

Genomics and Proteomics Facility

Genomics and proteomics laboratories are specialized facilities equipped to analyze genetic material (DNA/RNA) and protein expression profiles at the molecular level. These labs serve as critical infrastructure for biomedical research, drug discovery, diagnostics, agricultural biotechnology, and personalized medicine. Together, genomics and proteomics provide comprehensive insights into the central dogma of molecular biology — from gene sequence to functional protein product.

Instruments in this facility

- VeritiPro Thermal Cycler
- QuantStudio 5 Real-Time PCR
- Qubit Fluorometer
- ChemiDoc Go Gel Imager
- PROTEAN Tetra PAGE/ Blot with Mini Trans-Blot Module
- Labman Ice Flaker

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VeritiPro Thermal Cycler

The VeritiPro Thermal Cycler (developed by Applied Biosystems/Thermo Fisher Scientific) is a versatile PCR instrument widely used across multiple research disciplines. The thermal cycler is a workhorse instrument in modern molecular biology research, supporting everything from basic gene cloning to cutting-edge genomics, oncology, and epigenetics studies. Its precision, flexibility, and throughput make it suitable for both discovery research and translational/applied science settings.



Key Specifications

Block format	96-well, 0.2 mL alloy block
Max. block ramp rate	6.0 °C/sec
Max. sample ramp rate	4.4 °C/sec
Temperature accuracy	±0.25 °C (35–99 °C)
Temperature range	0–100.0 °C
Temperature uniformity	<0.5 °C (30 sec after reaching 95 °C)
PCR volume range	10–100 µL
VeriFlex Block range	30 °C range across block, 6 temperature zones (up to 10 °C per zone)

Signature Features

VeriFlex Block Technology: The VeriFlex blocks are controlled by multiple Peltier elements and provide six independent temperature control zones, offering precise PCR temperature optimization without the limitations of traditional gradient functions. This "better-than-gradient" approach allows

researchers to fine-tune primer-annealing conditions with exceptional accuracy across the block simultaneously.

Cloud Connectivity: The VeritiPro is cloud-ready and can be connected remotely using Connect, enabling users to design and upload methods and monitor runs from a mobile device or computer.

Simulation Mode: The VeritiPro is equipped with simulation modes that allow it to replicate the ramp rates of a wide range of instruments. This makes instrument transitions and protocol transfers seamless across labs.

Intuitive Interface: The expanded 8-inch touchscreen and improved user interface provide an intuitive, interactive system for easy programming and minimal training time for new users.

Key Research Application

- **Standard and High-Fidelity PCR:**

This instrument excels at routine end-point PCR amplification of DNA fragments, enabling researchers to copy specific DNA sequence from complex genomic samples, including human genomic DNA. It has been validated for amplifying targets ranging from short amplicons (under 600 bp) to long genomic amplicons exceeding 12,000 bp using master mixes such as AmpliTaq Gold, Platinum SuperFi Green, and SequalPrep Long PCR Kit. Its precise temperature control and fast ramp rates make it suitable for a wide range of PCR protocols.

- **Primer Annealing Optimization:**

Researchers can test multiple annealing temperatures in a single run, dramatically reducing the time needed to optimize new assays — a critical step in developing novel PCR assays for gene expression, genotyping, or mutation analysis.

- **Genomics & Genetic Analysis**

The precision and uniformity of the VeritiPro make it well-suited for

- **Genotyping** – Identifying genetic variants (SNPs, insertions, deletions) across populations or patient cohorts.
- **Whole-genome or targeted sequencing library preparation** – PCR steps in NGS (Next-Generation Sequencing) workflows rely on thermal cyclers for adapter ligation and amplification.
- **Gene mapping** – Amplifying loci of interest for physical or genetic mapping studies.
- **Cloning & Molecular Biology**

From colony PCR to amplification of inserts for cloning into expression vectors, the instrument provides reproducible results across diverse molecular biology workflows including, gene editing constructs (e.g., CRISPR), and synthetic biology applications.

- **Pathogen Detection & Infectious Disease Research**

The VeritiPro supports qualitative and diagnostic PCR assays for detecting viral, bacterial, and parasitic pathogens in clinical or environmental samples, including research into emerging infectious diseases.

