Main Laboratory Tests and Standard Operating Procedures (SOPs) for Collection, Transport, and Approval biological samples

The following document outlines the main approaches for collecting, transporting, and approving laboratory specimens, including blood, urine, feces, swabs, biopsies, and other biological samples. It ensures compliance with laboratory quality standards, minimizes pre-analytical errors, and enhances test accuracy.

1. Blood Sample Collection, Transport, and Approval

1.1 Main Blood Analyses

1. Hematology

Complete Blood Count (CBC)

Peripheral Blood Smear

Reticulocyte Count

Erythrocyte Sedimentation Rate (ESR)

2. Clinical Biochemistry

Liver function tests (ALT, AST, ALP, bilirubin)

Kidney function tests (Creatinine, BUN, eGFR)

Lipid profile (Cholesterol, Triglycerides, HDL, LDL)

Blood glucose (Fasting, Postprandial, HbA1c)

3. Coagulation Tests

Prothrombin Time (PT Ratio), International Normalized Ratio (INR)

Activated Partial Thromboplastin Time (aPTT Ratio)

D-dimer

Fibrinogen

Antithrombin, Protein C, Protein S

PCR Resistance, Protein C Antigen

Lupus Anticoagulant

Factor V and VIII

4. Immunology and Serology

Autoimmune panel (ANA, RF)

Allergy tests (IgE)

Infectious disease serology (HIV, HBV, HCV, syphilis)

Pregnancy Serology (ToRCH)

5. Blood Typing

ABO and Rh grouping

Direct and Indirect Coombs test

1.2 Blood Sample Collection Procedure

Step 1: Patient Identification and Preparation

Confirm patient identity with two identifiers (Full Name, Date of Birth).

Explain the procedure and obtain informed consent, if necessary.

Ensure the patient is seated or lying down to prevent adverse reactions (syncope, etc.)

Step 2: Selection of Collection Tube

Lavender (EDTA): CBC, blood smear, HbA1c

Light Blue (Sodium Citrate): Coagulation tests, determination of platelets in patients with pseudo-thrombocytopenia
Red/Gold (Serum Separator Tube - SST): Biochemistry, serology

Gray (Fluoride/Oxalate): Glucose testing

Step 3: Venipuncture Procedure

Perform hand hygiene and wear gloves.

Clean the venipuncture site with 70% isopropyl alcohol, let dry.

Use a sterile vacutainer needle and collect blood in the correct order of draw.

Apply gentle inversion to mix anticoagulants without hemolysis.

1.3 Transport & Storage of Blood Samples

Immediate transport to the laboratory (within 1–2 hours). Although different for different analytes, a temperature between 10°C and 20°C is recommended for most analytes.

Storage temperature:

Room temperature:

- Hematology (CBC, PT, aPTT)
- Biochemistry (Liver, Kidney function tests)
- Hormones, Special proteins

1.4 Sample Approval and Rejection Criteria

Approval:

Correct patient identification and tube selection.

Sufficient sample volume.

No clots in anticoagulated tubes.

Rejection:

Hemolyzed, clotted or insufficient samples.
Wrong test-tube.
Extended transport time with possible degradation.

2. Urine Sample Collection, Transport, and Approval

2.1 Main Urine Analyses

1. Chemical-physical and microscopic Urinalysis

Physical parameters: pH, relative density

Chemical parameters: Albumin, RAC, Hemoglobin, Leukocyte esterase, Nitrite

Microscopy: erythrocytes, leukocytes, cylinders, epithelial cells

2. Urineculture and Antibiotic Sensitivity

Bacterial identification (gram positive and gram negative bacteria and yeasts)

Antibiotic susceptibility testing

3. 24-Hours Urine Tests

Creatinine clearance

Protein quantification

Electrolytes (Na, K, Ca)

2.2 Urine Sample Collection Procedure

Extemporaneous urine: from guidelines first morning urine, midstream.

Midstream Clean-Catch Urine: for microbiological testing to avoid contamination/ complete urine test.

24-hour urine collection: all urine over 24 hours stored in a special container.

2.3 Transport and Storage of Urine Samples

Refrigerate if analysis is delayed (>2 hours).

Do not freeze unless required for special tests.

2.4 Sample Approval and Rejection Criteria

Approval: proper collection technique, sufficient volume, sterile container.

