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Microbiology Internship Report

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# Internship at Mymensingh Medical College Hospital

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# Internship Report

**A report submitted to the**

**Department of Life Sciences**

For the partial fulfillment for the award of the degree of

**BACHELOR OF SCIENCE IN MICROBIOLOGY**


**By:**

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School of Environment and Life Sciences

Independent University, Bangladesh


**December 2025**

# DECLARATION

I hereby declare that the work presented in this internship report has not been submitted for any other degree or professional qualification, and that it is the result of my own independent work.

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# Statement of Approval

This internship report has been approved in partial fulfillment of the requirements for the award of the degree of B.Sc. in Microbiology.

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Furthermore, I am truly grateful to the administration and faculty of Independent University, Bangladesh (IUB) for providing the necessary resources, academic support, and a conducive learning environment.

A very special note of appreciation goes to Mymensingh Medical College Hospital for granting me the opportunity to conduct my internship within their institution. Their cooperation, access to facilities, and supportive environment significantly enriched my learning experience and practical understanding.

Lastly, I extend my sincere thanks to everyone who contributed to this internship, directly or indirectly. Your efforts, guidance, and encouragement have been greatly valued.

Thank you all for your unwavering support and dedication throughout this journey.

# Abstract

This internship was undertaken as a partial requirement for the Bachelor of Science in Microbiology and was completed at Mymensingh Medical College Hospital, where I gained practical exposure to real-world clinical and laboratory environments. The primary objective of this internship was to bridge theoretical knowledge with hands-on experience by observing and participating in routine diagnostic procedures, laboratory operations, sample handling, and data interpretation under professional supervision.

Throughout the internship, I had the opportunity to work closely with experienced medical technologists and faculty members, enabling me to understand the workflow of clinical microbiology, patient sample processing, infection detection methods, and laboratory safety practices.

This experience not only broadened my academic learning but also contributed to the development of essential professional skills such as communication, discipline, teamwork, and ethical responsibilities in patient-centered environments. Overall, the internship at Mymensingh Medical College Hospital served as a valuable foundation for my future career in microbiology and the broader health sector.

Keywords: Internship, Hospital, Microbiology, Laboratory, Culture

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# Chapter 1

## Introduction:

### 1.1 Overview of the Venue

I successfully completed my internship at Mymensingh Medical College Hospital (MMCH), a prestigious government medical facility situated in Mymensingh, Bangladesh. This hospital operates as both a teaching and tertiary care institution, delivering extensive medical, diagnostic, and laboratory services to a large number of patients each day (Directorate General of Health Services [DGHS], 2022). It is one of the most important healthcare providers in the northern part of Bangladesh, serving both urban and rural communities with high-quality healthcare and contemporary clinical practices.

As the teaching hospital affiliated with Mymensingh Medical College (MMC), it supports medical education, clinical training, and research initiatives for both undergraduate and postgraduate medical students. The environment here facilitates the integration of theoretical knowledge and practical application, ensuring that medical students, interns, and residents gain direct experience in patient care and laboratory diagnostics.

My internship took place in the Microbiology Department, which is vital in aiding clinical departments by delivering diagnostic microbiological evaluations, including bacterial cultures, antibiotic susceptibility tests, serological assays, and biochemical identification. This department is managed by highly trained faculty members, alongside skilled medical technologists who uphold strict quality control and biosafety standards throughout laboratory procedures.



**Figure 1: Mymensingh Medical College Hospital (MMCH)**

### 1.2 Facility and Infrastructure

Mymensingh Medical College Hospital comprises a well-developed infrastructure designed to meet the demands of modern medical education and healthcare services. The entire medical complex is divided into two main sections:

- The **College Building**, which accommodates the pre-clinical and para-clinical disciplines.
- The **Hospital Building**, which houses the clinical departments and patient-care units.

The hospital occupies an area of **approximately 58 acres of land**, with an **additional 5.7 acres** allocated for S. K. Hospital. The total capacity of MMCH is around **1,000 beds**, allowing it to serve thousands of patients from Mymensingh and neighboring districts(MMCH Administration, 2023). The **College campus** itself is situated in Charpara on a land area of **84 acres**, featuring a **four-storied building with 18,000 sq. m of floor**

**area**, which accommodates lecture halls, laboratories, libraries, faculty offices, and research facilities. The proximity of the college and hospital buildings ensures seamless coordination between academic instruction and clinical practice.

