

# Overview of the lab

I am firstly going to give you an overview over the **structure** of staff within the laboratory.

- At the top is the Service manager who is in charge of the laboratory. Then the professional managers run the different departments. The senior BMS oversee the day-to-day work dealing with quality control and working with the BMS validating results. CSW are also a key group of staff who deals with pre-analytics, maintenance and reception.

Before we start the tour, I want to briefly speak about **health and safety**.

- We have chemical and biological spills kits with instructions.
- There is PPE available to staff such as lab coats, gloves, and face masks.
- There are also first aids, eye wash and hand wash stations around the lab.
- In addition to this, there are different fire extinguishers and fire blankets depending on the type of fire. Not expecting fire alarms today.

## Reception

First and foremost, the lab consist of 4 different parts: reception, haematology (coag), biochem (specialist biochem) and blood bank.

However, the **first line of staff** who deal with samples being delivered are the clinical support workers in combined specimen reception.

The samples can be **delivered** through two different systems:

- Pneumatic tube system (red pots)
- Or samples brought by porters

The samples are **booked in** through lab centre by scanning the barcode and the patient details appear in labcentre.

- CSW must check if the samples comply with the **minimum data set** (DOB, CHI, full name).

Although not all samples have a barcode, but the patient details are shown in a form which needs to be manually entered by the CSW.

Every **urgent sample** arrives at the urgent bench, they have their own red pot system. These samples are booked in, marked with a line at the top and they are spun for 7 minutes.

Now we will move to haematology.

# Haematology

This is the coagulation area, where they check for **coagulation factors**.

## Coagulation

- The tube sample volume and tube type are **checked** to identify any inaccuracies caused by improper sample collection such as haemolysis.
- The sample is scanned, and it is given a **number**. Analysers
- And **Validation** can also be done in here.

CS-5100 x2 same

CS-5100 Haemostasis System is used to analyse a **range** of coagulation tests including clotting screens. QC every 4 hours

In addition, **D-dimer reagents** are made up and placed just in one analyser.

The **results** are checked on the screen to see if they have passed over to the EPU. The normal results are auto validated, and the abnormal are validated by a BMS.

Over here, the CT-9000 track connects three types of analysers.

## CT-9000 track

- The first part are the XN-10s.
  - There are **3** analysers in charge of performing **FBCs**. RBCS, WBCS, PLT. The first one is **slightly different** as it also performs reticulocyte count.
  - **Maintenance**, they have three different QC levels.
  - In the screen, **QC file** (double click in one of the QC levels), and there should be a red cross if the QC has failed.
- Following the XN-10, SP-10 Blood film stainer
  - **Makes and stains blood films** from the sample, so BMS can take a look at them at the microscopes
  - This analyser is **disconnected** from the track bc not all samples need a blood film
  - The blood film of some samples such as **pediatric tubes or short samples can't** be done in here, so it is done by a BMS or a CSW and it is stained in the SP-10.
- Tube sorter
  - Once analysed, the samples are **sorted** by the Tube Sorter module into archive racks or sorted into the further testing rack.
  - **Further testing** may include barcode errors, Cold, ESR, Smear, Malaria, IM, G6PD, Sendaway, HbA1c
  - They **take out** the racks whenever it is full and they place it into the metal rack.

## Morphology

- Microscopy and validation
- **Validation** of coagulation and FBC are also carried out at these stations.
- Once a film is made, a BMS **interprets** the patients blood film before reporting any findings.
- This is a great tool for **educational** purposes or a second opinion

## Archive racks

Once archive racks are full in the Tube Sorter, they are removed and stored on metal racks for 24-48 hours before being discarded into the Yellow Clinical Waste bins ready for incineration.

## Manual test kits

Clearview IM II	Malaria antigen	Accusay hCG
Detection in plasma of infectious mononucleosis	Testing plasma for malaria	Testing urine samples for pregnancy
These tests give qualitative results, which mean they only show either positive or negative results. They perform Pos/Neg controls and EQA		

## PV

Benson Mark 2 plasma viscometer

- It measures the thickness of blood.
- The CSW perform daily checks, and the analyser gets QC before patient samples are run.
- If the results are abnormal, they are validated by a BMS.

## ESR

Inversa ESR

- Measures the ESR sedimentation rate of RBCs.
- The results are printed out and also validated in Labcentre.
- IQC is done once a day using alternative low or high controls.

# Special biochemistry

Now, we will move to the chemistry department. I will first show you special biochemistry because is just this way. This is where more specific biochemistry tests are performed.

### Electrophoresis Sebia

Gel electrophoresis is used in clinical laboratories to screen proteins in serum, urine & other biological fluids for abnormalities in the proteins

### Drugs of abuse

In this spot, the Thermo ISQ analyser performs drugs of abuse tests. It is not run at the moment as most of the drugs are sent away due to the low numbers of samples that we get.

### Cabinets and safety nitrogen

Over here, the Fume cabinet is where staff can work with difficult substances such as nitrogen. Safety is really important, that is why a chemical fire cabinet can also be found in here to protect the inflammable chemicals from any possible fire.

## Core Biochemistry

Now will move into core biochemistry. It is divided into 4 lines: pre-analytics, line 1, 2, and 3.

