# CDSA and CDSA 2.0

## COMPREHENSIVE DIGESTIVE STOOL ANALYSIS

## Why are these two tests important, and how do they differ?

The CDSA and the CDSA 2.0 offer a comprehensive look at the overall health of the gastrointestinal (GI) tract. They provide information about digestion, absorption, bacterial balance, yeast overgrowth, inflammation, metabolic activity, and immune function.

CDSA is the original non-invasive evaluation of gastrointestinal function that includes analyses of digestion, absorption, bacterial balance, yeast and parasites. This profile is recommended for patients with diffuse and non-specific GI-related symptoms, such as indigestion, dysbiosis, constipation, and diarrhea.

CDSA 2.0 uses advanced GI biotechnology to evaluate digestion, absorption, pancreatic function, and inflammation, in addition to bacterial balance, yeast, and parasite infection. The CDSA 2.0 also helps identify inflammatory conditions (including subclinical inflammation) such as food allergies, Inflammatory Bowel Disease (IBD), NSAID enteropathy, and post-infectious Irritable Bowel Syndrome (IBS).

## What do these tests involve?

The patient collects 1 stool sample. If parasite testing is requested, two additional samples are required. The samples are transferred into vials and shipped to the lab, where they are analyzed. The final report includes up to twenty one different pieces of information and an interpretative summary.

## What are the consequences of imbalanced gastrointestinal health?

- IBS can be the result of maldigestion, malabsorption, dysbiosis, and/or inflammation.
- Maldigestion can result in GI symptoms such as gas, bloating, abdominal pain, constipation or diarrhea.
- Chronic maldigestion can lead to bacterial/fungal overgrowth and alterations in gut permeability. Toxins and large molecules that escape the intestinal barrier can enter the general circulation, inflame the liver, burden the body's detoxification system, and increase the risk for food allergies, joint disease, and imbalances in overall health.
- Malabsorption can lead to deficiencies of nutrients, proteins, carbohydrates and fats. This can result in long term health complications such as anemia, malnutrition, impaired metabolism and other diseases, such as osteoporosis.
- Chronic dysbiosis can lower the levels of beneficial short chain fatty acids and alter bacterial metabolic activity, thereby increasing the risk of carcinogenesis, hormonal imbalance and GI inflammation.
- Altered GI immune function and exposure to bacterial pathogens can lead to diarrhea, mucosal inflammation, intestinal permeability, toxin production and auto-immune disorders.