The **Bacteriology and Microbiology Laboratories** are equipped with state-of-the-art instruments such as **autoclaves, laminar-flow hoods, biosafety cabinets, centrifuges, incubators, analytical balances, and compound microscopes**. The laboratories adhere strictly to aseptic techniques, biosafety protocols, and waste-disposal standards as per national health guidelines. The environment is conducive to scientific learning, microbial culture handling, and diagnostic accuracy.

In addition to the laboratory facilities, the hospital features specialized units and departments, including **Medicine, Surgery, Pediatrics, Gynecology and Obstetrics, Cardiology, ENT, Neurology, Pathology, Radiology, and Anesthesiology**. Each department is staffed with **experienced clinicians, professors, residents, and technologists**, ensuring an integrated and multidisciplinary approach to healthcare.

### 1.3 Academic and Administrative Structure

Mymensingh Medical College and its hospital operate under the administrative supervision of the **Directorate General of Health Services (DGHS)**, Ministry of Health and Family Welfare, Government of Bangladesh. The academic programs are governed by the **University of Dhaka** and **BSMMU**, which ensure compliance with national and international medical-education standards.




**Figure 2: Entrance of Mymensingh Medical College Hospital**

The academic structure encompasses a diverse range of **departments**, including foundational disciplines such as **Anatomy, Physiology, Biochemistry, and Pharmacology**, as well as clinical specialties like **Medicine, Surgery, Gynecology, Pediatrics, Orthopedic Surgery, Ophthalmology, and Psychiatry(Mymensingh Medical College, 2022)**. The college also hosts specialized and subspecialty units such as **Cardiology, Endocrinology, Gastroenterology, Nephrology, Neonatology, Radiology and Imaging, Neurosurgery, and Urology**, promoting advanced medical practice and research.

To support academic collaboration and student welfare, the administrative offices, library, ICT center, student housing, and clinical training wards are positioned strategically.The library is well equipped with both printed and electronic resources, including medical journals, reference books, and online databases that support the academic and research needs of students and faculty. In addition to publishing scholarly journals and newsletters that encourage professional cooperation and lifelong learning among graduates, the college maintains a robust alumni network. Due to its longstanding dedication to healthcare delivery, research, and education, MMC and MMCH are among the most reputable medical facilities in Bangladesh.

# Chapter 2

## Portfolio of Work

### 2.1 Assigned Laboratory: Bacteriology Section

During my internship, I was assigned to the **Bacteriology Section** of the **Department of Microbiology** at **Mymensingh Medical College Hospital (MMCH)**. This section is responsible for the **isolation, identification, and characterization of pathogenic bacteria** from a wide variety of clinical samples, including urine, blood, stool, sputum, pus, and wound swabs.

The laboratory performs essential diagnostic tests such as:

- **Antibiotic Sensitivity and Susceptibility Testing (AST)**
- **Biochemical Identification Tests**
- **Minimum Inhibition Concentration (MIC)** determination
- **Minimum Bactericidal Concentration (MBC)** determination
- **Culture and inoculation of blood, urine, stool, sputum, and wound swabs**
- **Gram staining** and **acid-fast staining** for Mycobacterium species
- **Rotavirus detection** in children and adults
- **SDS-PAGE and Agarose Gel Electrophoresis** for protein and DNA analysis

The laboratory operates under strict aseptic and biosafety conditions, ensuring accurate and safe diagnostic work.

## 2.2 Machines and Equipment for Laboratory Testing

The Bacteriology Laboratory of MMCH is well-equipped with modern diagnostic instruments and analytical tools to support a wide range of microbiological procedures. The availability of advanced equipment enhances the accuracy, reproducibility, and efficiency of laboratory testing.

**Key laboratory instruments include:**

- Autoclave (for sterilization of media and instruments)
- Laminar Flow Cabinet (for aseptic handling and inoculation)
- Incubators (maintained at 37°C for bacterial growth)
- Biosafety Cabinets (for handling pathogenic microorganisms)
- Centrifuges (for sample processing and separation)
- Compound Microscopes (for Gram and acid-fast staining observations)
- Hot Air Oven (for drying and sterilization of glassware)
- Refrigerator and Deep Freezer (for media, reagent, and sample preservation)
- Analytical Balance (for precise weighing of reagents)
- Water Bath and Heating Block (for temperature-controlled reactions)
- Electrophoresis Unit (for SDS-PAGE and agarose gel electrophoresis)
- Vortex Mixer and Magnetic Stirrer (for homogenizing samples)
- pH Meter (for media preparation and adjustment)




(a) (b) (c)




(d) (e) (f)

**Figure 3: Machines and Equipment Used in the Bacteriology Laboratory.**

(a) Biosafety Cabinet(b) Blood Culture Lab(c) Incubator(d) Laminar Flow Cabinet

(e) Laboratory (f) TwinGuardUltra-Low Temperature Freezer

These instruments are routinely calibrated and maintained to ensure reliable results in both research and diagnostic testing. Proper training in the operation of each instrument is an essential part of laboratory practice, promoting biosafety and data accuracy.