### Cobas 8100 Pre-analytics

The first part is the Cobas 8100 pre-analytical line, where test samples are organized. It consists of three areas: output, input, and the aliquot station.

- Output
- Input
- Aliquot station

So once samples have been checked in and sorted into the correct racks depending on tests, the samples are loaded into the Cobas 8100 (Track). The samples go into the input buffer (3 unspun, 1 spun), where then they are scanned and taken into the Automatic centrifuge unit (ACU) when needed. They are centrifuged for 10 minutes, decapped by the 'DSP – Destopper' module and sent to the appropriate Line, dependent on the tests requested.

BRF takes the sample from the single holder and place it into a 5 position rack so it can go into the line to be analysed.

### Line 1 and 2

Moving on to the lines, line 1 and 2 are responsible for 90% of the daily workload for chemistry.

Lines 1 and 2 are mirror images of each other so when one line is out due to maintenance or other issues, we are always able to process samples. Every line is divided into 3 different modules to manage the workload

- ISE units analyse sodium, potassium, chloride
- c702 analyze core chemistries such as liver or kidney function
- e801 analyze immunoassays such as glucose, drugs of abuse and other types of proteins and hormones

### Line 3

The next line is line 3, it consists of one C702 core chemistry and two e801. One e801 is completely for Serology testing and the other e801 is for Tumour Markers and B12 and Folates.

### Maintenance

An important point is maintenance.

- Every line undergoes through maintenance, calibration, and quality controls before a patient sample test can be performed.
- This is to ensure the quality of the test is maintain.
- \*Click overview and then daily maintenance\*

### Archiving Samples

After the test are performed, the track takes the sample to the P501 Fridge, where they are archived for 4 days. This is when the samples will be discarded during maintenance and taken by a CSW to the waste area. This fridge can store up to fourteen thousand tubes.

BRF, Restopper cups, scan and assigned a position.

### Urgent samples

Another important aspect to consider is the emergency samples from an accelerated source such as Accident and Emergency. They are spun in reception to avoid delays in case there are any technical issues in the track.

After they are spun in reception, they are loaded into the core unit so they can do the test in the corresponding analyser of the line. After the test is done, it comes back from the core unit and it is manually loaded in the IPB so it can do further test or be taken into the fridge or AOB for archiving.

Let's move to the front where we can find the validation stations.

### Validation Stations

- A validation station is available for each of the 3 lines.
- The BMS review IQC materials prior to patient samples being run.
- Review held patient samples I.e., held for specific flags, repeats, clotted samples.

### Fridge

Send away and made-up calibrators, anything kept there for convenience.

# Blood bank

The last one is blood bank. This lab **provides service** to this hospital and other service users **offering** different tests such as blood group and antibody screens.

## Reception

In blood bank, they have a **separate reception** to ensure there are no mistakes in identifying the patient. Here, the **Zero tolerance policy** is set, and they have to **strictly** follow the minimum data set.

## Grifols Eflexis

After the sample has been **double checked** and booked-in, it is placed into the Grifols eflexis if it is a routine sample. If the sample is **urgent**, the test is done manually.

\*It is an Automated blood typing system which performs pretransfusion compatibility tests using DG Gel technology.\*

Its **QC** is run every 12 hours. And the reagents, cards and waste bin are checked as part of **maintenance**.

1. Once sample has been analysed, the results are **validated** by the BMS and double checked.
2. The results are **printed** and sent to the service user.
3. In addition, the blood products are **issued** when results have been double checked.

## Sample storage Fridge

After validation, samples are **stored** into racks organized by day.

- They are stored up to **10 days** in case the patient has a **reaction**. And the racks are **emptied** as required when a full rotation is done.
- **IQC and some reagents** are kept here for easiness and convenience.

## Specialist testing bench and emergency bench

### Blood unit storage fridge

Blood is kept in the storage fridge. The two fridges are similar, but they contain the different units separated by the **individual shelf**.

The **temperature is controlled** as it is measured during the day to make sure units are kept at the correct temperature.

There is a **minimum stock check list** to ensure they do not run out of blood products. This list is checked every morning and they will place the order to **Edinburgh** asking for additional top ups.

#### Freezer

This is the freezer where the FFP and cryo are stored. They have to be **defrosted** in the Sahara Plasma Thawer for 5 minutes before use.

Cryoprecipitate	Fresh frozen Plasma
Once defrosted, store at room temperature for <b>4h</b>	Once defrosted, store at room temperature for <b>4h and 24h</b> in the fridge.

#### Platelet storage

This is the SRT Platelet agitator. This is kept at **room temperature** (25C) where they rock side to side in **constant movement** to avoid coagulations.

PLT with **tags** are the ones about to be issued to patients.

#### Traceability

This is traceability bench. The CSW or BMS **trace any issued blood** product booked out in the laboratory system. This is to ensure the **cold chain reaction** is not disrupted before it is transfused to the patient and to check if this blood has been **transfused** into a human being. Basically, it shows the **final fate** of the unit.

#### Products fridge

This is where products such as **Anti-D and beriplex** are kept. It is also **temperature** controlled so products are safe to use.

#### Emergency fridge

When blood units are **allocated** to a patient, they are place into the issue fridge. They have to be **electronically removed** from the system by a laboratory staff member or a porter.

Also, there are 4 **emergency O negs** store for use in case of an emergency.