

Urinalysis and Body Fluids CS

Unit 5

5 Feces & miscellaneous

Feces

- Feces
 - Composition
 - Bacteria,
 - Cellulose & other undigested foodstuffs
 - GI secretions, enzymes, bile pigments
 - Cells
 - Electrolytes and water

Overview of Indications for Fecal Testing

- GI bleeding
 - Occult blood
- Suspicion of pathogenic bacterial or parasitic infections
 - Microscopic exam for leukocytes
 - O&P
 - Stool cultures
- Diagnosis / confirmation of a malabsorption syndrome or liver and biliary duct disorder
 - Fecal fat & Fecal Carbohydrates
 - Meat fibers
- Fetal hemoglobin

Diarrhea

- Diarrhea
 - Common disorder of the GI tract
 - Increased frequency ($> 3x$ / day)
 - Increased amount (>200 gm stool wt / day)
 - Associated with infections, toxins, malabsorption issues, etc.

Diarrhea

- Diarrhea
 - Mechanisms of diarrhea:
 - 1. Secretory
 - Microbial infections
 - Vibrio cholerae
 - Some E. coli
 - Clostridium
 - Salmonella
 - Shigella
 - Staphylococcus
 - Campylobacter
 - Cryptosporidium
 - Drugs, laxatives
 - Inflammatory bowel disease / colitis
 - Endocrine disorders, malignancy, others

Diarrhea

- Diarrhea
 - Mechanisms of diarrhea:
 - 2. Osmotic imbalance
 - Incomplete digestion / absorption
 - Lactose intolerance
 - Amebiasis, antibiotics, laxatives, antacids
 - Irritable bowel syndrome, others

Diarrhea

- Diarrhea
- Mechanisms of diarrhea:
 - 3. Altered motility
 - Hypermotility with decreased absorption
 - Irritable bowel syndrome, others
- Ramifications - diarrhea can easily result in dehydration and critical electrolyte imbalances.

Other Disorders of the GI Tract

- Malabsorption
 - Abnormal digestion or absorption of one or more nutrients
 - May lead to malnutrition or anemia
- Maldigestion
 - Impaired digestion due to lack of digestive enzymes

Other Disorders of the GI Tract

- Colorectal cancer
 - Relatively common cancer of GI tract
 - Associated with 'occult' / hidden blood loss
- Pancreatic insufficiency and cystic fibrosis
 - Decreased pancreatic digestive enzymes
 - Trypsin
 - Chymotrypsin
 - Elastase I
 - Results in maldigestion

Fecal Specimen Collection

- Patient needs detailed instructions
- Clean container, avoid contamination with urine or toilet water
- Qualitative tests require only small amount of random sample
- Quantitative / timed specimens, may require collection over several days. May require entire sample during the time period (72 hr fecal fat) or small amounts taken over several days (O&P)
- In some tests, timing of collection is important
- Some tests require restrictions of diet (occult blood)

Fecal Laboratory Procedures

Color / Appearance	Possible Cause(s)
Brown (normal)	Normal - presence of urobilin (from bacterial breakdown of urobilinogen / stercobilinogen)
Black	*Upper GI bleeding, Iron therapy, or some medications
Red	*Lower GI bleeding, Beets, food coloring & some meds.
Pale yellow, white, gray	Giardia infection. Bile - duct obstruction. Barium sulfate
Green	Strongly green vegetables. Some oral antibiotics. Biliverdin
Bulky / frothy	Bile-duct obstruction. Pancreatic disorders
Ribbon-like	Intestinal constriction
Mucous /blood streaked	Colitis, dysentery, malignancy, constipation

*Color varies shades of red to black depending upon where bleeding occurs in the GI tract.

Fecal Laboratory Procedures

- Microscopic Examination for WBC
- Fecal leukocytes
 - Mucous with blood / pus often seen in dysentery and damage to intestinal wall.
 - Methylene blue, Wrights or Gram stain may be used to visualize WBCs.
 - Wrights best for cell differentiation
 - Can indicate pathogenic bacterial infection or ulcerative colitis
 - Neutrophils associated with bacterial infection
 - Eosinophils associated with amebic infestation.

Fecal Laboratory Procedures

- Microbiology tests
 - Gram stain - not much help. Stool full of gram negative rods (mostly E. coli.)
 - Cultures - must use *selective* media which restricts or prohibits the growth of normal flora, and allows pathogens to grow.
 - Salmonella, Shigella, Campylobacter, Yersinia, E. coli O157, Clostridium difficile

Fecal Laboratory Procedures

- Microbiology tests
 - Ova & Parasites
 - Giardia
 - Enterobius vermicularis (pinworm)
 - Taenia saganata
 - Taenia solis
 - D. latum
 - H. nana .. Tapeworms
 - Ascaris

Fecal Laboratory Procedures

- Blood in feces
 - Melana
 - A large amount of fecal blood
 - May be black, tarry stool
 - Lower GI tract bleeds usually bright red blood if not occult

Fecal Laboratory Procedures

- Fecal Occult Blood Testing (FOBT)
 - "Occult" = hidden
 - Detection of occult blood may indicate
 - Infection / inflammation / ulcers of GI tract
 - Intestinal Trauma / hemorrhoids / Bleeding gums
 - Colorectal cancer
- The American Cancer society recommends testing on all those over age 50 years.

