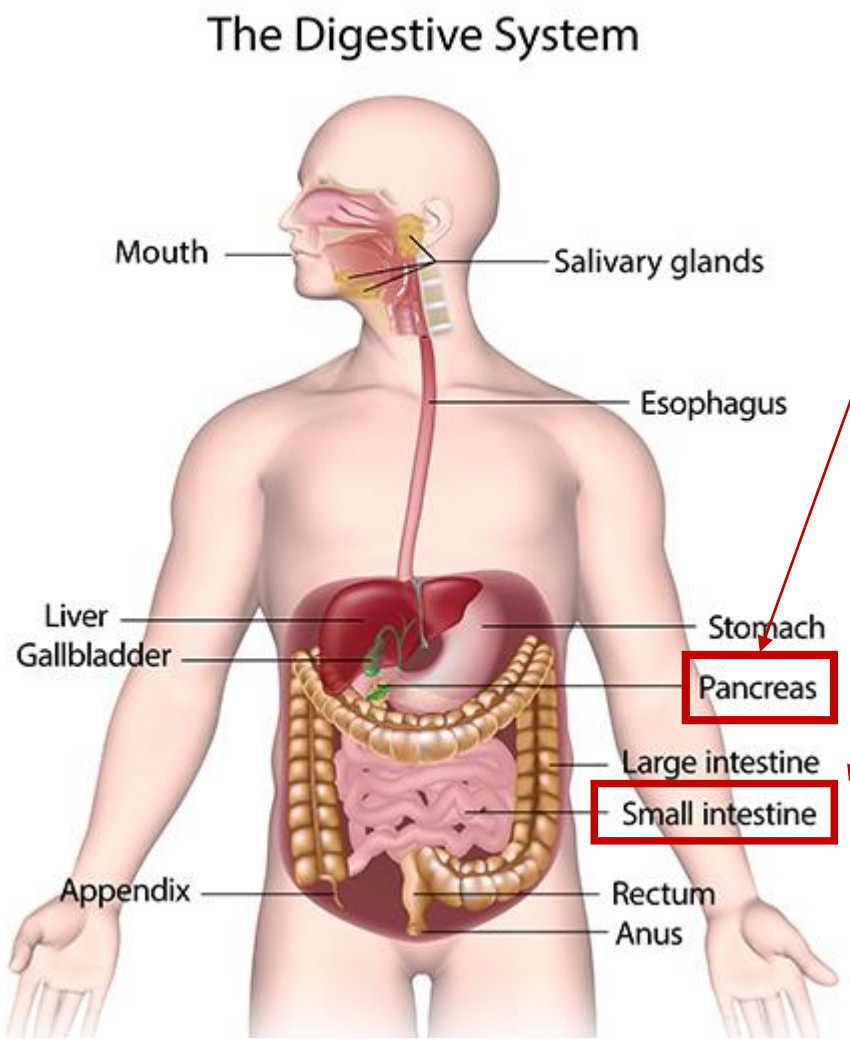
- Based on the findings of a stool test, we may decide to use enzymes to:
  - Support digestion
  - Disrupt biofilms
  - Decrease inflammation
- Let's look at some clues on a stool test report that suggest that enzymes may be helpful…starting with the obvious (direct markers) and moving on to the subtle (pattern recognition)

Digestive Enzymes



- **Pancreatic enzymes**
  - *Represented by the marker Elastase-1*
  - Secreted by the pancreas
  - Break down proteins, fats, and carbs
  - Proteases, amylase, lipase
- **Small intestinal enzymes**
  - *No direct markers on a stool test – have to look for clues*
  - **Brush border enzymes**
    - Secreted by the microvilli in the small intestine
    - Break down complex carbs and proteins
    - Lactase, maltase, sucrase, peptidases, etc
  - **Diamine oxidase (DAO)**
    - Secreted by villous enterocytes in the small intestine
    - Breaks down histamine from the diet