- **Forensic & Ancient DNA Research**

Its sensitivity and optimization features allow amplification of degraded or low-quantity DNA, making it useful in forensic science and paleogenomics (ancient DNA studies from archaeological specimens).

- **Epigenetics & Cancer Research**

- Used in bisulfite sequencing PCR (BSP) and methylation-specific PCR (MSP) workflows to study DNA methylation patterns — a key area of cancer and developmental biology research.
- Detecting oncogenes and tumor suppressor mutations
- Amplifying ctDNA (circulating tumor DNA) from liquid biopsies
- Validating somatic mutations identified by sequencing

- **Agricultural & Environmental Genomics**

- Plant and animal breeding programs (marker-assisted selection)
- Environmental DNA (eDNA) studies to detect species in ecosystems
- GMO detection and food authenticity testing

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QuantStudio 5 Real-Time PCR

The QuantStudio 5 is a reliable workhorse instrument well-suited for translational, basic, and applied research across genomics, oncology, infectious disease, and beyond. It supports multiple detection chemistries and offers robust data analysis through the Design & Analysis Software.



Key Specifications

Block format	96-well format with fast ramping speeds (0.2-mL block)
Multiplex capability	up to 5 targets simultaneously
Quantification modes	Absolute and relative
Cloud connectivity	Thermo Fisher Connect for data sharing
Excitation filter	470 ± 15, 520 ± 10, 550 ± 10, 580 ± 10, 640 ± 10, 662 ± 10 nm
Emission filter	520 ± 15, 558 ± 12, 586 ± 10, 623 ± 14, 682 ± 14, 711 ± 12 nm
Detection Chemistries Support	SYBR Green, TaqMan Probes, MGB Probes, FAM, SYTO9, MeltDoctor, fluorescein, PTS, VIC, JOE, TET, HEX, TAMRA, NED, BODIPY TMR-X, ABY, ROX, Texas Red, JUN, LIZ, Cy5, Mustang Purple, Cy5.5, Alexa Fluor
Temperature uniformity	<0.5 °C (30 sec after reaching 95 °C)
PCR volume range	10–100 µL
VeriFlex Block range	30 °C range across block, 6 temperature zones (up to 10 °C per zone)
Maximum ramp rate	6.5 °C/sec
Average ramp rate	3.6 °C/sec
Display	Interactive touch screen

Signature Features

- **Precise quantification, with 1.5-fold discrimination with 99.9% confidence**
- **Robust, friendly software:**

It offers single-plate data analysis for CT, standard curve, relative quantification, genotyping and presence/absence of gene of interest

- **Run multiple optimizations simultaneously**

QuantStudio systems with 96-well block format feature VeriFlex technology, which provides precise independent temperature control in each zone. Blocks contain six VeriFlex zones. Each zone can be a different temperature, allowing multiple temperature optimizations in the same run.

- **Access, analyze, and share data anytime, anywhere**

Remotely monitor your runs, quickly analyze sophisticated data sets, store results in a secure space, and safely share them online with colleagues across campus and around the world with Web browser-based software supported by our Connect cloud-based platform.

- **Pre-optimized protocol templates**
- **High Resolution Melt (HRM) Analysis**
- **Advanced multiplexing through decoupled excitation and emission filter channels.**

Key Research Application

- **Gene Expression Analysis (RT-qPCR):**

Quantifying mRNA levels to study how genes respond to treatments, diseases, or developmental stages. Typically uses SYBR Green or TaqMan assays with reference genes (e.g., GAPDH, β -actin) for normalization via the $\Delta\Delta C_t$ method.

- **Pathogen Detection & Quantification:**

Used extensively in microbiology and virology to detect and quantify bacteria, viruses, fungi, and parasites from clinical samples (blood, tissue, swabs) to environmental samples. TaqMan probes provide high specificity for pathogen-specific sequences.

- **Copy Number Variation (CNV)**

Use to determine gene amplification or deletion events common in cancer genomics. The QuantStudio 5 calculates relative copy number compared to a reference gene.

