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NutriPATH
Integrative Pathology Services

JOE DOE

Date of Birth: 08-Jan-1985
Sex: M
Collected: 31/Oct/2019
Received: 31/Oct/2019
INTERNATIONAL PATIENT 1000
Lab id: **3640442** UR#:

Dr.EDWARD CHAN

International Psychology Centre 11-1 Wisma Laxton Jalan Desa KUALA LUMPUR MALAYSIA 58100 1000

COMPLETE DIGESTIVE STOOL ANALYSIS - Level 2

MACROSCOPIC DESCRIPTION

	Result	Range	Markers
Stool Colour	**Brown**	Brown	**Colour** - Brown is the colour of normal stool. Other colours may indicate abnormal GIT conditions.
Stool Form	**Semiformed**	Formed	**Form** -A formed stool is considered normal. Variations to this may indicate abnormal GIT conditions.
Mucous	**ND**	< +	**Mucous** - Mucous production may indcate the presence of an infection, inflammation or malignancy.
Blood (Macro)	**ND**	< +	**Blood (Macro)**- The presence of blood in the stool may indicate possible GIT ulcer, and must always be investigated immediately.

Macroscopy Comment

BROWN coloured stool is considered normal in appearance.

SEMI FORMED stools may indicate dysbiosis, food allergy or intolerance, laxative use, high dose Vitamin C and magnesium. May also indicate an infection (bacterila or viral), amoeba or Giardia, Irritable Bowel Syndrome,Intestinal permeablilty, Coeliac Disease, malabsorption, maldigestion or stress.
Treatment:
- Investigate and treat possible underlying cause.
- Assess other CDSA markers such as pH, pancreatic elastase 1 & microbiology markers.

MICROSCOPIC DESCRIPTION

	Result	Range	Markers
RBCs (Micro)	**ND**	< +	**RBC(Micro)** - The presence of RBCs in the stool may indicate the presence of an infection, inflammation or haemorrhage.
WBCs (Micro)	**0**	< 10	**WBC(Micro)** - The presence of WBCs in the stool may indicate the presence of an infection, inflammation or haemorrhage.
Food Remnants	**+**	< ++	**Food Remnants** - The presence of food remnants may indicate maldigestion.
Fat Globules	**ND**	< +	**Fat Globules** -The presence of fat globules may indicate fat maldigestion.
Starch	**ND**	< +	**Starch** - The presence of starch grains may indicate carbohydrate maldigestion.

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DIGESTIVE MARKERS

	Result	Range
Chymotrypsin	3.6	0.9 - 26.8 U/g
Short Chain Fatty Acids, Putrefactive	9.7	1.3 - 8.6 umol/g

Markers

Chymotrypsin - Chymotrypsin is involved in protein digestion. Low levels of chymotrypsin may indicate protein maldigestion due to pancreatic insufficiency.

Short Chain Fatty Acids, Putrefactive - Putrefactive SCFAs are produced when anaerobic bacteria ferment undigested protein, indicating protein maldigestion.

	Result	Range
Meat Fibres	ND	< +
Vegetable Fibres	+	< ++

Markers

Meat Fibres - The presence of meat fibres may indicate maldigestion from gastric hypoacidity or diminished pancreatic output.

Vegetable Fibres - The presence of vegetable fibres may indicate maldigestion from gastric hypoacidity or diminished pancreatic output.

Digestive Markers Comment

Putrefactive SCFAs are ELEVATED:

ABSORPTION MARKERS

	Result	Range
Triglycerides, Stool	1.9	0.2 - 3.3 mg/g
Long Chain Fatty Acids	15.8	1.3 - 23.7 mg/g
Cholesterol, Stool	0.9	0.2 - 3.5 mg/g
Phospholipids	2.7	0.2 - 8.8 mg/g

Markers

Triglycerides, Stool - Elevated levels of Triglycerides in the stool may indicate lipid maldigestion.

Long Chain Fatty Acids - Elevated levels of LCFAs in the stool may indicate inadequate lipid absorption.

Cholesterol, Stool - Elevated levels of Cholesterol in the stool may indicate inadequate absorption.

Phospholipids - Elevated levels of Phospholipids in the stool may indicate inadequate absorption.

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METABOLIC MARKERS

Short Chain Fatty Acids, Beneficial
54.0
> 13.6 umol/g

Butyrate
16.1
10.8 - 33.5 %

b-Glucuronidase
4885.0
337.0 - 4433.U/g

pH
6.3

Acetate
63.8
6.3 - 7.7

44.5 - 72.4 %

Propionate
13.1
0.0 - 32.0 %

Markers

Short Chain Fatty Acids, Beneficial (Total) - Elevated SCFAs may indicate bacterial overgrowth. Inadequate SCFAs may indicate inadequate normal flora.