Elastase-1: Introduction

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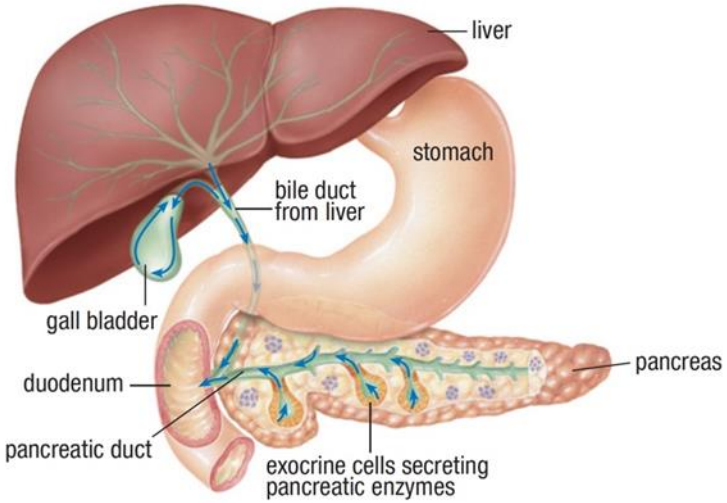
Intestinal Health			
Digestion	Result		Normal
Steatocrit	**<dl**		<15 %
Elastase-1	151	Low	>200 ug/g

- Elastase-1 is a digestive enzyme secreted exclusively by the pancreas
  - Used as a biomarker to reflect *overall* exocrine pancreatic function
  - The marker is *not* affected by pancreatic enzyme supplementation

- Measuring its level in the stool tells us whether the pancreas is producing enough enzymes to properly digest food (proteins, fats, & carbs)

- 3 major types of pancreatic enzymes:
  - **Proteases** to digest protein
  - **Lipase** to digest fat
  - **Amylase** to digest carbohydrates



Elastase-1: Interpretation

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- Low Elastase-1 = lack of pancreatic enzymes = poor digestion
  - Poor digestion can cause symptoms (gas, bloating, abdominal pain, etc) and lead to dysbiosis (organisms overgrow by consuming undigested food, etc)

- While >200 ug/g is considered "normal," the medical literature indicates that *healthy individuals* have Elastase-1 levels >500 ug/g

Intestinal Health			
Digestion	Result		Normal
Steatocrit	**<dl**		<15 %
Elastase-1	**339**	*Suboptimal*	>200 ug/g

- Low = <200 ug/g *(Pancreatic Exocrine Insufficiency or "EPI")*
- Suboptimal: 200-500 ug/g
- **Optimal: >500 ug/g**

Elastase-1: Intervention

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- When Elastase-1 is low (<200 ug/g) or suboptimal (200-500 ug/g), I recommend that a **pancreatic enzyme supplement** be taken with all meals

Supplement Facts

Serving Size: 1 Capsule
Servings Per Container: 60/90/120

Amount Per Serving		% Daily Value
Tzyme™ Protease Blend (Protease and peptidase) (55,131 HUT + 11 SAPU)	67 mg	†
Lipase (7,518 FIP)	24 mg	†
Tzyme™ Polysaccharolytic Blend	302 mg	†
Amylase	20,000 DU	†
Phytase	42 FTU	†
Glucoamylase	25 AGU	†
Alpha-galactosidase	438 Gal U	†
Macerase	400 CU	†
Beta-glucanase	25 BGU	†
Lactase	610 ALU	†
Pectinase	14 endo-PGU	†
Cellulase	295 CU	†
Diastase	168 DP°	†
Invertase	56 SU	†
Hemicellulase	28 HCU	†

† Daily Value not established

OTHER INGREDIENTS: HYPROMELLOSE, WATER, CALCIUM CITRATE

- In order to provide the body with the pancreatic enzymes it is lacking when Elastase-1 is low/suboptimal, a supplement *must include* **protease**, **amylase**, and **lipase**

** If you also see high Steatocrit (fat malabsorption), the client may need **extra lipase** or **liver/gall bladder support** (to promote bile production/secretion)*

Intestinal Health			
Digestion	Result		Normal
Steatocrit	25	High	<15 %
Elastase-1	66	Low	>200 ug/g