## 2.3: Experiments — Procedures and Results

### 2.3.1 Antibiotic Sensitivity Testing (AST) — Kirby–Bauer Disc Diffusion

**Principle:** To determine bacterial susceptibility to antibiotics by measuring the zone of inhibition around antibiotic-impregnated discs on an agar plate, which correlates with the effectiveness of the drug (Bauer et al., 1966).

**Objective:** Determine susceptibility/resistance of bacterial isolates to antibiotics.

**Materials & Equipment:** Mueller–Hinton agar (MHA) plates, sterile cotton swabs, 0.5 McFarland turbidity standard, sterile saline, antibiotic discs, sterile forceps, incubator (37°C), ruler/zone reader, marker.

**Procedure (step-by-step):**

1. Confirm isolate purity by subculturing a single colony onto nutrient agar and incubate 18–24 h at 37°C.
2. Pick 3–5 morphologically similar colonies and suspend in 4–5 mL sterile saline.
3. Vortex and adjust turbidity to **0.5 McFarland** (compare visually).
4. Dip a sterile swab into the suspension, remove excess by pressing against tube wall.
5. Streak evenly over the surface of an MHA plate in three directions to ensure confluent lawn.
6. Allow plate surface to dry for 3–5 minutes.
7. Place antibiotic discs aseptically onto the agar using sterile forceps; press gently.
8. Incubate plates inverted at 37°C for 16–18 hours.
9. Measure diameter of zones of inhibition (mm) using a ruler or zone reader.
10. Interpret results (S/I/R) according to the latest **CLSI** breakpoints.

**Results / Observations:**

- Common organisms tested: Klebsiella pneumoniae, Acinetobacter spp., Pseudomonas aeruginosa, E. coli.
- Most Klebsiella and Acinetobacter isolates showed resistance to ampicillin and third-generation cephalosporins; variable response to aminoglycosides.
- Carbapenems (imipenem/meropenem) and colistin retained activity against several isolates, but some isolates exhibited reduced susceptibility consistent with MDR profiles.

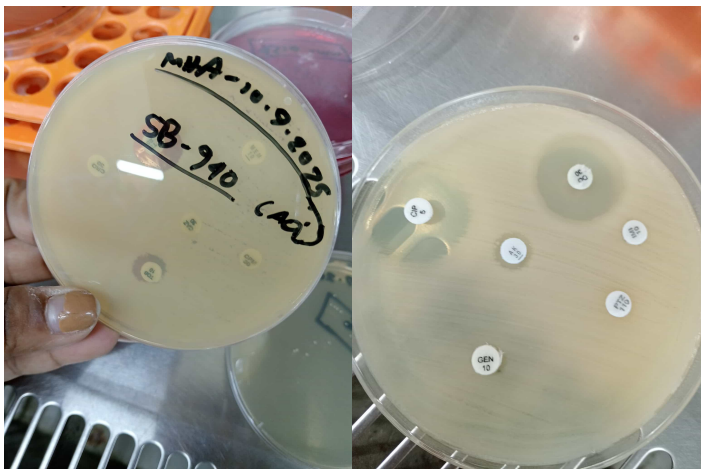



**Figure 4: Kirby–Bauer AST plate with measured zones**

### 2.3.2 Minimum Bactericidal Concentration (MBC)

**Principle:** To find the lowest concentration of an antibiotic that kills 99.9% of the initial bacterial inoculum, differentiating between bacteriostatic (inhibits growth) and bactericidal (kills) agents.

**Objective:** Determine the lowest antibiotic concentration that kills the test organism.

**Materials & Equipment:** Mueller–Hinton broth, sterile tubes, serial dilution setup, incubator (37°C), sterile nutrient agar plates.

**Procedure (step-by-step):**

1. Prepare serial two-fold dilutions of the antibiotic in Mueller–Hinton broth (e.g., 0.125–64 μg/mL).
2. Inoculate each dilution with standardized bacterial inoculum (final ≈ 5 × 10^5 CFU/mL).
3. Incubate tubes at 37°C for 16–20 h.
4. Identify tubes without visible turbidity.
5. From each turbidity-free tube, subculture 10 μL onto nutrient agar and incubate 24–48 h at 37°C.
6. The lowest antibiotic concentration showing **no growth** on subculture = **MBC**.