Butyrate - Decreased Butyrate levels may indicate inadequate colonic function.

b-Glucuronidase - Increased levels of b-Glucuronidase may reverse the effects of Phase II detoxification processes.

pH - Imbalances in gut pH, will influence SCFA production and effect.

Acetate - Decreased Acetate levels may indicate inadequate colonic function.

Propionate - Decreased Propionate levels may indicate inadequate colonic function.

Metabolic Markers Comment

beta Glucuronidase ELEVATED:
Suspect 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

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BENEFICIAL BACTERIA

	Result	Range
Bifidobacteria	++	2 - 4 +
Lactobacilli	+	2 - 4 +
Eschericia coli	++	2 - 4 +
Enterococci	+	1 - 2 +

COMMENTS:
Significant numbers of Lactobacilli, Bifidobacteria and E coli are normally present in the healthy gut: Lactobacilli and Bifidobacteria, in particular, are essential for gut health because they contribute to 1) the inhibition of gut pathogens and carcinogens. 2) the control of intetinal pH, 3) the reduction of cholesterol, 4) the synthesis of vitamins and disaccharidase enzymes.

OTHER BACTERIA

	Result	Range
Klebsiella	++++	< +++
Pseudomonas	+	< +++
Campylobacter	ND	< +
Citrobacter	++	< +++
Yersinia	ND	< +
	+++	
Other Bacteria.		< +++

COMMENTS:

YEASTS

	Result	Range
Candida albicans	ND	< +
	++	
Other Yeasts		< +

COMMENTS:

PARASITES

	Result	Range
Cryptosporidium	ND	< +
Giardia lamblia	ND	< +
Entamoeba Histolytica	ND	< +
Blastocystis Hominis	++	< +
Other Parasites	ND	< +

COMMENTS:

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MICROORGANISM SUMMARY

BENEFICIAL BACTERIA LEVELS LOW:
Consider possible causes and symptoms include antibiotics use, chlorinated water consumption, food allergy or sensitivity, IBS, IBD, inadequate dietary fiber or water, low intestinal sIgA, maldigestion, NSAIDs use, nutrient insufficiencies, parasite infection and slow transit time.
Ideally, Bifidobacteria should be recovered at levels of 4+, whilst Lactobacillus and E. coli should be 2+ or greater.
To Improve the levels of beneficial bacteria follow the four R's:
REMOVE
• Allergenic foods, Alcohol, NSAIDs, Pathogens, Sugar, refined carbohyrates, saturated fat, red meat, fermented foods
REPLACE
• Supplement hydrochloride, digestive enzymes or other digestive aids (see pancreatic elastase 1 results)
REINOCULATE
• Prebiotic and probiotic supplementation (see bacterial culture results)
REPAIR
• Use nutraceutical agents that will help heal the gastrointestinal lining. eg. L-glutamine, aloe vera, zinc, slippery elm.

Adequate levels of Bifidobacteria detected.

Klebsiella sp. PRESENT:
Klebsiella is isolated from foods and environmental sources.
Klebsiella appears to thrive in individuals on a high starch diet.
Avoiding carbohydrates such as rice, potatoes, flour products and sugary foods reduces the amount of Klebsiella in the gut.
Klebsiella forms part of the normal GI flora in small numbers, but can be an opportunistic pathogen.

Currently, standard texts provide no specific antimicrobial guidelines for GI overgrowth of Klebsiella. Klebsiella organisms are resistant to multiple antibiotics. Treatment depends on the organ system involved.

CITROBACTER PRESENT:
Citrobacter is considered an opportunistic pathogen and therefore can be found in the gut as normal flora. It is occasionally implicated in diarrheal disease, particularly C. freundii, C. diversus and C. koseri.

Treatment: Currently no specific antimicrobial guidelines for GI overgrowth of Citrobacter exist.
Carbapenems and fluroquinolones are the antibiotics of choice for extra-intestinal sites.
Low numbers of the bacteria should be ignored whilst supplementing with adequate levels of probiotics if indicated.

Blastocystis hominis PRESENT:
The role of B. hominis in terms of colonization and disease is still considered controversial. When this organism is present in the absence of any other parasites, enteric organisms or viruses, it may be considered the etiological agent of disease.