Small Intestinal Enzymes - Introduction

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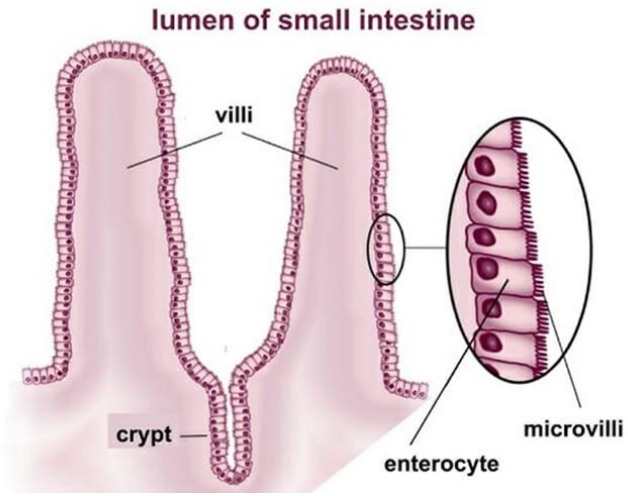
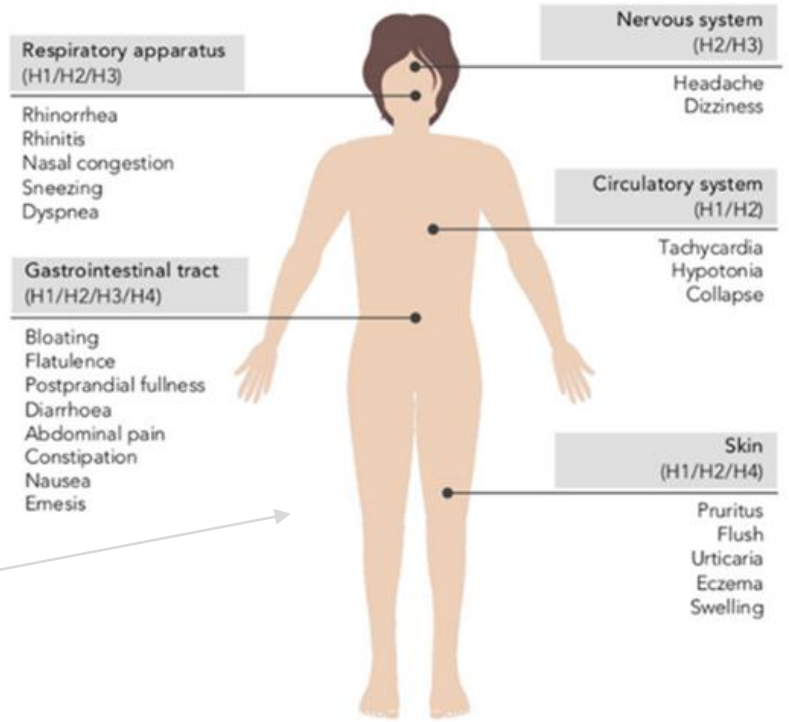


- Digestive enzymes produced in the small intestine include **brush border enzymes** and **DAO**

- When the small intestine is **damaged** or **inflamed**, *less* enzymes may be produced
  - Lactose intolerance *(due to low lactase)*
  - Carbohydrate intolerance *(due to low maltase, sucrase, invertase, etc)*
  - Histamine intolerance *(due to low DAO)*



- **Common symptoms (small intestinal enzyme deficiency)**
  - Difficulty digesting dairy, complex carbohydrates like FODMAPs, and/or high-histamine foods
  - Gas, bloating, abdominal pain, etc when eating dairy/carbs
  - Excess histamine symptoms (elevated histamine levels can lead to *intestinal* and *extra-intestinal* symptoms - see image)

Small Intestinal Enzymes - Interpretation

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- How do we know if the small intestine is **damaged** or **inflamed**?
  - No direct marker, so you must look for “clues” on the report

✓ Were any **parasites** that live in the small intestine detected (*Giardia* & *Cryptosporidium*)?

Parasitic Pathogens	Result	
Cryptosporidium	9.02e6	High

Giardia	2.04e4	High

Small Intestinal Enzymes - Interpretation

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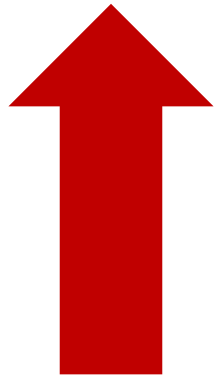
✓ Is there **overgrowth** of **pro-inflammatory bacteria/fungi** that can live in the small intestine (*Pseudomonas*, *Klebsiella*, *Citrobacter*, *Proteus*, *E. coli*, *Candida*, etc)

Opportunistic Bacteria			
Pseudomonas spp.	2.32e7	High	<1.00e4
Pseudomonas aeruginosa	7.40e4	High	<5.00e2
Klebsiella spp.	5.06e5	High	<5.00e3
Klebsiella pneumoniae	3.24e5	High	<5.00e4
Citrobacter spp.	2.01e2		<5.00e6
Citrobacter freundii	3.25e8	High	<5.00e5
Proteus spp.	8.12e4	High	<5.00e4
Proteus mirabilis	2.30e6	High	<1.00e3

