General Stool Examination (GSE)

- A general stool examination, is a diagnostic procedure in which a sample of stool (feces) is analyzed in a laboratory to provide information about gastrointestinal health and overall well-being.
- This examination can help diagnose various digestive disorders, infections, and other medical conditions.

❖ Samples collections:

- **Rectal swabs:** Only when it is not possible to obtain feces, should a specimen be collected by using a cotton wool swab. The swab should be inserted in the rectum for about 10 seconds. Care should be taken to avoid unnecessary contamination of the specimen with bacteria from the anal skin.
- **The adhesive tape method:** This is useful for the detection of the eggs of *Vermicularis*. The eggs can be collected by wrapping a strip of clear adhesive tape (e.g. cellotape, scotch tape) around the anus. After collecting the eggs, the tape should be sticked lengthways, face down on a microscope slide.

❖ Transport of the specimen:

- The specimen must reach the laboratory within 30 minutes of passing of the stool, since the motile organisms, for example, *Vibrio* and amoebic trophozoites are heat sensitive and they can die or become unrecognizable after that period.
- Transport media such as the Cary-Blair medium can be used for *Salmonella*, *Shigella* and *Yersinia*.
- When cholera is suspected, about 1 ml of specimen should be transferred into 10ml of alkaline peptone water, which will act as an enrichment as well as transport medium.
- When worms or tapeworm segments are present, these should be transferred to a container of physiological saline and sent to a laboratory for identification.

❖ Culture media used in stool examination:

1. **MacConkey Agar:** Used to isolate and differentiate lactose-fermenting gram-negative bacteria, such as *Escherichia coli*, from non-lactose fermenters.
2. **Salmonella-Shigella (SS) Agar:** Selective medium for the isolation of *Salmonella* and *Shigella* species, which are important causes of gastrointestinal infections.
3. **Hektoen Enteric (HE) Agar:** Selective medium for the isolation and differentiation of enteric pathogens like *Salmonella* and *Shigella* from other bacteria in stool samples.
4. **Xylose Lysine Deoxycholate (XLD) Agar:** Used for the isolation and differentiation of enteric pathogens, particularly *Salmonella* and *Shigella*.

5. **Thiosulfate Citrate Bile Salts Sucrose (TCBS) Agar:** Selective medium for the isolation and identification of *Vibrio* species, which can cause cholera and other gastrointestinal infections.
6. **Brain Heart Infusion (BHI) Agar:** A general-purpose medium used for the cultivation of a wide range of bacteria, including anaerobic bacteria in stool samples.
7. **Selenite F Broth:** Enrichment medium used to recover and promote the growth of *Salmonella* species.
8. **Cystine Lactose Electrolyte-Deficient (CLED) Agar:** Used to cultivate and count urinary bacteria, including Enterobacteriaceae, often relevant in the context of urinary tract infections, which can sometimes lead to gastrointestinal symptoms.
9. **Campylobacter Blood-Free Selective Agar:** Designed for the isolation of *Campylobacter* species, which can be associated with gastroenteritis.
10. **Sabouraud Dextrose Agar:** A medium used to culture fungi that may be present in stool samples, especially in cases of fungal infections of the gastrointestinal tract.

❖ **A general physical examination of stool**

A physical examination of stool, is a medical test that involves visually and sometimes chemically assessing the characteristics of a person's stool. There are some of the aspects that are typically assessed during a physical examination of stool:

- **Color:** The color of stool can vary and may change due to diet or health conditions. Common colors include brown, green, yellow, and white. Black or tarry stool may indicate the presence of blood (melena), while pale or clay-colored stool can suggest a problem with bile flow.
- **Consistency:** Stool consistency can vary from hard and dry to loose and watery. The consistency of stool can be an indicator of dietary habits or underlying digestive issues.
- **Shape:** Stool should have a typical cylindrical shape. Abnormal shapes, such as pencil-thin stool, could indicate an obstruction in the colon.
- **Odor:** Fecal odor is normal to some extent, but extremely foul-smelling stool can be a sign of malabsorption or an infection.
- **Blood:** The presence of visible blood in the stool can be a sign of gastrointestinal bleeding, which may be due to various causes, including ulcers, hemorrhoids, or more serious conditions.
- **Mucus:** A small amount of mucus in the stool is normal, but excessive mucus can indicate inflammation or infection in the gastrointestinal tract.
- **Undigested Food:** Sometimes, undigested food particles in stool can be a sign of malabsorption or a digestive disorder.