Symptoms can include: diarrhea, cramps, nausea, fever, vomiting and abdominal pain.

B. hominis has been associated with irritable bowel syndrome, infective arthritis and intestinal obstruction.

Treatment: Metronidazole (Flagyl) is considered the most effective drug (750 mg tid x 10 days). Iodoquinol (Yodoxin) is also an effective medication (650 mg tid x 20 days). Recommended therapy can also eliminate G. lamblia, E. histolytica and D. fragilis, all of which may be concomitant undetected pathogens and part of patient symptamology.

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ANTIBIOTIC SENSITIVITIES and NATURAL INHIBITORS

	Klebsiella pneumoniae	Citrobacter species	Pseudomonas aeruginosa
Antibiotics	Susceptible	Susceptible	Susceptible
Penicillin.	YES	NO	NO
Ampicillin	NO	NO	NO
Erythromycin	NO	NO	NO
Tetracycline	YES	YES	NO
Sulphonamides	YES	YES	NO
Trimethoprim	YES	YES	NO
Ciprofloxacin	YES	YES	YES
Gentamycin.	NO	NO	NO
Ticarcillin	NO	NO	NO
Tobramycin	NO	NO	NO
Augmentin	NO	NO	NO
Cephalexin	YES	NO	NO
Inhibitors	Inhibition %	Inhibition %	Inhibition %
Berberine	60%	60%	80.00
Oregano	40%	60%	60.00
Plant Tannins	60%	80%	100.00
Uva-Ursi	80%	80%	100.00

LEGEND

Low Inhibition — High Inhibition

0	20	40	60	80	100

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YEAST - SENSITIVITIES and NATURAL ANTIFUNGALS

Antifungals

	Candida kruseii	Rhodotorula species
	Inhibition	Inhibition
Fluconazole	16.0=R	>64=NI
Voriconazole	1.0=S	
Itraconazole		>2.0=NI

INHIBITION CATEGORY

R	Resistant	This category indicates that the organism is not inhibited by obtainable levels of the pharmaceutical agent
I	Intermediate	This category indicates where the minimum inhibiition concentrations (MIC) approach obtainable pharmaceutical agent levels and for which response rates may be lower than for susceptible isolates
SDD	Susceptible, Dose Dependent	This category indicates that clinical efficay is achieved when higher than normal dosage of a drug is used to achieve maximal concentrations
S	Susceptible	This category indicates that the organisms are inhibited by the usual achievable concentration of the agent
NI	No Interpretative Guidelines	This category indicates that there are no established guidelines for MIC interpreatation for these organisams

Non-absorbed Antifungals

	Inhibition %	Inhibition %
Nystatin	60%	60%

Natural Antifungals

	Inhibition %	Inhibition %
Berberine.	60%	60%
Caprylic Acid	20%	40%
Garlic	40%	60%
Undecylenic Acid	20%	40%
Uva-Ursi.	60%	80%

LEGEND

Low Inhibition — High Inhibition

0	20	40	60	80	100

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PATHOGEN SUMMARY

OTHER BACTERIA PRESENT:

Organism	Growth	Growth Level	Classification
alpha-haemolytic Streptococcus	2+	0 - 3+	Non-Pathogen
gamma-haemolytic Streptococcus	3+	0 - 3+	Non-Pathogen
Haemolytic Escherichia coli	3+	0 - 3+	Non-Pathogen
Streptococcus agalactiae Group B	2+	0 - 3+	Non-Pathogen
Citrobacter species	3+	0 - 3+	Non-Pathogen
Pseudomonas aeruginosa	3+	0 - 3+	Non-Pathogen
Klebsiella pneumoniae	4+ * H	0 - 3+	POSSIBLE Pathogen

OTHER YEASTS PRESENT:

Organism	Growth	Growth Level	Classification
Candida kruseii	2+ * H	0 - 1+	POSSIBLE Pathogen
Rhodotorula species	2+	0 - 3+	Non-Pathogen

OTHER PARASITES PRESENT:

Organism	Growth	Growth Level	Classification
Blastocystis hominis	2+ * H	< 1+	PATHOGEN

KLEBSIELLA:
Sources:
Isolated from foods and environmental sources.
Klebsiella appears to thrive in individuals on a high starch diet.
Avoiding carbohydrates such as rice, potatoes, flour products and sugary foods reduces the amount of Klebsiella in the gut

Pathogenicity:
Part of the normal GI flora in small numbers, but can be an opportunistic pathogen.
Klebsiella is capable of translocating from the gut when in high numbers.
Certain strains of K. oxytoca have demonstrated cytotoxin production.