**Results / Observations:**

- MBC values corroborate AST results: isolates with high MIC/MBC corresponded to resistant phenotypes in AST.
- Several clinical Klebsiella isolates had MBCs indicating tolerance to certain β-lactams, reinforcing the need for higher-tier antibiotics.

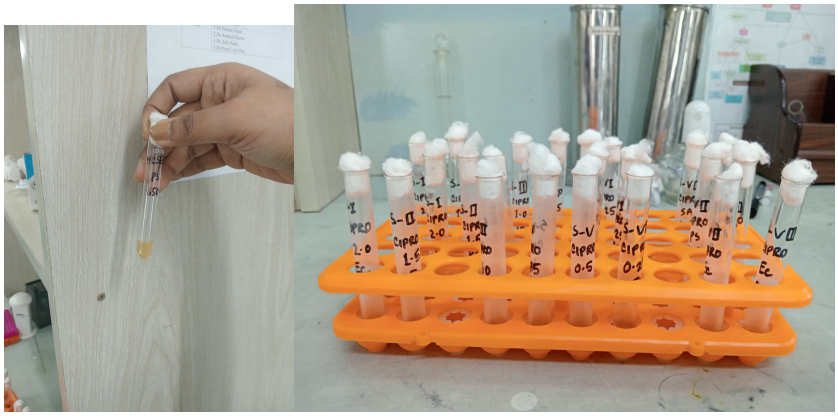


**Figure 5: Minimum Bactericidal Concentration (MBC)**

### 2.3.3 Biochemical Identification Tests

**Principle:** To identify bacteria based on their unique enzymatic activities and metabolic pathways, which are visualized through color changes in specific culture media (MacFaddin, 2000).

**Objective:** Identify bacteria to genus/species level using metabolic reactions.

**Materials & Tests:** Indole, Methyl Red (MR), Voges–Proskauer (VP), Citrate, Urease, Catalase, Oxidase, Triple Sugar Iron (TSI) slants, SIM or motility media.

**Procedure (step-by-step; typical protocol):**

1. Prepare and inoculate appropriate media with a single colony.
2. Incubate at 35–37°C for 18–24 h (or longer for some tests).
3. Add reagents as required (e.g., Kovac's for Indole; Barritt's reagents for VP).
4. Observe and record color changes, gas production, H2S formation, motility.

**Results / Observations:**

- Klebsiella pneumoniae: Indole (−), MR (−), VP (+), Citrate (+), Urease variable/weak (+), non-motile.
- E. coli: Indole (+), MR (+), VP (−), Citrate (−), motile.
- Pseudomonas aeruginosa: Oxidase (+), grows at 42°C, characteristic pigment production on some media.
- Acinetobacter spp.: Oxidase (−), catalase (+), non-motile, grows on nutrient agar as non-lactose fermenter/weak fermenter on MacConkey.



**Figure 6: Biochemical reaction tubes showing positive/negative results**

**2.3.4 Urine Culture (Quantitative / Calibrated Loop Method) and Sensitivity**

**Principle:** To semi-quantitatively culture urine to determine the number of bacteria per milliliter (CFU/mL), helping to distinguish between contamination, colonization, and true infection.

**Objective:** Detect and quantify uropathogens and perform susceptibility testing.

**Materials & Equipment:** CLED agar, MacConkey agar, blood agar, calibrated loop (0.01 mL), incubator.

**Procedure (step-by-step):**

1. Mix well and transfer urine sample with a calibrated loop onto agar plates (CLED/MacConkey).
2. Streak, incubate at 35–37°C for 18–24 h.
3. Count colonies: CFU/mL = colony count × 100 (for 0.01 mL loop).
4. Identify isolates via Gram stain and biochemical tests.
5. Perform AST on pure isolates.



**Figure 7: Urine Culture**

**Results / Observations:**

- Significant bacteriuria (>10^5 CFU/mL) commonly due to E. coli and Klebsiella pneumoniae.
- Sensitivity patterns: many isolates resistant to commonly prescribed oral antibiotics; carbapenem sensitivity noted in several strains.

### 2.3.5 Wound Swab and Pus Culture

**Principle:** To isolate and identify pathogenic microorganisms from wound infections to guide targeted antimicrobial therapy.