Normal Bacterial Flora			
Escherichia spp.	1.80e10	High	3.70e6 - 3.80e9

Fungi/Yeast			
	Result		Normal
Candida spp.	1.57e5	High	<5.00e3
Candida albicans	2.00e3	High	<5.00e2



Small Intestinal Enzymes: Intervention

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- When small intestinal **parasites are detected** and/or there are **a lot of organisms overgrowing** in the small intestine (bacteria and possibly fungi) *and* the client is experiencing **symptoms** associated with small intestinal enzyme deficiency, consider <u>supplementing with **small intestinal enzymes**</u>

- Supplement options:
  - **Brush border enzymes**
    - Included in *some* digestive enzyme formulas (check the label)
  - **DAO enzyme**
    - Available as a separate supplement

Supplement Facts
Serving Size: 1 Capsule
Servings Per Container: 30 / 90

	Amount Per Serving	%DV
Vitamin C (as ascorbyl palmitate)	10 mg	11%
DAO2™ porcine kidney extract (Diamine Oxidase Activity 10,000 HDU)	4.2 mg	*

Supplement Facts
Serving Size: 1 Capsule
Servings Per Container: 60/90/120

Amount Per Serving	% Daily Value
Tzyme™ Protease Blend (Protease and peptidase) (55,131 HUT + 11 SAPU)	67 mg †
Lipase (7,518 FIP)	24 mg †
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Cellulase	295 CU †
Diastase	168 DP° †
Invertase	56 SU †
Hemicellulase	28 HCU †

Pancreatic enzymes AND brush border enzymes

Supplement Facts
Serving Size 1 capsule

Amount Per Serving	% Daily Value
Pancrelipase (providing)	333 mg *
Pancreatic Lipase	8,000 USP Lipase *
Pancreatic Protease	33,333 USP Protease *
Pancreatic Amylase	33,333 USP Amylase *
Desiccated Ox Bile	50 mg *
Bromelain	33 GDU *

Pancreatic enzymes ONLY
*(*no* brush border enzymes)*

Gluten-Digesting Enzymes: Introduction

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- If a client has a gluten sensitivity, they should follow a **100% gluten-free diet**

- However, **cross-contamination** is a HUGE problem, so many people who are doing their best to be completely gluten-free are **still getting exposed**

- 2019 study: Gluten was detected in **32% of *"gluten-free"* restaurant meals** (PMID: 30920417)
  - Conclusion: **1/3 of all meals** that were said to be "gluten-free" at restaurants were in fact **contaminated** with gluten!!
  - "Gluten-free" **pizza** and **pasta** were the **most often contaminated**
    - Gluten was detected in 53.2% of pizza and 50.8% of pasta samples.
  - 30% of "gluten-free" **French fries** tested positive for gluten

Gluten-Digesting Enzymes: Interpretation

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- **High Anti-Gliadin IgA = immune reactivity to gluten**
  - Is the client currently gluten free?
    - If NO, they *should* go gluten-free
    - If YES, they need to *investigate possible sources of exposure*
      - Cross-contamination is one of the top “hidden” sources of gluten exposure

Immune Response	Result		Normal
Secretory IgA	**1285**		510 - 2010 ug/g
Anti-gliadin IgA	**213**	**High**	0 - 157 U/L

Gluten-Digesting Enzymes: Intervention

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- Gluten-sensitive individuals: When eating out at a restaurant or any place where *they* didn't prepare the food (such as at the home of a friend or family member), I recommend taking a **gluten-digesting enzyme supplement** before the meal

- Gluten-Digesting Enzymes include:
  - **DPP-IV**
  - **Endopeptidases/Exopeptidases**
    - Glutalytic®
    - Tolerase® G

Gluten-Digesting Enzymes **don't REPLACE a gluten-free diet**, they **PROTECT** against accidental **cross-contamination**