- **Genotyping / SNP Discrimination**

Allelic discrimination assays using dual-labeled TaqMan probes allow researchers to distinguish single nucleotide polymorphisms (SNPs), which is valuable in pharmacogenomics and population genetics.

- **miRNA Quantification**

Using stem-loop RT-qPCR or TaqMan MicroRNA assays, researchers quantify microRNAs involved in post-transcriptional gene regulation, cancer biology, and biomarker discovery..

- **Forensic & Ancient DNA Research**

Its sensitivity and optimization features allow amplification of degraded or low-quantity DNA, making it useful in forensic science and paleogenomics (ancient DNA studies from archaeological specimens).

- **Epigenetics — Methylation Analysis**

Methylation-specific PCR (MSP-qPCR) following bisulfite conversion is used to study DNA methylation patterns in promoter regions

- **Drug/Therapy Response Studies**

Monitors changes in target gene expression following drug treatment, siRNA knockdown, CRISPR editing, or other interventions.

- **GMO Detection**

In food science and agricultural research, qPCR is used to screen for and quantify genetically modified sequences in food products.

- **Viral Load Monitoring**

In infectious disease research, it quantifies viral copies (HIV, HCV, SARS-CoV-2, CMV, etc.) in patient samples over time to assess disease progression or treatment efficacy.

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Qubit Fluorometer

The Qubit™ Fluorometer by Thermo Fisher Scientific is a compact fluorescence-based quantitation device that accurately measures DNA, RNA, and protein concentrations using target-specific fluorescent dyes. It delivers highly selective, sensitive results with small sample volumes, making it ideal for molecular biology and sequencing workflows.



Key Specifications

Parameter	Specifications
Instrument Type	Compact benchtop fluorometer for biomolecule quantitation.
Measurement Mode	Fluorescence-based quantitation using specific Qubit Assay Kits for DNA, RNA, and protein.
Display	5.7-inch color touchscreen for easy navigation and result viewing.
Excitation Sources	Blue (~470 nm) and red (~635 nm) LEDs for dual-wavelength excitation.
Detection	Photodiode detector with emission filters ~510–580 nm (green) and ~665–720 nm (red).
Dynamic Range	~5 orders of magnitude for broad concentration detection.
Warm-Up Time	Ready to measure in ~<35 seconds from power on.
Sample Handling	Holds one Qubit Assay Tube at a time.
Calibration	Standard 2- or 3-point calibration for accurate quantitation.
Data Storage	Stores up to ~1,000 sample results internally.
Interface/Connectivity	USB port for data export and software update.
Power	Universal input (100–240 V) for global use.
Dimensions & Weight	Compact footprint (~13.6 × 25 × 5.5 cm) and lightweight (~743 g).

Signature Features

- **Fluorescence-based quantitation:** Uses target-specific fluorescent dyes for highly accurate DNA, RNA, and protein measurement.
- **Dual-wavelength LEDs:** Blue and red LED light sources support multiple assay types.
- **Sensitive detection:** Photodiode detector with emission filters ensures precise readings across a wide range.
- **Touchscreen interface:** Intuitive color touchscreen simplifies operation and results viewing.
- **Fast measurements:** Quick warm-up and <1 min read times streamline workflows.
- **Wide dynamic range:** Detects concentrations over ~5 orders of magnitude.
- **Internal calibration:** Built-in calibration routines maintain measurement accuracy.
- **Compact design:** Small footprint and light weight make it lab-friendly.
- **Data storage & USB:** Stores results internally and exports data via USB.
- **Assay flexibility:** Compatible with a range of Qubit Assay Kits for diverse applications.

Research Applications

- **DNA Quantification:** Accurate measurement of double-stranded and single-stranded DNA for PCR, cloning, and NGS library preparation.
- **RNA Quantification:** Sensitive detection of RNA for transcriptomics, cDNA synthesis, and gene expression studies.
- **Protein Measurement:** Precise protein concentration determination for enzymatic assays, western blotting, and proteomics.
- **Low-Concentration Samples:** Ideal for detecting very small amounts of nucleic acids or proteins where spectrophotometers are insufficient.
- **Next-Generation Sequencing (NGS):** Ensures accurate input DNA/RNA quantitation for library prep, improving sequencing quality and reproducibility.
- **Molecular Biology Workflows:** Supports routine laboratory assays, cloning, and genetic research requiring precise biomolecule measurement.
- **Contaminated or Complex Samples:** Fluorescence-based specificity allows reliable quantitation even in samples with contaminants or other biomolecules.
- **High-Throughput Labs:** Streamlines quantitation in workflows requiring multiple samples with consistent, rapid results.