Fecal Occult Blood Testing (FOBT)

- Two samplings from 3 consecutive stools for a negative
- Traditional screening tests based on detection of the *pseudoperoxidase activity of hemoglobin
- Different chromagens have been used
 - Benzidine (most sensitive), ortho-toluidine, & *gum guaiac (least sensitive, but preferred as to limit false positives)
 - Hydrogen peroxide oxidizes a colorless compound to for a blue color.
- View demonstration at:
<http://www.operationalmedicine.org/ed2/Video/Hemoccult.mpg>



Fecal Laboratory Procedures

- Stool guaiac test / gFOBT
- Diet restrictions
 - No red meats, fish
 - Turnips , Horseradish
 - Melons, bananas, pears, plums
 - Raw broccoli, & cauliflower
- Other restrictions
 - No aspirin or other non-steroidal anti-inflammatory medications for @ 7 days prior to collections to prevent GI irritation
 - iron supplements avoided for 3 days
 - High Vitamin C levels will reduce (**False negative Rx**) peroxidase activity

iFOBT

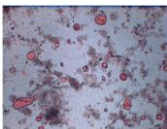
- Immunochemical fecal occult blood (iFOBT)
- Fecal Immunochemical Testing (FIT)
 - Hemocult ICT (commercial product name)
 - Specific for globin portion of human hemoglobin
 - Uses anti-human hemoglobin antibodies
 - No dietary or drug restrictions
 - Most sensitive to lower GI bleeding (patients with upper GI bleeding, such as ulcer would not react as blood has been digested)
- Although many studies are in progress comparing the iFOBT and the traditional guaiac, this test is quickly replacing the traditional fecal occult blood test!

Feces - fecal fat

- Fecal Fat - steatorrhea
- Notable characteristics
 - Floats in water
 - Pale and greasy oily appearance
 - Foul-smelling
- Causes
 - Decreased production of pancreatic enzymes
 - Absence of bile salts
 - Malabsorption syndromes
 - bacterial overgrowth, intestinal resection
 - celiac disease, tropical sprue
 - lymphoma
 - Crohn disease, Whipple disease, and giardiasis.

Feces - fecal fat testing

- Patient preparation
 - Normal diet with normal level of fats
 - No contamination by oils, suppositories, or creams (could cause false positives)
- Qualitative method
 - 2 procedures
 - Neutral fats (triglycerides)
 - Soaps and fatty acids
 - Sudan III/IV or Oil red O stain
 - Examine microscopically for large orange - red fat droplets.

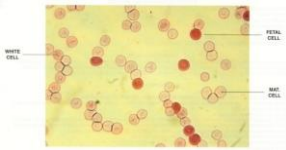


Feces - fecal fat testing

- Quantitative method
 - To follow up a positive quantitative test
- Dietary requirements
 - Requires adherence to a diet of 100g/ day fat intake before and during test collection.
- Chemistry dept - usually sent to reference lab
- 3day collection (72 hours)
- Test methods
 - Van de Kamer - classical titration. Use sodium hydroxide to chemically titrate the amount of fat.
 - Acid steatocrit
 - Near infra-red spectroscopy

Feces

- APT - fetal hemoglobin
 - To determine whether blood found in newborn's vomitus or stool is their own, or from the Mom.
 - Testing makes use of fact that baby blood (Hgb F) cells are resistant to lysing with sodium hydroxide & remain pink, while mom adult (Hgb A) cells lyse changing from the pink to yellow - brown.



Feces

- Fecal enzymes
 - Pancreatic insufficiency & cystic fibrosis
 - Pancreatic - associated enzymes
 - Trypsin
 - Classic trypsin test - series of diluted stool specimens are placed on x-ray paper (has a gelatin coating). After incubation, the stool is rinsed off and the paper evaluated to determine the dilution at which no gelatin has been digested by the protease trypsin. TEST NOT SENSITIVE
 - Chymotrypsin - more sensitive and can be measured spectrophotometrically
 - Elastase I
 - pancreas specific enzyme not affected by motility or other mucosal issues
 - Immunoassay procedure provides higher degree of specificity

Feces - Fecal Carbohydrates

- Fecal carbohydrates.
- Celiac disease - inability to absorb carbohydrates
- Lactose intolerance - lack enzymes to digest
- Inflammatory necrotizing enterocolitis - rare, but very serious condition, most often occurs in premature infants
- Increased carbohydrates in stool results in osmotic diarrhea.
- Disaccharides (lactose is example) in the large intestine and bowel are osmotically active and cause movement of a large amount of water into the intestine.
- Clinitest to detect the carbohydrate
- Fecal pH to determine increased acid level
 - Stool pH normally @ 7-8
 - pH 5.5 - 6 indicates increased acid

Bronchial Washings & Bronchoalveolar Lavage

- Fiberoptic bronchoscope placed in airway can be used to obtain specimen.
- Or sterile saline infused (lavage procedure) and retrieved for analysis. - Results may be as good as biopsy.
- Specimens usually sent to cytology / pathology to be examined for malignancy.
- Occasionally, they are examined for other cells:
 - macrophages (60-80%),
 - lymphs, up to 10%
 - neutrophils up to 21%
 - eosinophils < 1 %
 - bronchial epithelial cells,
 - squamous cells
- OR, more often cultured for microorganisms.

Other miscellaneous fluids.

- Nasal smears
 - Hansel stain for eosinophils
- Cyst fluids - cells, and organisms
- Tears - eosinophils
- Breast milk - eosinophils.

- always can culture them.

Reference Listing

- > Please credit those whose work and pictures I have used throughout these presentations.
- > Lillian Mundt & Kristy Shanahan, Graff's Textbook of Urinalysis and Body Fluids, 2nd Ed.
- > Susan Strassinger & Marjorie Di Lorenzo, Urinalysis and Body Fluids, 5th Ed.
- > Wikipedia, the free encyclopedia
- > www.wikipedia.org
