



✓ **UNIT 5: GENOMICS UNIT**

The Genomics Unit is equipped with Next Generation Sequencing (NGS) technology, the Illumina MiSeq. The robustness of the system puts it at the top of the line of NGS sequencers for sequencing of small genomes. The MiSeq offers an end-to-end sequencing solution, integrating cluster generation, amplification, sequencing, and data analysis in a single instrument.

With this technology, we are able offer the following services:

- Amplicon sequencing
- Small genomes re-sequencing
- Metagenomics
- De novo sequencing of small genomes

The unit is supported by the KCRI Bioinformatics Unit, which develops and maintains the applications and databases used for analysing sequence data. The KCRI bioinformatics applications are publicly available via the KCRI application portal at <http://www.kcri.ac.tz/>.

✓ **UNIT 6: PHARMACOKINETICS**

The Pharmacokinetics Unit carries out pharmacokinetic analyses for the various drug trials taking place at KCRI. We have established protocols for measuring TB drug levels, in particular for the first line drugs Ethambutol, Rifampicin, Pyrazinamide, and Isoniazid, as well as for the second-line drug Ofloxacin.

Concentration levels are measured using high performance liquid chromatography (HPLC). Drug extraction from plasma is performed using solid phase extraction (SPE).

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BASED HEALTH INTERVENTIONS

**KCMC/KCRI**  
**BIOTECHNOLOGY**  
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## ✓ UNIT 1: MOLECULAR AND IMMUNOLOGY

The Molecular and Immunology Unit is equipped with state of the art instruments, enabling a wide range of assays for molecular biology and immunology to be carried out i.e. for diagnosis of infectious diseases such as malaria, chikungunya and dengue, gene expression studies and immunological activities such as CD4 and CD8 counts. Examples of instruments include:

- Automated/robotised DNA/RNA/protein extraction/purification system (QIAcube)
- Real-time PCR detection systems
- Roche LightCycler
- BD FACSCalibur flow cytometer

## ✓ UNIT 2: GENE EXPRESSION

The Protein Expression Unit is equipped with the range of instruments necessary for E. coli expression system. Currently, there is the production of recombinant protein antigens which are candidate vaccines under development for malarial transmission blocking (Pfs25 antigen), pregnancy associated malaria (VAR2CSA antigen), liver stage malarial infection (CSP antigen) and under five severe malaria (CIDR alpha 1). Examples of instruments include:

- NUAIRE Biological Safety Cabinet Class II
- Jenway 7300 Spectrophotometer
- Electrophoresis and Gel documentation system ( in collaboration with unit 1 )
- His-Tag Purification system ( His Trap)

The main service provided at the unit now is production of recombinant proteins using E.coli expression system. Other services include:

- DNA/RNA/Protein extraction and purification ( in collaboration with unit 1 )
- Detection of protein using dot blot and western blot

KCRI Biotechnology Laboratory is equipped with advanced facilities of technologies that provide vital diagnostic, monitoring and screening testing. All equipment is fully validated through ISO international standards. The lab employs qualified scientists and support staff who are trained on Good Laboratory and Clinical Practice (GLCP). The lab comprises seven functional units and a storage facility, which provide a range of research-related services.

## ✓ UNIT 3: HAEMATOLOGY & BIOCHEMISTRY

The unit has state of art instruments such as an automatic haematology analyzer for multi-parameter that performs complete blood counts (CBC) as well as differentiating five subpopulations of white blood cells (WBC). In addition, it has an automatic chemistry analyzer for diagnostic clinical chemistry testing, Classic chemistry, electrolytes, specific proteins, therapeutic drug monitoring, drugs of abuse, and thyroid hormone testing consolidated into one system with one reagent cassette design. Tests performed by the Haematology and Biochemistry Unit include:

- Haematology: Complete Blood Count (CBC) + Differentials
- Liver function Tests
- Electrolytes (Sodium Indirect, Potassium Indirect, Chloride Indirect, etc.)
- Lipid profile (Triglycerides, Total Cholesterol, HDL Cholesterol and LDL-Cholesterol )

Instruments used:

- Cobas Integra 400 plus; a number of biochemical tests are performed on site using Cobas Integra, Rochel platform
- Cell Dyn 3500/ 3700 analysers for haematology

## ✓ UNIT 4 : MICROBIOLOGY UNIT (BSL-2 AND BSL-3)

The microbiology unit is equipped with BSC II cabinets, BD MGIT 960 System, Incubators, LED Fluorescent microscope, Cepheid GeneXpert MTB/RIF and Hain: MTBC, GenoType MTBDRplus and GenoType MTBDRsl. The BSL3 lab performs the following tests:

- Sputum microscopy
- Tuberculosis screening
- TB drug susceptibility testing
- Molecular speciation of M. tuberculosis Complex
- Culture

The BSL 2 lab is equipped with a BD BacT/ALERT 3D system, CO2 Water-Jacketed Incubator, Bright field microscopes and a Class II Biosafety cabinet. Tests performed in this lab include but are not limited to:

- Bacterial culture from biological specimens such as blood, stool, urine, swabs, etc.
- Drug susceptibility testing
- Microscopy
- Biochemical tests e.g. Catalase test, coagulase test, API 20E, etc

The BSL2 (Bacterial Zoonoses) laboratory is furnished with a CO2 Water-Jacketed Incubator, Bright field microscopes and a class II Biosafety cabinet. The lab offers the same procedures as of BSL2 (Human) lab. This lab handles specimens of animal origin. Currently this lab handles bovine, ovine, rodents and caprine origin specimens. These include Blood, milk and urine specimens.