

Laboratories of Biomedical Sciences Department

1. Neuroscience Research Center

Dr. Mohammad Qneibi, Lab founder, and Principal Investigator will help the University to pursue vital research programs that try to comprehend how complex neural circuits are shaped and reshaped through the development of the brain. Dr. Qneibi's lab will contribute to global progress in brain science and establish the An-Najah University as one of the world's leading neuroscience centers. With outstanding faculty recruits, talented students, state-of-the-art equipment, and modern new facilities, the lab, together with established neuroscientists at the An-Najah University will have a significant role in generating significant intellectual home for cutting-edge Neuroscience research.

Moreover, An-Najah University will be the first institution in Palestine and even Arab universities to have a neuroscience lab that can investigate neurological diseases at the molecular level by using state-of-art techniques such as electrophysiology. Our future studies might represent novel therapeutic targets to treat various neurological disorders such as neurodegeneration, disorders of cognitive function, epilepsy, Parkinson's and psychiatric disorder.

Dr. Mohammad Qneibi's research will concern the membrane proteins on the cell surface. The activity of virtually every cell is regulated by extracellular signals, such as neurotransmitters, hormones, and sensory stimuli. These signals are transmitted into the cell interior via membrane receptor proteins. Understanding how these membrane proteins mediate signal transmission and transduction is the primary research interest in my laboratory. In particular, we are interested in the structure and function relationship, the kinetic and molecular mechanism of protein function by protein-protein and protein-drug interactions.

We also attempt to develop better inhibitor/potentiators to regulate membrane protein functions. In the long term, we hope that our research will provide not only insight into the mechanisms of action of these molecular machines but also clues for the design of molecular devices which can be used (i) for studying signal transduction pathways and (ii) as diagnostic/detection tools for disease treatment. We use an interdisciplinary approach in our research, including rapid kinetic techniques suitable for membrane proteins, biochemical and biophysical chemistry, molecular biology, electrophysiology, and neuroscience.

The research centers on glutamate ion channel receptors (GluRs). These receptors mediate synaptic neurotransmission and are indispensable in the brain activity, such

as memory and learning. Upon binding to glutamate, the glutamate receptor rapidly changes its conformation and opens its ion channel pore to allow small cations such as sodium ions to flow across the cellular membrane, thus transmitting an electrical signal between neurons. Because the receptor channel opens in the microsecond second-time region and desensitizes even in the millisecond (ms) time domain, a rapid kinetic technique must be used that not only has a sufficient time resolution but also is suitable for studying these channel proteins embedded in the membrane.

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We use a fast exchange solution (i.e., piezo device) technique, which permits glutamate to bind to the receptor with a time constant of $\sim 30 \mu\text{s}$. This technique, combined with electrophysiological recordings, serves as a unique functional tool so that we can investigate the mechanism of channel formation, inhibition, and regulation within the μs -to- ms time domain.

Major Laboratory Equipment:

Computers:

The laboratory has two personal and dedicated computers running standard software for document and data processing. We use pCalmp, IgorPro, and Prizm for electrophysiological. Data collection and analysis.

Microscopes:

- IX73 Olympus Inverted microscope: IX73 Olympus Inverted microscope frame for reflected and transmitted light observation with one deck for intermediate attachments.
- SZ51 Olympus Stereo-Microscope: SZ51 Stereo-Microscope zoom body with ESD capability, magnification range 0.8x - 4x.

Electrophysiology items from SUTTER:

- P-1000 pipette puller for electrode manufacturing,
- IPA (INTEGRATED PATCH AMPLIFIER),
- Micromanipulator (MPC325)- right-handed.

Perfusion systems from AutoMate Scientific, Inc.

- Fast Piezo Perfusion Switcher – Left Hand

Another laboratory equipment:

- Each working space is equipped with pipettors, vortexes, and single-speed centrifuges. The chemical station has regular and analytical scales, a pH meter, and temperature-controlled stirrers. We have one -20C freezers and 4C refrigerators, stationary and shaking variable temperature incubators (4-65°C), and centrifuge

2. Microbiology Lab

The student can learn to isolate, develop and discover many harmful and isolated bacteria from many places in addition to learning the methods of diagnosis of bacteria through chemical tests for bacteria.

Major Laboratory Equipment:

- **Sterilizer (Autoclave)**
Is a pressure tank made of metal designed to heat water solutions above their boiling points at the atmospheric pressure to sterilize.
- **Incubator**
Is a device used to develop microbial colonies by providing a temperature, humidity and an appropriate amount of oxygen to grow
- **Microscopes**
A device to enlarge the small objects that cannot be seen with the naked eye or to show the precise details of the objects in order to discover their composition and study and is used to examine the slices of bacteria after dyeing
- **Balance**
A device to measure the weights of the special materials necessary to prepare the various media used for the development of bacteria and the preparation of dyes
- **Hot Plate**

A device used to heat and move media and pigments while preparing to help dissolve them.

- **Centrifuge**

A device to separate particles from solution according to their size, shape, density, viscosity of medium velocity and dizziness in solution

- **Fridge**

- **Various Media**

- **Water Bath**

3. Physiology Lab

The objective of the laboratory is to enhance the relationship between theoretical and applied materials. In order to achieve this, the laboratory has provided many devices and tools that enrich the teaching process and increase the student's ability to conduct scientific experiments related to theoretical material. Where the student can learn how to examine the physiological functions of different organs of the body and learn how to take some vital signs of the body **such as:**

- Measuring respiratory function
- ECG and its analysis
- Measuring blood pressure in several settings
- Perform various blood tests such as bleeding time, volume of cells stacked, total blood count, and blood scan
- Perform a glucose tolerance test
- Training students to perform parts of the clinical examination of the nervous system

Major Laboratory Equipment:

- **Sphygmomanometer**

Is a mercurial device used to measure blood pressure

- **ECG (Electrocardiograph ECG)**

It records the electrical planning of the heart and the electrical activity of the heart, in addition to the calculation of the heartbeat.

- **Glucose Meter**

Is a medical device for the approximate examination of blood glucose

- **Complete Blood Count CBC**

Is a routine examination to take a complete picture of blood, which helps in the diagnosis of many diseases, especially blood diseases

- **Capillary Centrifuge (Capillary Centrifuge)**

A device to separate blood components when placed in special capillary tubes

- **Centrifuge**

A device to separate particles from a solution according to their size, shape, density, viscosity of medium velocity and dizziness in a solution, is used to separate the blood components in addition to separating the deposits in the urine

- **Microscopes**

A device to enlarge the small objects that can not be seen with the naked eye or to show the precise details of things in order to discover their composition and study, and is used to see the blood slides in addition to urine test strips.

- **Balance**

- **Hot Plate**

4. **Pathology Lab**

The laboratory aims to connect the theoretical material to the process by teaching students how to examine the real tissue of the various organs in the laboratory in addition to the examination of slides of cases under the microscope to be able to diagnose diseases related to different body systems.

Major Laboratory Equipment:

- Fume Hood: Is a device designed to reduce exposure to hazardous or harmful vapors, or dust.
- A number of composite microscopes
- microscope with a camera
- Anatomy Instruments

5. **Anatomy Lab**

The student learns how to apply the theoretical material to the anatomy of the organs using plastic models for all members of the various body organs

Major Laboratory Equipment:

- Plastic models of all body organs, skeletons, muscles and external and internal organs