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ChemiDoc Go Gel Imager

The ChemiDoc™ Go Gel Imaging System developed by Bio-Rad Laboratories is an advanced gel documentation and imaging system designed for detection of nucleic acids, proteins, and chemiluminescent signals. The system enables high-resolution imaging of agarose and polyacrylamide gels stained with fluorescent or colorimetric dyes, making it an essential instrument in molecular biology and biochemical research workflows.



Key Specifications

Parameter	Specifications
Imaging Technique	Gel Documentation & Chemiluminescence Imaging
Detection Modes	UV, Visible, and Chemiluminescence
Camera Type	High-resolution scientific-grade CMOS camera
Illumination Sources	UV transillumination and LED light sources
Sample Compatibility	Agarose gels, PAGE gels, Western blots
Image Acquisition	Automated exposure control
Software Control	Integrated imaging and analysis software
Data Output	Digital image capture and quantitative analysis

Signature Features

- **High-Sensitivity Detection:** The system is capable of detecting low-abundance DNA, RNA, and protein bands using fluorescence or chemiluminescent substrates. This ensures accurate visualization of faint bands in gels and Western blots, supporting precise molecular analysis.

- **Automated Image Optimization:** It automatically adjusts exposure time, focus, and illumination settings to produce clear, high-contrast, and reproducible images. This minimizes manual intervention and enhances consistency across experiments.
- **Multiple Imaging Modes:** The instrument supports imaging of ethidium bromide- and SYBR-stained nucleic acids, Coomassie-stained protein gels, and chemiluminescent Western blot membranes. This versatility makes it suitable for diverse molecular biology applications.
- **User-Friendly Interface:** A touchscreen-based interface enables rapid image capture, processing, and analysis without complicated setup procedures. This simplifies operation for both teaching and research laboratories.
- **Safe Imaging Environment:** The closed imaging chamber design reduces user exposure to harmful UV radiation during gel visualization. This ensures safer laboratory practices while maintaining high-quality imaging performance.