**Objective:** Isolate causative organisms from wound infections and determine antimicrobial susceptibility.

**Materials & Equipment:** Blood agar, MacConkey agar, nutrient agar, anaerobic media if required.

**Procedure (step-by-step):**

1. Collect swab from wound after cleaning superficial debris (if allowed clinically).
2. Streak onto blood and MacConkey agar plates.
3. Incubate aerobically (and anaerobically if indicated) at 35–37°C for 18–48 h.
4. Identify isolates (morphology, Gram stain, biochemical tests).
5. Perform AST.

**Results / Observations:**

- Frequently isolated: Pseudomonas aeruginosa, Klebsiella pneumoniae, E. coli, Staphylococcus aureus.
- Pseudomonas often multidrug-resistant, particularly in burn/wound center patients.

### 2.3.6 Sputum Culture

**Principle:** To identify the causative agents of lower respiratory tract infections by culturing expectorated sputum on selective and non-selective media.

**Objective:** Identify respiratory pathogens from expectorated sputum or tracheal aspirate.

**Materials & Equipment:** Blood agar, chocolate agar, MacConkey agar, sputum quality scoring (e.g., Bartlett's or Murray–Washington).

**Procedure (step-by-step):**

1. Assess sputum quality (reject saliva-dominated samples).
2. Streak onto blood/chocolate/MacConkey agar.
3. Incubate at 35–37°C (blood/chocolate in 5–10% CO2 for some pathogens).
4. Identify growth and perform AST.

**Results / Observations:**

- Klebsiella spp., Acinetobacter spp., Pseudomonas spp. commonly isolated from hospital-acquired LRTIs.
- Many isolates displayed resistance to multiple antibiotic classes.

**2.3.7 Stool Culture and Rotavirus Detection (Children & Adults)**

**Part A — Bacterial Stool Culture**

**Principle:** To isolate enteric bacterial pathogens (e.g., *Salmonella*, *Shigella*) using selective and differential media that inhibit normal flora and allow visual differentiation based on colony appearance.

**Objective:** Detect enteric bacterial pathogens.

**Materials & Equipment:** MacConkey agar, XLD agar, SS agar, enrichment broths.

**Procedure (step-by-step):**

1. Inoculate selective and differential media with stool sample.

2. Incubate 24–48 h at 35–37°C.
3. Identify suspicious colonies (e.g., lactose fermenters vs. non-fermenters) and confirm with biochemical tests.

**Results / Observations (bacterial):**

- E. coli as predominant isolate; occasional Salmonella/Shigella detected depending on clinical presentation.

**Part B — Rotavirus Antigen Detection (Children & Adults)**

**Principle:** To detect rotavirus-specific antigens in stool samples using enzyme immunoassay (EIA), which relies on antibody-antigen binding and an enzyme-linked colorimetric reaction (Dennehy, 2011).

**Objective:** Detect rotaviral antigen in stool specimens.

**Materials & Equipment:** Commercial ELISA/EIA or latex agglutination kits, positive and negative controls.

**Procedure (step-by-step):**

1. Prepare stool suspension as per kit instructions.
2. Pipette reagents and sample into wells (ELISA) or mixing pad (latex).
3. Incubate specified time and read results (color change or agglutination).
4. Record as positive/negative.

**Results / Observations (rotavirus):**

- Highest positivity seen in **children under five**, consistent with global epidemiology; sporadic positive results in adults (often milder disease or secondary exposure).



**Figure 8: Rotavirus EIA test wells**

### 2.3.8 Blood Culture

**Principle:** To detect and identify microorganisms circulating in the bloodstream (bacteremia) by incubating blood in enriched broth media that supports bacterial growth.

**Objective:** Detect bacteremia/septicemia organisms from blood samples.

**Materials & Equipment:** Blood culture bottles (aerobic/anaerobic), incubator (automated or manual), subculture media.

**Procedure (step-by-step):**

1. Aseptically collect blood (recommended volume by patient age) into culture bottles.
2. Incubate at 35–37°C; observe for turbidity/gas.
3. If automated system used, follow instrument prompts; otherwise blind subculture at 24–48 h onto blood/MacConkey agar.
4. Identify isolates and perform AST.

**Results / Observations:**

- Isolates included Staphylococcus aureus (including MRSA phenotypes in some samples) and Gram-negative rods like E. coli.
- Acid-fast Mycobacterium detection handled separately via smear/culture due to slow growth.



**Figure 9: Blood Culture**

### 2.3.9 Acid-Fast Staining — Ziehl–Neelsen (for Mycobacterium tuberculosis & M. leprae)

**Principle:** To differentiate acid-fast bacilli (e.g., *Mycobacterium tuberculosis*) from non-acid-fast organisms based on the high mycolic acid content in the bacterial cell wall, which retains the primary dye (carbol fuchsin) even after decolorization with acid-alcohol (Tortora et al., 2021).