- **Parasites:** Stools may contain adult helminthes. Nematodes like Ascaris are easily visible as their size is large. Hook worms and Proglottids of cetodes may also present. These may be visible to the naked eye.
- **Fat:** Excess fat in the stool (steatorrhea) may indicate malabsorption, as seen in conditions like celiac disease or pancreatic insufficiency.
- **Debris and foreign objects:** Sometimes, the presence of non-food items in the stool may indicate pica or other unusual dietary habits.

A general microscopic examination of stool

Microscopic examination of stool is a diagnostic procedure that involves the analysis of a stool sample under a microscope to detect various abnormalities, such as the presence of parasites, bacteria, white blood cells, and other microorganisms. There are the key components that may be assessed during a microscopic examination of stool:

- **Parasites:** The presence of parasites in the stool can be a sign of intestinal infections. Common parasites that may be detected include *Giardia lamblia*, *Entamoeba histolytica*, and various types of intestinal worms.
- **Bacteria:** The examination may identify pathogenic bacteria, which can cause gastrointestinal infections. Bacterial pathogens may include *Salmonella*, *Shigella*, *Campylobacter*, and *Escherichia coli*.
- **White Blood Cells (Leukocytes):** The presence of white blood cells in the stool may indicate an inflammatory process in the gastrointestinal tract. Elevated levels of leukocytes can be seen in conditions such as inflammatory bowel disease or infectious colitis.
- **Red Blood Cells:** Microscopic examination can reveal red blood cells in the stool, which might be a sign of gastrointestinal bleeding. This could be due to various causes, such as ulcers, hemorrhoids, or colorectal cancer.
- **Undigested Food:** Examination under the microscope may show undigested food particles, which can be an indicator of malabsorption or digestive problems.
- **Yeast and Fungi:** Yeast and fungal overgrowth in the gastrointestinal tract may be identified, which could be linked to conditions like Candida infection.

❖ **Macroscopic Examination of stool**

A macroscopic examination of stool, involves assessing the visible characteristics of a stool sample with the naked eye.

Materials Needed:

1. Disposable gloves, plastic or disposable container for collecting the stool sample.
2. Wooden tongue depressor or plastic applicator, adequate lighting source.
3. Personal protective equipment (PPE) as needed.

Procedure:

1. Wash the hands thoroughly with soap and water before starting the procedure. Put on disposable gloves to prevent contamination.

2. Instruct the patient on how to collect the stool sample if they are doing it themselves. Provide them with a clean, dry container for collection. If you are collecting the sample from the patient, gently insert a wooden tongue depressor or plastic applicator into the stool to obtain a representative sample.
3. Examine the stool sample for various characteristics, including color, consistency, shape, odor, blood, and mucus, undigested food and parasites or worm.
4. Record the observations, dispose of gloves and any disposable items properly in a biohazard waste container. Clean and sanitize any tools or surfaces used during the examination.

❖ Microscopic examination of stool

Microscopic examination of stool is a laboratory test that involves analyzing a stool sample under a microscope to detect various microorganisms and abnormalities, such as parasites, bacteria, white blood cells, and other elements.

Materials Needed:

1. Stool sample collected in a clean dry container, disposable gloves.
2. Microscope, microscope slides, cover slides, Microscope, microscope slide labels.
3. Stains (e.g., iodine or Gram stain for specific tests).

Procedure:

1. Put on disposable gloves to prevent contamination.
2. Mix the stool sample to make it homogeneous, ensuring that any relevant components are evenly distributed.
3. Label a microscope slide with the patient's information and a unique identifier. Place a small amount of the well-mixed stool sample on the labeled slide.
4. Depending on the specific tests being conducted, a thin smear of the stool sample may need to be prepared. This can be done by spreading the sample evenly across the slide using another slide or applicator.
5. In certain cases, stains may be applied to the slide to enhance the visibility of specific microorganisms or components. **For example**, iodine can be used for identifying cysts and eggs of parasites. Gently place a cover slip over the prepared slide, ensuring there are no air bubbles or debris trapped underneath.
6. Place the prepared slide on the microscope stage. Start with the lowest (10x) objective lens and focus on an area of the slide with the stool sample. Once you have a clear view, switch to a higher (40x) objective lens to examine specific elements more closely.
7. Observe the slide for the following components, Parasites (e.g., cysts, eggs, or adult forms), Bacteria, White blood cells (leukocytes), Red blood cells, Yeast or fungi and any other relevant structures or abnormalities. Document your findings, noting the presence or absence of various components and any relevant observations.

8. Remove the slide from the microscope stage. Dispose of gloves and any disposable items properly in a biohazard waste container. Clean and disinfect the microscope and work area.
9. Record your findings on the laboratory report form, including any relevant details about the stool sample and the microscopic examination.