Supplement Facts
Serving Size 1 Capsule
Servings Per Container 90/180

Amount Per Serving		% Daily Value
Tzyme™ Enzyme Blend	373 mg	
Protease Blend (endo/exo proteases) (47,104 HUT / 500 DPP-IV)	205 mg	†
Phytase	90 FTU	†
Amylase	3,495 DU	†
Alpha-galactosidase	525 GalU	†
Glucoamylase	12 AGU	†
Pectinase	30 endo-PGU	†
Lipase	340 FIP	†
Lactase	140 ALU	†
Protease 3.0	2 SAPU	†
Cellulase	60 CU	†
Hemicellulase	60 HCU	†
Invertase	14 SU	†
Diastase	42 DP°	†
Herbal Blend	63 mg	†
Fennel (seed), Ginger (rhizome), Flax seed, Peppermint (leaf), Artichoke (leaves) extract		
Bifidobacterium infantis (250 million cfu)	6 mg	†

Supplement Facts
Serving Size 1 capsule

Amount Per Serving		% Daily Value
Glutalytic®	350 mg	*
Endo-Peptidase Complex	75,000 HUT/500 SAPU	*
Exo-Peptidase Complex	125 DPPIV	*
Protease (*Bacillus subtilis*)	30,000 PC	*
Bromelain (*Ananas comosus*)(stem)	500,000 PU	*

Supplement Facts
Serving size 1 capsule
Servings per container 60

	Amount Per Serving	%DV
Tolerase® G Prolyl Endopeptidase	83,300 PPI	*
BioCore® Dairy	105 mg	*
protease (endo/exopeptidase)	630 BLGU	
lactase	1,000 ALU	

Biofilm-Disrupting Enzymes: Introduction

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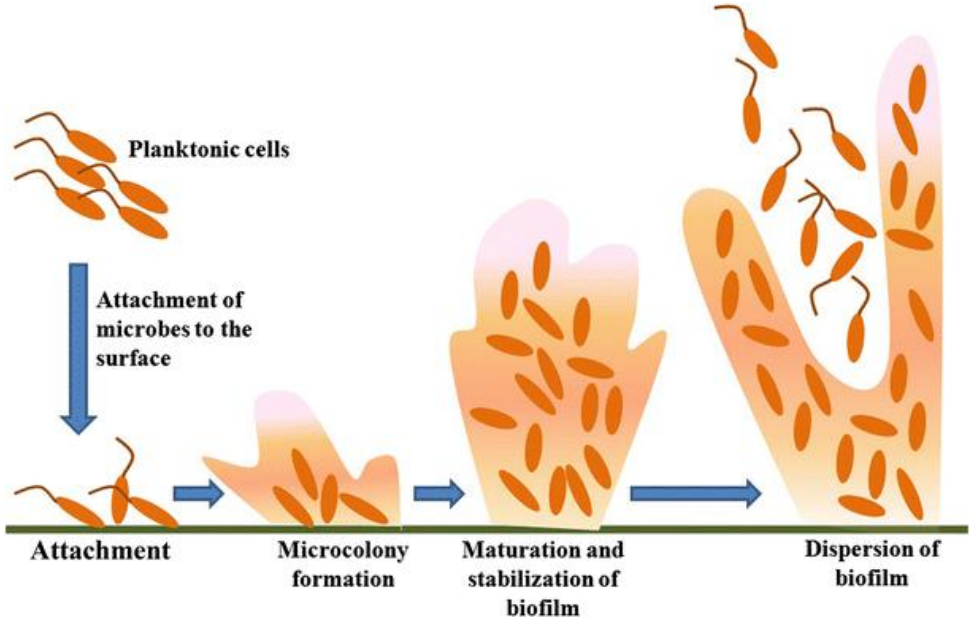
- A biofilm is a **complex structure** consisting of microorganisms such as bacteria, fungi, parasites, and viruses that are living together in a community enclosed in an extracellular polymeric substance matrix

- **Dental plaque** on teeth is an **example** of a biofilm

- The **glue-like consistency** of the biofilm forms a **physical barrier** (like a **shield**) that **protects the organisms** inside from the immune system, anti-microbial agents, and other substances that might otherwise harm them



- Bacteria within biofilms can be as much as **1,000 times more resistant to antibiotics**!

Biofilm-Disrupting Enzymes: Interpretation

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- How do you know if biofilms may be a factor for your client?
  - No direct marker, so you must look for “clues” on the report and in the client’s history

✓ Do you see an **overgrowth of organisms** known for their ability to **produce biofilms**?

✓ ***Pseudomonas spp***, ***Klebsiella spp***, ***Proteus spp***, ***Staphylococcus aureus***

✓ Be especially suspicious when the levels of these organisms are *extremely* high

Pseudomonas spp.	3.88e9	High	<1.00e4
Pseudomonas aeruginosa	1.17e6	High	<5.00e2

Pseudomonas
- Known to produce biofilms
- E9 level = 5 powers above ref range (e4) [5 powers = 100,000 times more than the upper cut-off!]