**Objective:** Detect acid-fast bacilli (AFB).

**Materials & Reagents:**Carbol fuchsin, acid-alcohol (decolorizer), methylene blue (counterstain), Bunsen burner/heater.

**Procedure (step-by-step):**

1. Prepare thin smear from patient sample (sputum or skin scraping), air dry, and heat-fix.
2. Flood with carbol fuchsin and heat gently until steam appears (do not boil) for ~5 minutes (replenish stain if it evaporates).
3. Rinse with water.
4. Decolorize with 1% acid-alcohol for 1–2 minutes; rinse.
5. Counterstain with methylene blue for 30–60 seconds.
6. Rinse, dry, and examine under oil immersion (1000×).

**Results / Observations:**

- M. tuberculosis and M. leprae appear as **bright red slender bacilli** against a blue background.
- Sputum AFB positivity correlated with clinically suspected pulmonary TB cases. M. leprae detection primarily from skin lesion smears and histopathology; less commonly observed in routine bacteriology.

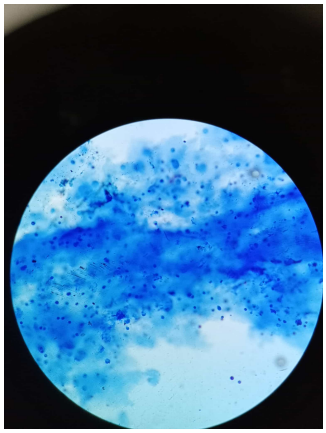


**Figure 10: Ziehl–Neelsen stained smear showing acid-fast bacilli.**

### 2.3.10 Tracheal Aspirate Analysis

**Objective:** Identify pathogens causing severe/ventilator-associated LRTIs.

**Procedure (step-by-step):**

1. Collect tracheal aspirate using sterile suction catheter into sterile container (as per ICU protocol).
2. Gram stain immediately to assess neutrophils and organisms.
3. Culture on blood/MacConkey agar; incubate and interpret.
4. Perform AST on significant isolates.

**Results / Observations:**

- Frequent recovery of Pseudomonas spp., Klebsiella spp., Acinetobacter spp. — organisms prone to hospital selection and MDR.
- Early Gram-stain guided empiric therapy until culture results available.

### 2.3.11 SDS–PAGE (Protein Profiling)

**Principle:** To identify pathogens in the lower respiratory tract of intubated or critically ill patients, aiding in the diagnosis of ventilator-associated pneumonia.

**Objective:** Separate and visualize bacterial proteins for comparative and research purposes.

**Materials & Equipment:** SDS sample buffer, polyacrylamide gels, electrophoresis apparatus, molecular weight markers, Coomassie Brilliant Blue stain.

**Procedure (step-by-step):**

1. Prepare bacterial cell lysates and quantify protein concentration.
2. Mix with SDS loading buffer; heat-denature at 95°C for 5 minutes.
3. Load samples and marker into wells.
4. Run electrophoresis at constant voltage until dye front reaches bottom.
5. Stain gel with Coomassie, destain, and document band patterns.

**Results / Observations:**

- Distinct banding patterns for M. tuberculosis isolates used to compare protein expression; useful for research investigations though not routine clinical identification.

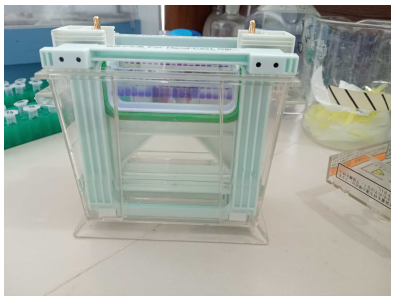


**Figure 11: SDS–PAGE gel with bacterial protein bands**

### 2.3.12 Agarose Gel Electrophoresis (DNA Analysis / PCR Product Verification)

**Principle:** To separate denatured proteins based on their molecular weight by applying an electric field through a polyacrylamide gel matrix, allowing for protein analysis and comparison (Laemmli, 1970).

**Objective:** Verify DNA extraction and PCR amplification products.

**Materials & Equipment:** Agarose powder, electrophoresis tank, DNA ladder, ethidium bromide or alternative stain, UV transilluminator.

**Procedure (step-by-step):**

1. Prepare agarose gel (0.8–2% depending on fragment size) and set combs.
2. Load DNA samples mixed with loading dye into wells.
3. Run at 80–120 V until separation achieved.
4. Visualize bands under UV and photograph.