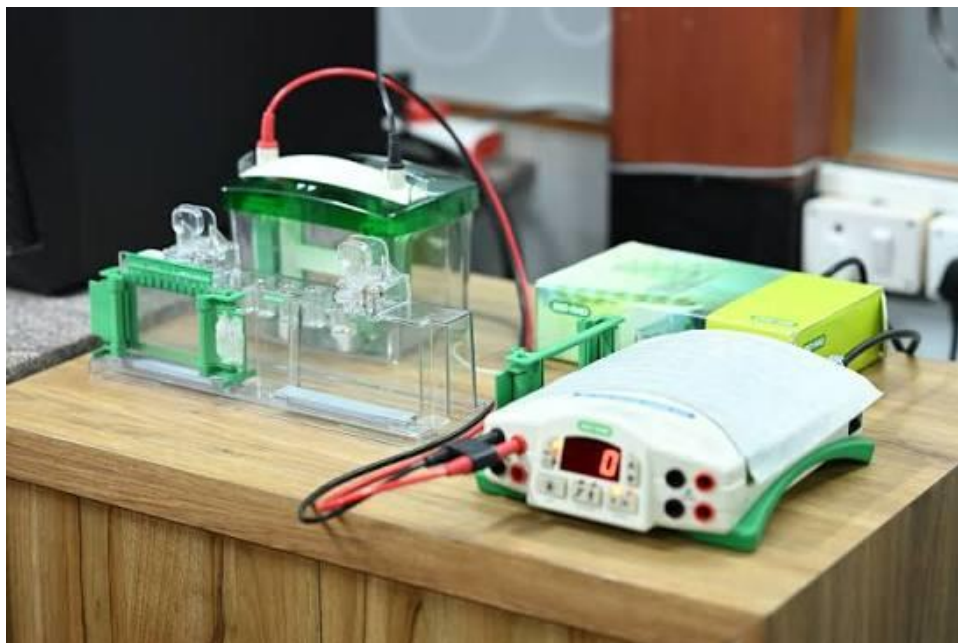
Research Applications

- **DNA and RNA Analysis:** The ChemiDoc™ Go Gel Imaging System enables clear visualization of PCR products following agarose gel electrophoresis using fluorescent dyes such as ethidium bromide or SYBR stains. It also supports nucleic acid quantification and precise band analysis through integrated densitometry software.
- **Protein Electrophoresis:** The ChemiDoc™ Go Gel Imaging System provides high-resolution imaging of SDS-PAGE and Native PAGE gels for analyzing protein separation patterns. This facilitates protein expression studies, purity assessment, and comparative analysis of samples.
- **Western Blot Analysis:** The ChemiDoc™ Go Gel Imaging System detects chemiluminescent protein bands with high sensitivity, enabling accurate immunoblot documentation. It supports quantitative analysis of protein expression levels in research and diagnostic applications.
- **Gene Expression Studies:** The ChemiDoc™ Go Gel Imaging System verifies amplified gene fragments and assists in confirming cloning results and genetic modifications. The system plays a vital role in molecular biology workflows, including gene expression and recombinant DNA studies.
- **Educational and Research Documentation:** The ChemiDoc™ Go Gel Imaging System allows secure archiving of experimental data and high-quality image export. Built-in quantitative densitometry tools enable accurate measurement and comparison of band intensities for research reporting.

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PROTEAN Tetra PAGE/ Blot with Mini Trans-Blot Module

*The **Mini-PROTEAN Tetra Cell with Mini Trans-Blot Module** is a combined vertical electrophoresis and wet transfer system designed for protein and nucleic acid analysis. In this integrated setup, the Mini-PROTEAN Tetra Cell performs high-resolution separation of samples by running 1–4 mini polyacrylamide gels simultaneously, enabling efficient SDS-PAGE or native PAGE separations. Once electrophoresis is complete, the **Mini Trans-Blot Module** attaches directly to the system to facilitate wet transfer of separated proteins from the gel onto membranes such as PVDF or nitrocellulose for downstream detection methods like Western blotting. This combination offers a seamless workflow from separation to transfer in a compact, reliable format ideal for research and teaching laboratories.*



Key Specifications

Gel Electrophoresis (Mini-PROTEAN Tetra Cell):

Parameter	Specifications
Gel Capacity	1–4 mini poly acrylamide gels run simultaneously.
Gel Size	Compatible with standard mini gel dimensions ($\sim 8.3\text{--}8.6 \times 6.4\text{--}6.8\text{ cm}$) and short glass plate formats.
Separation Types	Supports SDS-PAGE and native PAGE for proteins, as well as nucleic acid electrophoresis.
Buffer Volume	Typically, $\sim 700\text{--}1,000\text{ mL}$ depending on gel number.
Construction	Durable polycarbonate tank with secure gaskets to prevent leaks.

Protein Transfer (Mini Trans-Blot Module):

Parameter	Specifications
Transfer Format:	Wet transfer module that integrates with the electrophoresis system.
Blot Capacity	Holds up to 2 gels per transfer.
Maximum Blot Size	~10 × 7.5 cm per gel.
Electrode Configuration	Uniform wire electrodes spaced for efficient transfer.
Buffer Requirement	~450 mL transfer buffer.
Cooling Support:	Includes an integrated cooling pack to maintain efficient transfer.

Signature Features

- **Integrated Electrophoresis and Blotting System:** Combines vertical mini gel electrophoresis with a wet transfer module, enabling a smooth workflow from protein separation to membrane transfer for Western blotting.
- **Simultaneous Multi-Gel Capability:** Runs 1–4 mini polyacrylamide gels at a time, improving efficiency and allowing multiple samples or experimental conditions to be processed together.
- **High-Resolution Performance:** Delivers sharp and reproducible separation of proteins (SDS-PAGE or native PAGE) and supports effective transfer onto PVDF or nitrocellulose membranes.
- **Efficient Wet Transfer Module:** Accommodates up to two gels per transfer with uniform electric field distribution and cooling support to ensure consistent and reliable protein transfer.
- **Compact and User-Friendly Design:** Durable, space-saving construction with color-coded components simplifies assembly and reduces setup errors, making it suitable for research and teaching laboratories.