INTERPRETIVE GUIDELINES

Genova Diagnostics®
Innovative Testing for Optimal Health

# Digestive Markers

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Chymotrypsin**<br>*CDSA/P,*<br>*CDSA,*<br>*Digestive Function,*<br>*Optional add-on with*<br>*CDSA 2.0*<br>*CDSA 2.0 without Parasitology* | Low <0.9 mcg/g | Pancreatic insufficiency or hypochlorhdyria<br>Other factors include slow transit time | Assess putrefactive SCFAs<br>***Therapeutic Interventions:***<br>Pancreatic enzyme supplementation and/or betaine HCL<br>Dietary fiber (insoluble) to improve transit time |
| | Normal<br>0.9-26.8 mcg/g<br>1 SD=2.1-13.7 | Adequate exocrine pancreatic function | 1-2 SD = Results from 1-2 SD (yellow range) warrant clinical correlation even though within the "normal" reference range. |
| | Elevated<br>>26.8 mcg/g | Rapid transit time | Rule out false elevations from diarrhea (assess pancreatic elastase 1 levels)<br>***Further Testing:***<br>• Comprehensive Parasitology Profile<br>• Bacterial Overgrowth of the Small Intestine<br>• Lactose Intolerance<br>• Food Antibody Assessment<br>• Celiac Testing |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Pancreatic Elastase 1 (PE1)**<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitology,*<br>*Optional add-on with*<br>*CDSA/P,*<br>*CDSA,*<br>*Digestive Function,*<br>*Stand alone test* | Low<br>100-200 mcg/g | Mild to moderate pancreatic insufficiency | ***Further Testing:***<br>• Intestinal Permeability Assessment<br>• Comprehensive Parasitology Profile<br>• Celiac Testing<br>***Therapeutic Interventions:***<br>Pancreatic enzyme supplementation |
| | Very Low<br><100 mcg/g | Moderate to severe pancreatic insufficiency | ***Further Testing:***<br>• Bone Resorption Assessment<br>• Glucose/Insulin Analysis*<br>• Celiac Testing<br>• Bacterial Overgrowth of the Small Intestine<br>***Therapeutic Interventions:***<br>Pancreatic enzyme supplementation<br>Vitamin and mineral supplementation |
| | Normal<br>>200 mcg/g | Adequate exocrine pancreatic function | No further action necessary<br>Pancreatic supplementation may be of benefit in low normal (<400 mcg/g) range |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Putrefactive Short-Chain Fatty Acids (SCFA's)**<br>*CDSA/P,*<br>*CDSA,*<br>*Optional add-on with*<br>*CDSA 2.0,*<br>*CDSA 2.0 without parasitology* | Low<br><1.3 micromol/g | Low protein diet | ***Further Testing:***<br>• Amino Acid Analysis |
| | Normal<br>1.3-8.6 micromol/g<br>1 SD=2.2-6.2 | Adequate digestion and absorption of dietary protein | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |
| | Elevated<br>>8.6 micromol/g | Hypochlorhydria, exocrine pancreatic insufficiency, or protein malabsorption<br>Other causes include bacterial overgrowth of the small bowel, gastrointestinal disease, and/or rapid transit time | Assess pancreatic elastase 1 to evaluate exocrine pancreatic function<br>***Further Testing:***<br>• Bacterial Overgrowth of the Small Intestine<br>• *Helicobacter pylori* Antibody Assessment<br>***Therapeutic Interventions:***<br>Betaine HCL supplementation and/or pancreatic enzyme supplementation |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Meat fibers/Vegetable fibers**<br>*CDSA/P,*<br>*CDSA,*<br>*Digestive Function* | Inside reference range;<br>Meat none<br>Vegetable fibers None-Few | Adequate digestion and absorption of dietary protein (meat or fish) and vegetable fiber | Assess chymotrypsin and/or pancreatic elastase 1, putrefactive SCFAs |
| | Outside reference range:<br>Meat rare-many<br>Vegetable fibers few-many | Pancreatic insufficiency, hypochlorhydria, inadeqate mastication, bile salt insufficiency | Assess chymotrypsin and/or pancreatic elastase 1, putrefactive SCFAs<br>***Therapeutic Interventions:***<br>Pancreatic enzyme supplementation<br>Betaine HCL<br>Cholagogues |

# Absorption Markers

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Triglycerides**<br>*CDSA/P,*<br>*CDSA,*<br>*Digestive Function.*<br>*Optional add-on (as a part of Fecal Fats) with*<br>*CDSA 2.0*<br>*CDSA 2.0 without Parasitology* | Low <0.2 mg/g | Low dietary fat intake | Assess other markers of fat metabolism (LCFAs, phospholipids, cholesterol and fecal fat)<br>***Further Testing:***<br>• Essential & Metabolic Fatty Acid Analysis |
| | Normal<br>0.2-3.3 mg/g<br>1 SD=0.4-1.7 | Adequate fat hydrolysis | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |
| | Elevated<br>>3.3 mg/g | Incomplete fat hydrolysis<br>Rule out:<br>Bile insufficiency<br>Reduced pancreatic function<br>High fat diet<br>Hypochlorhydria | Assess other markers of fat metabolism (LCFAs, phospholipids, cholesterol and fecal fat), chymotrypsin and/or pancreatic elastase 1<br>***Further Testing:***<br>• Intestinal Permeability Assessment<br>• Essential & Metabolic Fatty Acid Analysis<br>***Therapeutic Interventions:***<br>Cholagogues, betaine HCL supplementation and/or pancreatic enzyme supplementation |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Long Chain Fatty Acids (LCFAs)**<br>*CDSA/P,*<br>*CDSA,*<br>*Digestive Function,*<br>*Optional add-on (as a part of Fecal Fats) with*<br>*CDSA 2.0*<br>*CDSA 2.0 without Parasitology* | Low <1.3 mg/g | Low dietary fat intake | Assess other markers of fat metabolism (triglycerides, phospholipids, cholesterol and fecal fat)<br>***Further Testing:***<br>• Essential & Metabolic Fatty Acid Analysis |
| | Normal<br>1.3-23.7 mg/g<br>1 SD=3.4-15.8 | Adequate free fatty acid absorption | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |
| | Elevated<br>>23.7 mg/g | Malabsorption<br>Increased mucosal cell turnover<br>Bacterial overgrowth of the small intestine<br>Bile insufficiency | Assess other markers of fat metabolism (triglycerides, LCFAs, phospholipids and fecal fat), chymotrypsin and/or PE1<br>***Further Testing:***<br>• Bacterial Overgrowth of the Small Intestine<br>• Intestinal Permeability Profile<br>• Essential & Metabolic Fatty Acid Analysis<br>***Therapeutic Interventions:***<br>Cholagogues, betaine HCL supplementation and/or pancreatic enzyme supplementation |