Symptoms:
K. pneumoniae and K. oxytoca have been associated with diarrhea in humans.
Cytotoxin-producing strains are associated with acute hemorrhagic enterocolitis.
Increased colonization of Klebsiella in the stool has been found in HLA-B27 + AS patients.

Treatment:
Currently, standard texts provide no specific antimicrobial guidelines for GI overgrowth of Klebsiella.
Third generation cephalosporins and fluroquinolones are the recommended antimicrobial agents for extra-intestinal sites.

CITROBACTER:
Sources:
Common in the environment and may be spread by person-to person contact. Several outbreaks have occurred in babies in hospital units. Isolated from water, fish, animals and food.

Pathogenicity:
Citrobacter is considered an opportunistic pathogen and therefore can be found in the gut as part of the normal flora.

Symptoms:

Citrobacter has occasionally been implicated in diarrheal disease, particularly C. freundii and C. diversus and C. koseri

Treatment:
Currently, standard texts provide no specific antimicrobial guidelines for GI overgrowth of Citrobacter.
Carbapenems and fluroquinolones are the recommended antibiotics for extraintestinal sites.

PSEUDOMONAS SPECIES:
Pseudomonas is found in water and soil as well as fruits and vegetables.
Bottled water can be a common source of infection.
Because the organism is able to survive aqueous environments, it is an important nosocomial pathogen.
Pseudomonas can also be found on a number of surfaces and in aqueous solutions.

Pathogenicity:
Pseudomonas is considered an opportunistic pathogen.

Symptoms:
Associated with diarrhoeal infection, particularly in the immunocompromised host.

Treatment:
Ciprofloxacin is recommended for the treatment of Pseudomonas induced antibiotic-associated colitis.
Pseudomonas is usually susceptible to antipseudomonal penicillins, aminoglycosides, carbapenems, 3rd generation cephalosporins and gentamycin.

CANDIDA
Sources:
Most sources of Candida infection are thought to be of endogenous origin.While yeast are ubiquitous in the environment and are found on fruits, vegetables and other plant materials, contamination from external sources is linked to patients and health care workers.

Pathogenicity:
A normal inhabitant of the GI tract. May become an opportunistic pathogen after disruption of the mucosal barrier, imbalance of the normal intestinal flora and/or impaired immunity.
Risk factors for colonization include: Antibiotics, corticosteroids, antacids, H2 blockers, oral contraceptives, irradiation, GI surgery, Diabetes mellitus, burns, T cell dysfunction, chronic stress and chronic renal disease.

Symptoms:
The most common symptom attributable to non-invasive yeast overgrowth is diarrhea. Symptoms of chronic candidiasis affect four main areas of the body.
1 . Intestinal system - symptoms include: diarrhea, constipation, abdominal discomfort, distention, flatulence and rectal itching.
2. Genital Urinary system - symptoms include: menstrual complaints, vaginitis, cystitis and urethritis.
3. Nervous system - symptoms include: severe depression, extreme irritability, inability to concentrate, memory lapses and headaches.
4. Immune system - symptoms include urticaria, hayfever, asthma, and external otitis.
Sensitivities to tobacco, perfumes, diesel fumes and other chemicals.

Treatment:
Currently, standard texts provide no specific antifungal guidelines for GI overgrowth of Candida.
Oral azoles have been recommended for extra intestinal infections.
Susceptibility testing is advised due to increasing drug resistance.

YEAST NOT CANDIDA, RHODOTORULA SPECIES, TRICHOSPORON SPECIES

Sources:
Yeast are ubiquitous in the environment and can be found on fruits, vegetables and other plant materials.
They can also live as normal inhabitants both within and on the body
ar Pathogenicity:
Less common yeast such as those outlined in this section should only be considered opportunistic pathogens in the Immunocompromised host.

Symptoms:
Disseminated infections may include the intestinal tract and are usually associated with immunosuppressive diseases or conditions such as leukemia, organ transplant, multiple myeloma, aplastic anemia, diabetes mellitus with ketoacidosis, ICU patients, lymphoma, solid tumors and AIDS. Immunosuppressive therapy such as corticosteroids, chemotherapeutic agents and cyclosporine can also enhance fungal overgrowth.

Treatment:
Currently, standard texts provide no specific antifungal guidelines for GI overgrowth of the fungi mentioned.
Treatment is at the discretion of the practitioner, and should be based upon clinical symptoms and a positive reculture of the organism.