Rejection: contaminated sample, insufficient volume, improper storage.

3. Faeces Sample Collection, Transport, and Approval

3.1 Main Faeces Analyses

1. Stool Culture: research of Salmonella, Shigella, Campylobacter

2. Fecal Parasitology: microscopic research of fecal parasites

3. Scotch test: research of Enterobius vermicularis eggs

4. Occult Blood Test: detection of hidden bleeding

3.2 Collection Procedure

Stool Culture: sterile container with a transport media, named Cary-Blair (red liquid).

Fecal parasitology: dedicated container with a colorless liquid.

Occult blood test: dedicated container and dietary restrictions for occult blood test (avoid red meat, iron supplements).

3.3 Transport & Storage

Microbiology samples should be transported immediately.

For Stool Culture and fecal parasitology: store samples at room temperature.

Occult blood test: refrigerate the samples at 2-8°C.

3.4 Approval and Rejection Criteria

Approval: proper container, sufficient sample, correct labeling.

Rejection: contaminated sample, insufficient volume, improper storage.

4. Swab Collection, Transport, and Approval

Swabs with correct transport medium (Amies for bacteria and yeast, VTM for viruses).

Biopsies: formalin-fixed at 10% or fresh/frozen for molecular analysis.

4.1 Main Swab Analyses

1. Bacterial Culture & Sensitivity (Throat, Wound, Vaginal, Nasal swabs)

2. Viral PCR Testing (COVID-19, Influenza, HPV)

3. Fungal Culture

4.2 Collection Procedure

Use sterile swabs and transport medium.

Avoid saliva contamination for throat swabs.

4.3 Transport & Storage

Transport immediately to the laboratory at room temperature.

4.4 Approval and Rejection Criteria

Approval: Correct transport medium, sufficient sample.

Rejection: Dry swab, improper storage.

5. Biopsy & Other Biological Samples

5.1 Main Analyses

1. **Histopathology (PAP test staining, Immunohistochemistry)**
2. **Molecular Tests (FISH, PCR for cancer markers)**

5.2 Collection & Transport

Formalin-fixed for routine pathology.

Fresh/frozen for molecular analysis.

5.3 Approval and Rejection Criteria

Approval: Proper fixation and labelling.

Rejection: Incorrect fixative, insufficient tissue.

Conclusion

The document outlines the main laboratory tests by ensuring sample integrity, accurate results, and regulatory compliance. Further needs can be directly requested to the main Multimedica Centers.

SUMMARY TABLE

TYPE OF TEST/S	**FOR WHAT?**	**MODALITY OF COLLECTION**
BLOOD ORAL GLUCOSE TOLERANCE TEST (OGTT)	To diagnose diabetes mellitus: patient's fasting blood glucose level Measure ny takeing a glucose drink and further blood samples will be taken after 2 hours from the basal level. To diagnose gestational diabetes in pregnant women: 3 blood samples (fasting value, and after 1 hour and 2 hours taking a glucose drink	No food from at least 8 hours before the test. Only water is allowed. Go to the phlebotomy center for a first blood sample to measure glucose level. The patient will be then asked to take a glucose drink containing water and 75gr of sugar. After 2 hours a further blood sample will be taken. In case of diagnosis of gestational diabetes in pregnant women, a further third blood sample is taken after another 1 hour. For any adverse event (nausea, vomit, dizziness etc.), the health care staff is immediately alerted.
BLOOD STANDARD SAMPLING	Any blood parameter or marker requiring blood, plasma and serum	No food from at least 8 hours before the test. Only water is allowed. • Go to the phlebotomy center for blood sample collection
FECAL SAMPLES	• STOOL CULTURE • FECAL PARASITES • SCOTCH TEST (research of Enterobius vermicularis eggs) • FECAL OCCULT BLOOD (FOB)	STOOL CULTURE Clean the anal region with hot water. Don't use antibacterial solution. For each sample, it's necessary: 1. Collect the stools on a clean surface 2. Unscrew the container cap 3. Collect the sample with the special pallet 4. Put it inside the container 5. Mix the stools with the red liquid 6. Close very well the cap of the container