Research Applications

- **Protein Separation (SDS-PAGE & Native PAGE):** Used for high-resolution separation of proteins based on molecular weight (SDS-PAGE) or native structure (Native PAGE), enabling analysis of protein size, purity, and expression levels.
- **Western Blotting:** After electrophoretic separation, proteins are transferred onto PVDF or nitrocellulose membranes for immunodetection. This is widely used for protein identification, quantification, and validation of target proteins.
- **Gene and Expression Studies:** Supports analysis of protein expression patterns in different samples or experimental conditions, commonly applied in molecular biology, cell biology, and biotechnology research.

- **Recombinant Protein Analysis:** Used to evaluate expression and purification of recombinant proteins in cloning and genetic engineering experiments.
- **Clinical and Diagnostic Research:** Assists in detecting disease-related biomarkers and studying protein alterations in pathological conditions.

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Labman Ice Flaker

The Labman Ice Flaker is a compact laboratory device that produces clean, uniform ice flakes for rapid cooling of samples, reagents, and biological materials. Its flake ice is ideal for sensitive applications like histology, microbiology, and analytical experiments, providing fast cooling without excess water or temperature shock. Designed for benchtop use, it offers durable construction, easy operation, and efficient ice production to meet routine laboratory cooling needs.



Key Specifications

Parameter	Specifications
Ice Production Capacity	Up to 30 kg / 50 kg / 100 kg of flake ice per 24 hours (model dependent)
Ice Storage Capacity	Built-in bin holds approximately 7–25 kg of flake ice
Cooling System	Air-cooled refrigeration for efficient and reliable performance
Refrigerant	Environmentally friendly R290A refrigerant
Power Supply	220 V, 50/60 Hz AC input
Construction	Stainless steel body for durability and easy cleaning
Water Inlet	Standard 3/4-inch water supply connection
Noise Level	Quiet operation (typically ≤ 52 dB)
Control	Automatic microprocessor control with indicator lights for water/ice status
Dimensions & Weight	Compact benchtop footprint (varies by model size)

Signature Features

- **High Ice Output:** Produces a large quantity of clean, dry flake ice (e.g., 30 kg, 50 kg, or 100 kg per 24 hrs) to meet diverse laboratory cooling needs.
- **Uniform Flake Ice:** Generates soft, uniform flake ice that cools rapidly without damaging temperature-sensitive samples.
- **Automatic Operation:** Fully automatic ice production with microprocessor control and auto shut-off when storage is full.
- **Durable Construction:** Rugged stainless-steel body ensures corrosion resistance and long-term reliability in lab environments.
- **Efficient Cooling System:** Air-cooled refrigeration provides consistent performance with low maintenance requirements.
- **User-Friendly Controls:** Easy-to-operate interface with status indicators or displays for ice production and water level.
- **Low Noise & Energy Efficient:** Designed for quiet operation and optimized energy use, suitable for routine benchtop placement.
- **Safety Features:** Includes low water alarms and protective systems to prevent damage when water supply is insufficient.

Research Applications

- **Sample Cooling & Preservation:** Rapidly cools biological samples, reagents, enzymes, and specimens during preparation and transfer.
- **Histology & Pathology Labs:** Used to keep tissue samples and slides at consistent low temperatures during processing.
- **Microbiology & Cell Culture:** Maintains optimal temperature for culture handling, transport, and incubation steps.
- **Analytical Chemistry:** Provides chilled ice for assays, titrations, and reactions that require controlled low temperatures.
- **Clinical & Diagnostic Testing:** Supports procedures requiring cold storage such as blood serum separation and emergency sample cooling.
- **General Laboratory Support:** Serves as a convenient source of ice for labs in teaching, research, pharmaceutical, and industrial settings.