**Results / Observations:**

- PCR amplicons from diagnostic or research assays appeared at expected sizes, confirming successful amplification/extraction. (Specific PCRs depend on departmental research; agarose gel used for QC.)

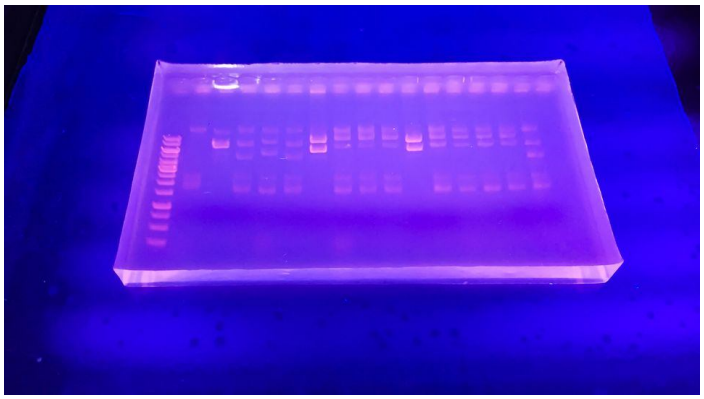


**Figure 12: Agarose Gel Electrophoresis**

**2.4. Consolidated Results Summary & Interpretation**

- **High prevalence of Gram-negative pathogens** (Klebsiella pneumoniae, Pseudomonas aeruginosa, Acinetobacter spp., E. coli) across urine, wound, sputum, and tracheal aspirates.
- **Multidrug resistance (MDR)** was a recurrent finding, particularly for Klebsiella and Acinetobacter, with many isolates resistant to common β-lactams and aminoglycosides; carbapenems and colistin remained effective for several isolates.

- **Blood cultures** identified both Gram-positive and Gram-negative organisms including Staphylococcus aureus; MRSA phenotype noted in some isolates.
- **Acid-fast bacilli detection** confirmed presence of M. tuberculosis in pulmonary specimens; M. leprae detection supported clinical diagnosis in dermatology/skin lesion cases.
- **Rotavirus antigen testing** positive predominantly in pediatric patients, consistent with typical epidemiology.
- **MBC and AST correlation** provided confirmatory quantitative susceptibility data for therapeutic guidance.
- **SDS–PAGE and agarose gel electrophoresis** were successfully used for laboratory research/confirmatory purposes (protein profiling and DNA/PCR verification).

### 2.5. Notes on Quality Control, Biosafety & Limitations

- **Quality control:** Control strains (e.g., E. coli ATCC 25922, S. aureus ATCC 25923) were included for AST validation where applicable. Biochemical and staining procedures used positive/negative controls routinely.
- **Biosafety:** All work conducted in laminar flow cabinets or under appropriate containment; AFB work followed enhanced safety and separate processing protocols.
- **Limitations:** Resource constraints sometimes limited molecular confirmation (e.g., routine PCR for all isolates). Occasional instrument downtime delayed turnaround for some tests.

# Chapter 3

## Personal Reflection:

This internship at the MMCH Bacteriology Department was a profoundly impactful period of professional and personal growth. It served as a critical bridge, connecting the theoretical knowledge acquired in academic settings with the practical, high-stakes environment of a clinical diagnostic laboratory. The leap from reading about bacterial colonies in a textbook to witnessing them bloom from a patient's sample was both intimidating and exhilarating, signifying my evolution from a student to a prospective practitioner. My most major learning outcome was the development of a rigorous, detail-oriented, and deeply responsible approach to laboratory work. Handling real patient samples—each tube representing aperson in distress—instilled in me a profound sense of duty.

I recognized that the correctness of my Gram stain, the precision of my dilution, and the precision of my dilution, and the clarity of my zone measurements directly influenced a physician's diagnosis and a patient's treatment outcome. Mastering aseptic technique was no longer just a procedural requirement to be checked off; it became a fundamental principle of ethics and safety, a crucial barrier against iatrogenic infection and cross-contamination that could compromise result integrity. Interpreting biochemical test results and antibiotic susceptibility profiles transformed from a memorization task into a dynamic diagnostic puzzle. Each test, from a simple catalase reaction to a complex antibiogram, became a piece of evidence, and I was the detective tasked with piecing it together to identify a pathogen and guide life-saving therapy.