✓ Has the client been suffering from **severe** symptoms for a **long** time?

✓ Has the client done **anti-microbial protocols in the past** and the levels of the organisms they’ve been targeting are *NOT decreasing* or their symptoms *don’t improve* or *return shortly* after discontinuing the protocol?

✓ Biofilms can be a factor in the inability to resolve chronic gut infections and dysbiosis. By shielding organisms, biofilms can prevent the successful eradication of these organisms.

Biofilm-Disrupting Enzymes: Intervention

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- **Proteolytic enzymes** act as fibrolytic agents and **dissolve the fibrous matrix of biofilms**

- When taken on an **empty stomach**, these protein-digesting enzymes can **break down biofilms**, allowing the immune system and anti-microbial agents to kill the organisms that are hiding inside biofilms

- Proteolytic enzymes include:
  - Proteases
  - Serrapeptase
  - Nattokinase
  - Lumbrokinase

- If you suspect that biofilms may be present, consider including **proteolytic enzymes** in a client's anti-microbial protocol to disrupt biofilms

- Proteolytic enzymes can be used synergistically *with* antimicrobial agents to enhance their effect

Inflammation-Lowering Enzymes

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- Inflammation in the GI tract can make it more challenging to eliminate pathogens and balance the microbiome by:
  - **Inhibiting the growth of beneficial flora** (which do *not* grow well in an inflamed environment)
  - **Promoting the growth of many pathogens and opportunistic organisms** (which *flourish* in an inflamed environment)
  - **Hindering immune function** (which impairs the body's ability to get rid of undesirable organisms)

- If you see that **Calprotectin** (a marker of colonic inflammation) is *high-normal* or *high*, or that there is a significant **overgrowth of pro-inflammatory organisms**, the GI tract may be inflamed

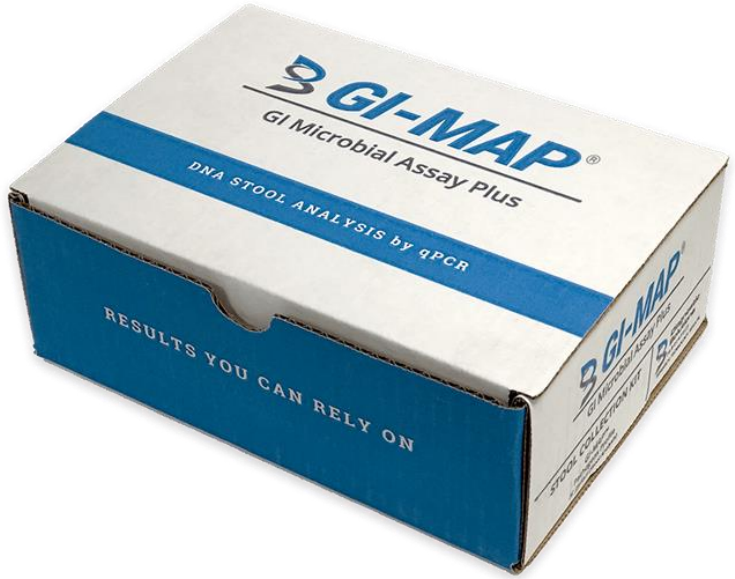
Inflammation	Result		Normal
Calprotectin	207	High	<173 ug/g

- When there are signs and symptoms of inflammation, consider the use of **proteolytic enzymes**, which can be taken on an empty stomach to decrease inflammation

To Learn More…

Diagnostic Solutions Laboratory

https://www.diagnosticsolutionslab.com/



- DSL offers the **GI-MAP** stool test
- The GI-MAP relies exclusively on **qPCR technology** (quantitative polymerase chain reaction) to detect parasites, bacteria, fungi, and viruses by targeting the specific DNA of the organisms tested

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Pomeroy Institute For Functional Nutrition

https://pomeroyinstitute.com/

- In addition to working as a **clinical consultant** for Diagnostic Solutions Laboratory, I educate health practitioners on functional lab interpretation through my **training courses** and **1-on-1 consultations** through Pomeroy Institute For Functional Nutrition

COMING SOON: "GI Pathogens & Dysbiosis" training course
(in-depth review of all the markers on the GI-MAP)