❖ Culture and sensitivity testing

Culture and sensitivity testing of stool is a laboratory procedure used to identify and determine the susceptibility of pathogenic bacteria found in a stool sample. This test is crucial for diagnosing and treating bacterial gastrointestinal infections.

Materials Needed:

1. Stool sample collected in a sterile container.
2. Culture media suitable for the isolation of enteric (intestinal) bacteria
3. Sterile swabs or inoculating loops, Incubator, Personal protective equipment (PPE),
4. Antibiotic susceptibility testing plate.
5. Microscope.

Procedure:

1. Put on appropriate personal protective equipment, including disposable gloves and a lab coat.
2. The stool sample is collected in a sterile container. Mix the sample to make it homogeneous.
3. Sterilize a loop or swab by flaming or using an alcohol burner. Aseptically transfer a small amount of the well-mixed stool sample onto the surface of the culture media. Typically, selective and differential media, like MacConkey agar or Eosin Methylene Blue agar, are used to encourage the growth of specific bacteria.
4. Place the inoculated media in an incubator set to the appropriate temperature and conditions for the growth of enteric bacteria (usually around 37°C or 98.6°F). Incubation typically lasts for 24 to 48 hours.
5. Once bacterial colonies have grown, perform identification tests. This may involve Gram staining, microscopic examination, and specific biochemical tests to determine the type of bacteria present.
6. Select colonies that are likely to be pathogenic and conduct antibiotic susceptibility testing. This involves inoculating antibiotic susceptibility testing plates (such as the Kirby-Bauer method or automated systems) with the bacteria and measuring their response to different antibiotics. This helps determine which antibiotics are effective in treating the infection.

7. Record the results of bacterial identification and susceptibility testing on the laboratory report form. Indicate which antibiotics are effective against the isolated bacteria.
8. Dispose of all materials used in the testing, including the stool sample and contaminated cultures, according to appropriate biohazard protocols.

❖ **A stool occult blood test**

Also known as a fecal occult blood test (FOBT), is a screening test used to detect hidden blood in the stool, which may be a sign of gastrointestinal bleeding from various sources, including colorectal cancer.

Materials Needed

1. FOBT kit, which typically includes Test cards or slides.
2. Sticks, Developer solution Instructions, Disposable gloves
3. Clean, dry and disposable container for stool sample.

Procedure:

1. Put on disposable gloves to prevent contamination during sample collection and handling.
2. The stool sample should be obtained from different areas of the bowel movement to ensure a representative sample.
3. Open the FOBT kit and lay out all the materials according to the instructions provided. Depending on the type of FOBT kit, the following steps may vary:

a. **Slide Test**: Use the applicator or stick provided in the kit to apply a small smear of stool to a specific area on the test card or slide.

b. **Fecal Immunochemical Test (FIT):** use the provided container or tube to collect a small stool sample, the specific instructions for this type of test.

4. Allow the stool sample to air dry on the test card or slide, following the kit's instructions, apply the developer solution to the designated area on the test card or slide. The solution reacts with any occult blood in the stool, causing a color change that can be detected. Let the test card or slide with the applied developer solution incubate for the required time specified in the kit's instructions. This typically takes a few minutes.
5. Examine the test card or slide for any color change in the designated area. A positive result is indicated by a color change.
6. Record the results, including whether the test is positive or negative, on the laboratory report form or in the patient's medical record.
7. Dispose of gloves and any disposable materials properly according to biohazard protocols.

❖ A quantitative fecal fat test

Also known as a fecal fat analysis, is a laboratory test used to measure the amount of fat in a stool sample. It helps diagnose conditions that affect the body's ability to absorb dietary fats, such as malabsorption disorders or pancreatic insufficiency.

Materials Needed:

1. Sterile stool container or tube, Laboratory-scale or balance, Solvents or chemicals for fat extraction
2. Glassware (beakers, flasks, etc.), Centrifuge, Laboratory-grade pipettes,
3. Reagents for fat determination (e.g., Sudan III stain), swabs, Disposable gloves,

Procedure:

1. A stool sample in a sterile container. Label the stool container with the patient's information. Mix the stool sample to make it homogeneous. This is crucial for an accurate analysis.
2. Weigh a specific amount of the well-mixed stool sample. The exact amount may vary depending on the laboratory's protocols, but it's typically a defined quantity (e.g., 5 grams).
3. Extract the fat from the weighed stool sample using solvents or chemicals suitable for fat extraction. This process may involve the use of solvents like ether or petroleum ether to dissolve the fat content. In some protocols, the fat extract may be separated from the rest of the sample using a centrifuge.
4. Use a specific reagent or staining method (e.g., Sudan III stain) to determine the concentration of fat in the extracted sample.
5. Measure the absorbance or color intensity of the fat extract using a spectrophotometer or colorimeter. The results are typically expressed in grams of fat per 24 hours.
6. Record the results on the laboratory report form, indicating the concentration of fecal fat in the sample.
7. Dispose of gloves and any disposable materials properly according to biohazard protocols.