		The specimen must be stored at room temperature and has to be delivered to the laboratory as soon as possible. <u>FECAL PARASITES</u> The collection can be done with one or more samples (collected in different days). For each sample, it's necessary: 1. Collect the stools on a clean surface 2. Unscrew the container cap 3. Collect the sample with the special pallet 4. Put it inside the container 5. Close very well the cap of the container The specimen must be stored at room temperature and has to be delivered to the laboratory as soon as possible. <u>SCOTCH TEST</u> The sampling must be done in the morning, before the patient washes and before the emission of feces. 1. Cut the clear adhesive tape to the length of the slide 2. Place the adhesive part of the tape on the perianal region, pressing gently 3. Adhere the adhesive part to the glass 4. Place in the transport container and deliver to the collection center as soon as possible Store the sample at room temperature. <u>FOB TEST</u> 1. Sign the name and the date of collection on the label 2. Unscrew and take out green cap 3. Do not spill the solution from the collection container

		4. Drag the stick on the stools several times, horizontally and vertically 5. Put the stick back in place, closing cap firmly Carry the sample/samples to the laboratory as soon as possible. If the delivery in the same day of the collection is not possible, store the samples in a refrigerator (2-8°C) no later than 72 hours from the first collection. It is important do not contaminate the samples with urine or menstrual blood.
24-HOUR URINE COLLECTION IN ACIDIFIED CONTAINER	• Fractionated catecholamines • 5-hydroxyindoleacetic acid • vanillylmandelic acid • metanephrines	Collect a 24-hour urine in the proper container (ask to the Laboratory or to the Pharmacist). Hydrochloridric acid is addict in the laboratory. • Note: When testing for 5-hydroxyindoleacetic acid, vanillylmandelic acid and metanephrines it is necessary to follow a diet free of bananas, vanilla, chocolate, coffee, tea, pineapple, kiwi and walnuts, starting 48 hours prior and for the entire duration of urine collection. Discard the first stream of urine and collect for the following 24 hours. Add the first ones the next morning. During the urine collection keep the container in a cool place and in the dark. Go to the phlebotomy center for sample collection or delivering.
24 HOUR URINE COLLECTION	Creatinine, other parameters	Collect a 24-hour urine in the proper container (ask to the Laboratory or to the Pharmacist). Discard the first stream of urine and collect for the following 24 hours. Add the first ones the next morning. During the urine collection keep the container in a cool place. Go to the phlebotomy center for sample collection or delivering.

URINE	• Urine-culture • Chemical-physical and microscopic examination	<u>Urine-culture</u> Use a suitable sterile container with a screw cap and collect the first morning urine or those present in the bladder after at least 6 hours after the last urination. During collection, let the first part of the urine flow out and collect the remaining quantity Deliver the sample within two hours of collection at the collection point or within 12 hours of collection keeping the sample between 2°-8°C. MALES collection Wash the hands with soap and water and dry with disposable paper Retract the foreskin and wash the gland thoroughly, rinse with water and dry. Open the container taking care do not to touch it inside. Collect urine by keeping the foreskin retracted deliver the first jet of urine in the toilet (first stream) and collect into the sterile container the second jet of urine (mid-stream). FEMALES collection Wash the hands and the external genitalia: holding the labia majora apart with one hand and wiping from front to back with the other hand, rinse with running water and dry. Open the container only at the last moment and take care not to touch it inside. Collect urine by spreading the labia and deliver the first jet of urine in the toilet (first stream), finally collect into the sterile container the second jet of urine (mid-stream). <u>Chemical-physical and microscopic examination</u> Follow the same collection procedures described for Urine Culture. Use a suitable container, it doesn't need to be sterile (ask the Laboratory or Pharmacy). Deliver the sample at the collection point within four hours of collection

VARIUOS BIOLOGICAL SAMPLES	MICROBIOLOGICAL OR CYTOLOGIC EXAMINATION ON: • Urethral swab • Endocervical and/or vaginal Swab • Pharyngeal swab • Eye and ear swab • Pap test	For these tests it is suggested to consult MDs specialist for the right advices for the collection of the biological samples. Here are just a few general warnings before undergoing the sampling: - Avoid local medication and general antibiotic therapy at least 5 days before the examination, or abstain to sexual activity within 48 hours before the urethral/endocervical/vaginal swabs; do not use mouthwash or medicines for local use for 6 hours prior to the pharyngeal swab; avoid internal/douche/ovuli vaginal compounds during the three days preceding the examination in case of Pap test (this test cannot be performed during the menstrual period).