* Refer to website www.gdx.com for educational documents

# Absorption Markers, continued

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Cholesterol**<br>*CDSA/P,*<br>*CDSA,*<br>*Digestive Function,*<br>*Optional add-on (as a part of Fecal Fats) with*<br>*CDSA 2.0*<br>*CDSA 2.0 without Parasitology* | Low <0.2 mg/g | Low dietary fat intake | Assess other markers of fat metabolism (triglycerides, LCFAs, phospholipids and fecal fat)<br>***Further Testing:***<br>• Essential & Metabolic Fatty Acid Analysis |
| | Normal<br>0.2-3.5 mg/g<br>1 SD=0.4-2.0 | Adequate absorption of dietary cholesterol | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |
| | Elevated<br>>3.5 mg/g | Malabsorption<br>Increased mucosal cell turnover<br>Bacterial overgrowth of the small intestine | Assess other markers of fat metabolism (triglycerides, LCFAs, phospholipids and fecal fat), chymotrypsin and/or pancreatic elastase 1<br>***Further Testing:***<br>• Bacterial Overgrowth of the Small Intestine<br>• Intestinal Permeability Assessment<br>• Essential & Metabolic Fatty Acid Analysis Profile<br>***Therapeutic Interventions:***<br>Cholagogues, betaine HCL supplementation and/or pancreatic enzyme supplementation |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Phospholipids**<br>*CDSA/P,*<br>*CDSA,*<br>*Digestive Function,*<br>*Optional add-on (as a part of Fecal Fats) with*<br>*CDSA 2.0*<br>*CDSA 2.0 without Parasitology* | Low <0.2 mg/g | Insufficient dietary fat intake<br>Dietary phospholipid deficiency<br>Impaired gall bladder function | Assess other markers of fat metabolism (triglycerides, LCFAs, phospholipids and fecal fat), chymotrypsin and/or pancreatic elastase 1<br>***Further Testing:***<br>• Essential & Metabolic Fatty Acid Analysis<br>***Therapeutic Interventions:***<br>Phosphatidyl choline (lecithin)<br>Phosphatidyl serine<br>Phosphatidyl inositol |
| | Normal<br>0.2-8.8 mg/g<br>1 SD=0.4-4.7 | Adequate dietary phospholipid intake and absorption | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |
| | Elevated<br>>8.8 mg/g | Malabsorption<br>Reduced bile salt resorption<br>Increased mucosal cell turnover | Assess other markers of fat metabolism (triglycerides, LCFAs, cholesterol and fecal fat), chymotrypsin and/or pancreatic elastase 1, eosinophil protein X (EPX) and calprotectin<br>***Further Testing:***<br>• Intestinal Permeability Assessment<br>• Essential & Metabolic Fatty Acid Analysis<br>***Therapeutic Interventions:***<br>Cholagogues, betaine HCL supplementation and/or pancreatic enzyme supplementation |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Fecal Fat (Total)**<br>*CDSA/P,*<br>*CDSA,*<br>*Digestive Function,*<br>*Optional add-on with*<br>*CDSA 2.0*<br>*CDSA 2.0 without Parasitology* | Low <2.6 mg/g | Low dietary fat intake | Assess other markers of fat metabolism (triglycerides, LCFAs, cholesterol and phospholipids)<br>***Further Testing:***<br>• Essential & Metabolic Fatty Acid Analysis |
| | Normal<br>2.6-32.4 mg/g<br>1 SD=6.1-23 | Adequate dietary fat absorption | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |

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| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Fecal Fat (Total)** *(Continued)* | Elevated >32.4 mg/g | Malabsorption, increased mucosal cell turnover, bacterial overgrowth of the small intestine | Assess other markers of fat metabolism (triglycerides, LCFAs, cholesterol and phospholipids), chymotrypsin and/or pancreatic elastase 1, eosinophil protein X (EPX) and calprotectin<br>***Further Testing:***<br>• Intestinal Permeability Assessment<br>• Essential & Metabolic Fatty Acid Analysis<br>***Therapeutic Interventions:***<br>Cholagogues, betaine HCL supplementation and/or pancreatic enzyme supplementation |

# Metabolic Markers

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Short-Chain Fatty Acids (SCFAs)**<br>*CDSA/P,*<br>*CDSA,*<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitolgy,*<br>*Digestive Function* | Low <13.6 micromol/g | Insufficient fiber<br>Slow transit time<br>Recent antibiotic therapy | ***Dietary and Therapeutic Interventions:***<br>Dietary fiber and resistant starch, prebiotics & probiotics, butyric acid (oral or rectal) |
| | Normal ≥13.6 micromol/g<br>1 SD ≥29.8 | Suggests adequate energy for the colonocytes | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **SCFA distribution**<br>*CDSA/P* **(as part of SCFAs),**<br>*CDSA* **(as part of SCFAs),**<br>*Optional add-on with*<br>*CDSA 2.0*<br>*CDSA 2.0 without Parasitology* | Inside reference range<br>Acetate 44.5-72.4%<br>Proprionate ≤ 32.1% n-Butyrate 10.8-33.5% | Adequate balance among anaerobic organisms in the colon | No further action necessary |
| | Outside reference range<br>Acetate <44.5% or >72.4%<br>Proprionate >32.1% n-Butyrate <10.8 or >33.5% | Imbalance among anaerobic organisms in the colon. Elevated % recovery of acetate suggests an overgrowth of anaerobic flora, specifically *Clostridium* | Assess *Bifidobacteria*<br>***Further Testing:***<br>• *Clostridium difficile* EIA |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **n-butyrate (as part of SCFAs)**<br>*CDSA/P,*<br>*CDSA,*<br>*CDSA without Parasitology,*<br>*CDSA 2.0,*<br>*Digestive Function* | Low <2.5 micromol/g | Insufficient fiber<br>Sow transit time<br>Recent antibiotic therapy | ***Dietary and Therapeutic Interventions:***<br>Dietary fiber and resistant starch, prebiotics and probiotics, butyric acid (oral or rectal) |
| | Normal ≥2.5 micromol/g<br>1 SD ≥5.6 | Adequate energy for the colonocytes | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |

* Refer to website www.gdx.com for educational documents

# Metabolic Markers, continued

| Analyte, related Profiles | Result | Suspect | Consider |
|---|---|---|---|
| **pH**<br>*CDSA/P,*<br>*CDSA,*<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitology,*<br>*Digestive Function* | Low <6.1 | Carbohydrate maldigestion or malabsorption, osmotic laxatives, rapid transit time, or small bowel bacterial overgrowth | ***Further Testing:***<br>• Bacterial Overgrowth of the Small Intestine<br>• Lactose Intolerance<br>• Essential & Metabolic Fatty Acid Analysis<br>***Therapeutic Interventions:***<br>Plant or pancreatic enzymes, betaine HCL and/or disaccharidases |
| | Normal 6.1-7.9<br>1 SD=6.6-7.4 | Balanced concentration between acids and bases witin the colon | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |
| | Elevated >7.9 | High protein and/or low fiber diet<br>Dysbiosis<br>Slow transit time<br>Hypochlorhydria<br>Increased bile flow rate<br>Pancreatic bicarbonate<br>Associated with increased risk for colorectal cancer | Assess putrefactive SCFAs<br>***Dietary and Therapeutic Interventions:***<br>Reduce dietary fat and protein; increase fiber (particularly resistant starch)<br>Probiotic supplementation<br>Prebiotic supplementation |

| Analyte, related Profiles | Result | Suspect | Consider |
|---|---|---|---|
| **Beta-glucuronidase**<br>*CDSA/P,*<br>*CDSA,*<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitology* | Low <337 U/g | Reduced enterohepatic recirculation and increased excretion of toxins, drugs, steroid hormones, and other compounds subject to glucuronidation<br><br>Rule out recent use of broad-spectrum antibiotics | ***Further Testing:***<br>• Standard Detoxification Profile<br>• DetoxiGenomic™ Profile |
| | Normal<br>337-4,433 U/g<br>1 SD=647-2143 | Balanced microbial activity from anaerobic organisms that produce this enzyme (*Bacteroides*, *Clostridia*, *E.coli*, *Peptostreptococcus*) | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |
| | Elevated<br>>4,433 U/g | Increased activation and enterohepatic recirculation of toxins, hormones, and various drugs within the body. Increased burden on glucuronidation pathway is associated with increased risk of colorectal, prostate and breast cancers | Assess stool pH (alkaline pH induces the activity of beta-glucuronidase)<br>***Further Testing:***<br>• Women's Hormonal Health Assessment<br>• Estrogen Metabolism Assessment<br>• Female Hormone Profile<br>• Menopause Profile<br>• Standard Detoxification Profile<br>• DetoxiGenomic™ Profile<br>***Dietary and Therapeutic Interventions:***<br>Reduce fatty meat intake; increase insoluble dietary fiber<br>Probiotics (*Lactobacilli* and *Bifodobacteria*), Silybum marianum, calcium-D-glucarate |

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| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Lithocholic: Deoxycholic acid ratio (LCA:DCA)**<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitology,*<br>*Optional add-on with*<br>*CDSA/P and CDSA*<br>*Stand alone test* | Low <0.39 mg/g | Imbalanced colonic ecology (*Clostridia*, *Bacteroides*, *Enterococcus* and *Lactobacilli* modify primary bile acids into secondary bile acids). Rule out recent broad spectrum antibiotic therapy | Assess microbial ecology |
| | Normal<br>0.39-2.07 mg/g<br>1 SD=0.66-1.55 | Healthy ratio of secondary bile acids reflecting balance between dietary and endogenous cholesterol | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |
| | Elevated >2.07 | Inhibition of glutathione-S-transferase with subsequent recirculation of procarcinogens. Associated with increased risk of breast and colorectal cancer<br>Small bowel bacterial overgrowth, cholelithiasis and cholecystectomy | Consider the levels of calprotectin, beta-glucuronidase, pH, n-butyrate and occult blood to assess overall neoplastic risk<br>***Further Testing:***<br>• Bacterial Overgrowth of the Small Intestine<br>• Estrogen Metabolism Assessment<br>• DetoxiGenomic™ Profile<br>***Dietary and therapeutic considerations:***<br>Reduce fat intake; increase vegetable intake (beta-sitosterol); increase dietary fiber (insoluble fiber)<br>Probiotics (*Lactobacillius reuteri, Lactobacillius acidophilus*) |