❖ A stool pH test

A stool pH test is a diagnostic procedure used to measure the acidity (pH) of a stool sample.

Materials Needed:

1. Sterile stool container or tube, pH test strips or a pH meter,
2. swabs, Disposable gloves

Procedure:

1. The stool sample put in a sterile container, Label the stool container with the patient's information,
2. Mix the stool sample to make it homogeneous. The pH measurement is representative of the entire sample.
3. There are two primary methods for measuring stool pH:

a. **pH Test Strips:**

- Dip a pH test strip into the well-mixed stool sample.
- Wait for a few seconds as per the instructions provided with the test strips.
- Compare the color change on the test strip to a pH color chart to determine the pH value.

b. **pH Meter:**

- Calibrate the pH meter using standard buffer solutions, following the manufacturer's instructions.
- Immerse the electrode of the pH meter into the stool sample.
- Allow the reading on the pH meter to stabilize, and record the pH value.

4. The recorded pH value can be used to assess the acidity of the stool sample. Stool pH normally falls within the range of approximately 5.5 to 7.0, although some variation is expected.
5. Dispose of gloves and any disposable materials properly according to biohazard protocols.

❖ **<u>The laboratory diagnosis of most parasitic infections</u>**

It is a laboratory test used to detect the presence of parasitic organisms, their eggs (ova), or cysts in a stool sample. This test helps diagnose parasitic infections in the gastrointestinal tract.

Materials Needed:

1. Sterile stool container or tube,
2. Microscope, Microscope slides, cover slides, swabs
3. Disposable gloves, Fixatives (e.g., formalin), Saline solution, Lugol's iodine solution, Specific stains or reagents (e.g., trichrome stain for protozoa)

Procedure:

1. The collect of fresh stool sample in a sterile container or tube.
2. Label the stool container with the patient's information
3. For some parasites, particularly protozoa, it's essential to preserve the sample using a fixative, typically formalin. Follow the specific instructions for the type of fixative required and the proportions for mixing.
4. A small portion of the stool sample is transferred onto microscope slides.

5. Some parasites may require Lugol's iodine staining to enhance their visibility. Apply a drop of Lugol's iodine solution to the prepared slide with the stool sample.
6. Cover the sample on the microscope slide with a drop of saline solution and place a cover slip over it.
7. Examine the stool sample under a microscope, starting with the low-power (10x) objective lens and then using higher-power (40x) and oil-immersion (100x) lenses as needed. Look for the presence of ova, cysts, or parasites. Different parasites have distinct characteristics and shapes, which may include roundworm eggs, tapeworm segments, or protozoan cysts.
8. If ova, cysts, or parasites are identified, attempt to identify the specific type of parasite based on its morphology and characteristics.
9. Document the findings, including the presence or absence of parasites. Record the results on the laboratory report form,
10. Dispose of gloves, slides, and other disposable materials properly according to biohazard protocols.

❖ **Parasite were seen in stool examination under microscope.**

1. Protozoa:

a. *Entamoeba histolytica*: To investigate the vegetative phase (trophozoite) and cyst, causing amoebic dysentery disease.
b. *Entamoeba coli*: trophozoite + cyst

Note: - most of children diarrhea less than 2 years cause by *Entamoeba coli*.

c. *Giardia lamblia*, trophozoite + cyst, Cause watery diarrhea disease in children, especially.
d. *Balantidium coli,* trophozoite + cyst, causing Balantidiasis in colon.

2. Worms:

a. *Enterobius vermicularis* (pinworm): investigating the eggs that are of convex and flat surface and a pointed end.
b. *Ascaris lumbricoides:* investigating for eggs which characterized by the content of granular yellow to Brown irregular albumin membrane.
c. Hookworm (*Ancylostoma duodenale)*: investigating the eggs where the egg yolk is divided and surrounded by a thin membrane.
d. Tapeworms, (Taenia *solium)*: investigating the worm pieces called (**gravid segments or Proglottids)** that comes out with the feces.
e. *Schistosoma mansoni*: Investigating the eggs distinct by lateral spin.