Every day, I was confronted with the tough reality of antimicrobial resistance, or AMR. Seeing so many different kinds of bugs that were resistant to multiple drugs, especially Klebsiella pneumoniae and Acinetobacter baumannii, in all sorts of samples was a real-life lesson on this huge health problem. I'd read about AMR in books, but actually seeing a bug

that was resistant to everything, taken from an ICU patient, and knowing that it left doctors with very few treatment choices, was something else entirely. It made it super clear how important microbiology labs are in fighting antibiotic misuse. We weren't just collecting numbers; we were giving doctors the crucial information they needed to decide how to treat patients, which in turn helped stop antibiotics from being used incorrectly and kept our strongest drugs working for longer.

Furthermore, I gained a comprehensive understanding of the operational symphony of a high-throughput diagnostic lab. I learned the delicate art of prioritizing tests, managing time efficiently under pressure, and maintaining meticulous, traceable records. Collaborating with the seasoned laboratory technologists, consulting physicians, and fellow interns underscored the irreplaceable importance of clear communication and teamwork in a healthcare setting. A miscommunication here could have real consequences. While the laboratory was well-equipped for routine diagnostics, I also observed the challenges posed by resource constraints, which taught me to be resourceful, innovative, and to appreciate the power of sophisticated molecular techniques that, while often unavailable in routine settings, represent the future of rapid and precise diagnostics.

In conclusion, this internship solidified my passion for medical microbiology. It equipped me with indispensable technical skills, honed my critical thinking under real-world pressures, and gave me a realistic, grounded perspective on the immense challenges and profound rewards of working in clinical diagnostics. The experience has been invaluable in shaping my career aspirations, moving me beyond academic curiosity to a committed sense of purpose. I am confident that the lessons learned in responsibility, collaboration, and resilience will form an unshakable foundation for my future endeavors in this vital field.

# Chapter 4

## Conclusion:

Doing an internship at the Bacteriology Section in Mymensingh Medical College Hospital was a really hands-on and thorough experience. It was great because it helped me connect what I learned in books with what actually happens in clinical microbiology. I got to practice all sorts of important diagnostic steps, like figuring out what germs are growing, testing how well antibiotics work against them, and using special ways to see them under a microscope. Being so involved really helped me get good at lab skills, staying safe, looking at results, and making sure everything was accurate.

What was pretty striking and a bit worrying from my practical work was how common it was to find Gram-negative bacteria that weren't responding to many drugs. This matches what everyone's concerned about regarding antibiotic resistance, both here in Bangladesh and all over the world. It really hammered home how crucial the clinical microbiology lab is, not just for figuring out infections, but for helping doctors pick the right treatments and for the hospital to manage antibiotic use wisely. Seeing how a busy public hospital lab runs day-to-day also gave me a good feeling for how to manage tasks, work with different departments, and deal with the everyday difficulties you find when resources are stretched. It definitely made me feel more adaptable and practical.

Overall, the internship was an invaluable endeavor that significantly enhanced my technical proficiency and professional understanding. It has firmly prepared me for a future career in medical microbiology and public health, equipping me with the skills, perspective, and motivation necessary to contribute meaningfully to the healthcare sector.

**Future Goals and Aspirations**

Building upon this foundational experience, my career aspirations have crystallized into a clear pathway aimed at addressing the critical challenges I witnessed, particularly the scourge of AMR.

- **Short-Term Goals (0-2 years):** My immediate objective is to secure a position as a clinical microbiologist in a dynamic hospital setting. In this role, I aim to apply my skills diligently, ensuring the rapid and accurate diagnosis of infectious diseases. I am particularly driven to become an active member of an Antimicrobial Stewardship Program (ASP), where I can act as a bridge between the laboratory and clinicians, translating complex AST data into actionable therapeutic guidance.

- **Mid-Term Goals (3-5 years):** I plan to pursue a Master of Philosophy (M.Phil.) or MSc, focusing my research on the molecular epidemiology of multidrug-resistant Gram-negative pathogens. Understanding the genetic mechanisms and transmission dynamics of these organisms is crucial for developing effective containment strategies. Furthermore, I intend to gain expertise in advanced molecular diagnostics (e.g., PCR, Whole Genome Sequencing) to enhance my ability to investigate complex outbreaks and resistance patterns.

- **Long-Term Vision (5+ years):** Ultimately, I aspire to work at the intersection of clinical diagnostics, research, and public health policy. I aim to contribute to the development of national guidelines on AMR and infection prevention and control (IPC). I am also passionate about education and hope to mentor future microbiologists, fostering a new generation of scientists who are not only technically skilled but are also advocates for rational antibiotic use and equitable diagnostic services. Through this multifaceted approach, I hope to contribute to a more resilient and effective healthcare system for Bangladesh.

# Chapter 5

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