# Immunology Markers

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Eosinophil Protein X**<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitology,*<br>*Gut Immunology,*<br>*Optional add-on with*<br>*CDSA/P*<br>*CDSA*<br>*Digestive Function*<br>*Stand alone test* | Normal<br>≤7.0 mcg/g<br>1 SD ≥1.0 | No active inflammation of the GI tract, successful elimination diets | 1-2 SD = Results from 1-2 SD may warrant clinical correlation even though within the "normal" reference range. |
| | Elevated<br>>7.0 mcg/g | Inflammation and/or tissue damage in the GI tract. This could be due to food allergy, protein sensitive enteropathy, helminthic infection, Inflammatory Bowel Disease (IBD), allergic colitis, or gastroesophageal reflux | Assess calprotectin levels<br>***Further Testing:***<br>• Food Antibody Assessment<br>• Comprehensive Parasitology Profile (with add-on Macroscopic Exam for Worms)<br>• Celiac Testing<br>***Natural therapeutics to reduce inflammation:***<br>Probiotics, fish oils, N-acetylglucosamine<br>Anti-inflammatory agents such as the leukotriene inhibitors or TNF-alpha antagonists<br>Elimination Diet |

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* Refer to website www.gdx.com for educational documents

# Immunology Markers, continued

| Analyte, related Profiles | Result | Suspect | Consider |
|---|---|---|---|
| **Calprotectin**<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitology,*<br>*Gut Immunology,*<br>*Optional add-on with*<br>*CDSA/P*<br>*CDSA*<br>*Stand alone test* | Normal <50 mcg/g | No active inflammation of the GI tract | No further action necessary |
| | Elevated<br>50-100 mcg/g | Low-grade inflammation of the GI tract is present. This could be due to post-infectious Irritable Bowel Syndrome (IBS), infection, food allergies, polyps, neoplasia, non-steroidal anti-inflammatory drugs (NSAIDs), or IBD (in remission) | Levels between 50-100 mcg/g require repeat testing in six weeks. If levels remain elevated after ruling out other etiologies, further investigative tests (endoscopic or radiographic) should be considered<br>***Further Testing:***<br>• Stool Culture/Microbiology<br>• Intestinal Permeability Assessment<br>• Food Antibody Assessment<br>• Celiac Testing<br>• ImmunoGenomic™ Profile<br>• Comprehensive Parasitology Profile<br>***Therapeutic Interventions:***<br>Probiotics , fish oils, N-acetylglucosamine, rutin |
| | Elevated<br>>150 mcg/g | A value above 150 mcg/g indicates significant inflammation in the gastrointestinal tract. Possible causes include: Inflammatory Bowel Disease (IBD), infection, food allergies, NSAID use, polyps, adenomas, colorectal cancer, diverticulitis | Unless source of inflammation is clear, further evaluation is recommended and may include endoscopy and/or colonoscopy<br>Assess microbiology/parasitology<br>***Further Testing:***<br>• Intestinal Permeability Assessment<br>• Food Antibody Assessment<br>• Celiac Testing<br>• ImmunoGenomic™ Profile<br>• Comprehensive Parasitology Profile<br>***Therapeutic Interventions:***<br>Probiotics, fish oils, N-acetylglucosamine, rutin<br>Anti-inflammatory agents such as the leukotriene inhibitors or TNF-alpha antagonists |
| | Elevated<br>>250 mcg/g | In addition to the possible causes listed for calprotectin >150 µg/g (see above):<br>In patients with Inflammatory Bowel Disease (IBD), levels >250 indicate disease activity. Patients with IBD in remission who have levels >250 mcg/g are at high risk of relapse within one year. | In addition to the above recommendations for calprotectin >150 mcg/g, the following is suggested:<br>Management of IBD with standard therapies, as directed by a qualified gastroenterologist when necessary<br>***Therapeutic interventions:***<br>Probiotics, fish oils, N-acetylglucosamine, rutin<br>Anti-inflammatory agents such as the leukotriene inhibitors or TNF-alpha antagonists |

| Analyte, related Profiles | Result | Suspect | Consider |
|---|---|---|---|
| **Lactoferrin**<br>*CDSA/P,*<br>*CDSA* | Negative | No acute inflammation | No further action necessary |
| | Positive | Significant mucosal inflammation from bacterial or parasitic infection, diverticulitis or active Inflammatory bowel disease (IBD) | Rule out enteric infection<br>***Further Testing:***<br>• Calprotectin<br>• Eosinophil protein X<br>• Intestinal Permeability Assessment<br>***Therapeutic interventions:***<br>Probiotics, fish oils, N-acetylglucosamine, rutin<br>Anti-inflammatory agents such as the leukotriene inhibitors or TNF-alpha antagonists |

# Microbiology Markers

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Beneficial Bacteria**<br>*CDSA,*<br>*CDSA 2.0,*<br>*Comprehensive Parasitology Profile,*<br>*Microbiology Profile,*<br>*Bacterilogy Profile* | Within normal levels<br>*Lactobacilli* >2+<br>*Bifidobacteria* >4+ | Suggests healthy levels of beneficial flora | No further action necessary |
| | Below normal levels<br>*Lactobacilli* <2+<br>*Bifidobacteria* <4+<br>*E.coli* <4+ | Increased susceptibility to pathogenic bacterial infection, increased toxic enzyme exposure, increased risk for mucosal barrier defects and immune dysregulation | Assess SCFAs, beta-glucuronidase, pH and mycology<br>***Further Testing:***<br>• Intestinal Permeability Assessment<br>• Gut Mucosal Assessment<br>***Therapeutic Interventions:***<br>Probiotics (supplementation with *Lactobacilli* and *Bifidobacteria* to help balance deficient flora) |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Additional Bacteria**<br>*CDSA/P,*<br>*CDSA,*<br>*CDSA without Parasitology,*<br>*CDSA 2.0,*<br>*Comprehensive Parasitology Profile,*<br>*Microbiology Profile,*<br>*Bacterilogy Profile* | Non-Pathogenic (NP) | Organisms that constitute normal aerobic flora or commensal flora, and have not been recognized as etiological agents of disease | No further action necessary |
| | Potential pathogen (PP) | Organisms that have the potential in certain hosts to be opportunistic pathogens | If clinical symptoms persist in the absence of any other clearly defined infection, treatment may be considered<br>Refer to the ***Pathogenic Organsim Chart*** for therapeutic recommendations |
| | Pathogen (P) | Organisms that have the potential in certain hosts to be opportunistic pathogens | Refer to the ***Pathogenic Organsim Chart*** for therapeutic recommendations |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Mycology**<br>*CDSA/P,*<br>*CDSA,*<br>*CDSA without Parasitology,*<br>*CDSA 2.0,*<br>*Comprehensive Parasitology Profile,*<br>*Microbiology Profile,*<br>*Anti-Candida Antibody,*<br>*Candida Antibody,*<br>*Candida Intensive Culture,*<br>*Yeast Culture* | Candida species | Organisms that may be involved in gastrointestinal symptoms | ***Further Testing:***<br>• Intestinal Permeability Assessment<br>• Gut Mucosal Assessment<br>• Anti-Candida Antibody<br>Refer to the ***Pathogenic Organsim Chart*** for clinical significance and therapeutic recommendations |
| | Yeast, not Candida (includes *Cryptococcus, Geotrichum*, and *Rhodotorula* species) | Rare, opportunistic organisms usually isolated only in immunocompromised hosts | ***Further Testing:***<br>• Intestinal Permeability Assessment<br>Refer to the ***Pathogenic Organsim Chart*** for clinical significance and therapeutic recommendations** |

* Refer to website www.gdx.com for educational documents

# Microbiology Markers, continued

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **H. pylori Stool Antigen**<br>*Optional add-on with these tests:*<br>*CDSA/P,*<br>*CDSA,*<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitology*<br>*Digestive Function*<br>*Stand alone test* | Negative | No active *Helicobacter pylori* infection, or successful eradication (after at least 7 days of treatment) | No further action necessary |
| | Positive | Active *Helicobacter pylori* infection or partially treated *H. pylori* infection (antibiotic failure/resistant strain) | ***Therapeutic Interventions:***<br>Triple or quadruple therapy - see the HpSA white paper**. Retest patient in 7-14 days for test-of-cure, particularly if symptoms continue<br>Consider addition of probiotics to improve treatment tolerance & effectiveness<br>Consider mastic gum and/or zinc carnosine as alternative/adjunctive therapy<br>Refer to the ***Pathogenic Organsim Chart*** for clinical significance and therapeutic recommendations |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Shiga Toxin E.coli (STEC)**<br>*Optional add-on with these tests:*<br>*CDSA/P,*<br>*CDSA,*<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitology,*<br>*Comprehensive Parasitology Profile*<br>*Microbiology,*<br>*Bacteriology*<br>*Stand alone test* | Negative | No active infection | No further action necessary |
| | Positive | Active STEC infection | Antibiotics are NOT effective (unless etiological role in cystitis or pyelonephritis)<br>Probiotics may help to prevent infection, but cannot nullify the effects of STEC once it has attached and released its toxin<br>Refer to the ***Pathogenic Organsim Chart*** for clinical significance and therapeutic recommendations |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Campylobacter specific antigen**<br>*Optional add-on with these tests:*<br>*CDSA/P*<br>*CDSA*<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitology,*<br>*Comprehensive Parasitology Profile*<br>*Microbiology,*<br>*Bacteriology*<br>*Stand alone test* | Negative | No active infection | No further action necessary |
| | Positive | Active *Campylobacter* infection | Infections are usually self-limiting and do not require antibiotic therapy. Patients with persistent diarrhea secondary to *Camplyobacter* infection require antibiotic therapy (erythromycin or ciprofloxacin are the preferred drugs of choice). Activated charcoal may decrease symptoms<br>Refer to the ***Pathogenic Organsim Chart*** for clinical significance and therapeutic recommendations |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| ***Clostridium difficile* toxins A & B**<br>*Optional add-on with these tests:*<br>*CDSA/P,*<br>*CDSA,*<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitology*<br>*Stand alone test* | Negative | Absence of both toxins A and B, or an extremely low toxin level below the assay's detection limit | No further action necessary |
| | Positive | Active *Clostridium difficile* infection | Oral vancomycin or metronidazole are the drugs of choice for severe infection, though disease relapse can occur<br>Probiotics such as *Lactobacillus rhamnosus* (GG), *Bifidobacterium bifidum*, and *Saccharomyces boulardii* may help prevent infection and/or the recurrence of *C.difficile*<br>Probiotics will NOT nullify the effects of *C.difficile* once the toxins have been released and the mucosal barrier has been compromised<br>Refer to the ***Pathogenic Organsim Chart*** ** for clinical significance and therapeutic recommendations |

| Analyte, related Profiles | *Result* | *Suspect* | *Consider* |
|---|---|---|---|
| **Occult blood**<br>*CDSA/P,*<br>*CDSA,*<br>*Optional add-on with these tests:*<br>*CDSA 2.0,*<br>*CDSA 2.0 without Parasitology,*<br>*Digestive Function* | Negative | No hemoglobin detected in the stool | Rule out ingestion of vitamin C above 250 mg/day (inactivates test) |
| | Positive | Suggests abnormal amounts of hemoglobin from excessive blood loss. Suspect ulcers, polyps, diverticulitis or colorectal cancer | Rule out false positive results from non-intestinal sources of bleeding (hemorrhoids, menstruation, hematuria) or use of rectal suppositories, oral medications, including aspirin and corticosteroids<br>Repeat positive results should be followed up with other diagnostic procedures such as protosigmoidoscopic examination, full colonoscopy, barium enema, or other examinations |

| Analyte, related Profiles | Result | *Suspect* | *Consider* |
|---|---|---|---|
| **Parasitology**<br>*CDSA/P,*<br>*CDSA 2.0,*<br>*Comprehensive Parasitology Profile,*<br>*Parasitology Profile* | Positive | Parasite infection and Dysbiosis | Assess calprotectin, EPX and/or Lactoferrin<br>***Further Testing:***<br>• Intestinal Permeability Assessment<br>Refer to the ***Parasitic Organism Chart*** ** for clinical significance and therapeutic recommendations |

* Refer to website www.gdx.com for educational documents

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