Electron Microscopy Research Department
Theodor Bilharz Research Institute
Ministry of Higher Education & Scientific Research

There can hardly be a disease or pathological process where electron microscopy has not added new details or improved our understanding to existing

The Electron Microscopy Research Department is one of the departments of the Clinical Laboratory Research Division of Theodor Bilharz Research Institute which is affiliated to the Ministry of Higher Education & Scientific Research. This department is one of the first centers in Egypt specialized in using Electron Microscopy in research and diagnosis of diseases. This Electron Microscopy Research Department is unique in having an assembly of qualified specialized staff in most of the medical laboratory fields: pathology, hematology, microbiology and clinical chemistry. Most of them got training in well known international centers in Europe and USA. The department tackles in an integrated approach the ultrastructure study of the diseases of special interest for the institute and which constitute the core of its mission. It works focus on the diseases affecting the liver, the gastrointestinal and the urinary tracts, mainly as result of schistosomiasis and viral hepatitis. The main goal of the department is to add new details, findings, and improve our understanding to existing disease knowledge. Moreover, innovate procedures for easy sample processing. The Electron Microscopy Research Department cooperates with all TBRI departments, many national and international Universities and research Institutions to conduct advanced and profound research focusing on the early subcellular changes accompanying hepatic infections, fibrosis, malignant transformation as well as regeneration after stem cell transplantation. Recently, the Department succeeded to implement a memorandum of agreement with the Electron microscopy Platform of Mossakowski Medical Research Centre, Polish Academy of Sciences, as well as a memorandum of understanding with the Department of Electron Microscopy Molecular Pathology, The Cyprus Institute of Neurology and Genetics. The Department plans to become a center of excellence in ultrastructural research in the region.

May 2018

❖ Staff, assistant and co-assistant staff members

Prof. Dr. Nagwa Abdel El Khalek Elkhafif *Prof. of Hematology and current Head of the Department.*

Prof. Dr.Nawal ElBadrawy *Prof. of Tropical Medicine .(Founder & former Head of the Department (1979-1994).*

Prof. Dr. Soheir Saiid Mansy. *Prof. of Pathology.((Head of the Dept.1994-2006 then 2013-2014) and former Deputy of Clinical Laboratory Research Division 2006-2013) She contributed to the foundation of the department and played a pivotal role in its development.*

Prof. Dr. Hoda Ahmed Yehia*. Prof. of Pathology. (Former Head of the Department 2006-2010).*

Prof. Dr. Lobna Youssef Ghanam *Prof. of Haematology. (Former Head of the Department 2010-2013).*

Prof. Dr. Abeya Abd El Maguid Lotfi *Prof. of Haematology.*

Prof. Dr. Amira Helmi Mohamed*. Prof. of Haematology.*

Dr. Magda Azmy Moussa*. Associate Prof. of Microbiology.*

Dr.Ayat SalahElDin Mohammed*. Researcher of Clinical Pathology.*

Dr. Moshira Ali Badawy *Researcher of Microbiology.*

Dr. Sara Tawfik *Researcher of Pathology.*

Dr. May Mostafa Osman. *Assist. Lecturer of Pathology.*

Dr. Alia Adel Salah ElDin. *Assist. Researcher of Pathology.*

Dr. Rania ElSheikh *Assist. Researcher of Pathology.*

Dr.Omar Mohammed Helmy.*Assist.Researcher of Clinical Pathology.*

Dr. Ehab Osama *Assist.Researcher of Pathology*

Dr. Fatma Elzahraa Mahmoud *Assist.Researcher inMicrobiology*

Dr. Asmaa Eid Mohamoud *Assist.Researcher in Haematology*

Dr. ***Alaa Osama Ahmed*** *Assist.Researcher in Haematology*

Mr. Walid Mohamed *Technical Specialist*

Ms. Sahar Abbas *Technician*

Ms. Wafaa Rezk *Technician*

Ms. Shaimaa Sayed *Technician*

Mr. Saied Abdel Salam Awaad *Secretary*

Mrs. Neamat Ahmed Aly *Secretary*

❖ Department constitution:

The department includes:

- *Room for sample processing*
- *Room for doing semithin and ultrathin sections*
- *Rooms for the electron microscopes (scanning and transmission)*
- *Dark room for photos development*

❖ Equipment:

The department includes the following equipment and facilities:

- *Philips Transmission Electron Microscope EM208S*
- *CCD Camera and set of cell image analysis.*
- *Philips Scanning Electron Microscope*
- *Ultramicrotome : Leica Ultracut R.*
- *Ultramicrotome: LKB Broma 8800 Ultratome III.*

- *Cryoultramicrotome*
- *Knifemaker: Leica EM KMR2.*
- *Knifemaker: LKB 7800.*
- *Equipment for developing photos*
- *Enlarger: Beseler 45V-XL.*
- *Drier: DEVAPPA 3200.*
- *Developing set.*
- *9-Midi MACS for cell separation*
- *10-Other facilities: Incubators, water bath, centrifuge Rotofix, refrigerator, computers, air conditioned rooms.*

❖ **The Techniques performed in the department are:**

Conventional technique for electron microscopy

Immunohistochemistry of tissue sections and cells.

Immunofluorescence

Immunoelectron Labeling

Innovated Agarose Cell Block technique for processing of cytological samples (innovated by Mansy 2004).

Negative staining for microorganisms

Nanoparticles examination

❖ **Fields of Interest**

- ***Application of electron microscopy in research***

concerning basic medical sciences (pathology, haematology, clinical chemistry, parasitology, and microbiology).

- Pathological diagnosis of human specimens (tissue, blood, body fluids) at an ultrastructural level, specially specimens concerning the liver, gastrointestinal tract, urinary system and muscle.

❖ Medical Services

- Ultrastructure examination and diagnosis of different types of specimens sent from TBRI hospital or referred from other hospitals or private clinics.

❖ Training and internships attended by the staff, assistant and co- assistant staff members of the department in international centers:

Training in France

- ***Training at the Liver Pathology & Electron Microscopy Department at Pasteur Institute,Lyon, France April- July*** *1982.*
- *Training on the techniques of conventional and immuno-electron microscopy and training on blood cells separation techniques, at Pasteur Institute, Lyon, France. Nov. 1983 - Feb. 1984*
- *Training on blood cells separation and processing for electron microscopy and conventional and immunoelectron microscopy techniques, at Pasteur Institute Lyon, France, January - March, 1984.*

Training in United States of America

Training on the techniques of electron microscopy, image analysis & morphometry of liver cells and in situ hybridization at the Pathology Dept. Michigan University. USA, May – Aug. 1996

Training in United Kingdom

Training on In situ hybridization , multicolor fluorescence, spectral imaging, DNA expression arrays, and automated kinetic mode of molecular morphology at University of York, U.K. September 9-11, 2000.

Training in the Netherlands

Training on EM 208-S transmission electron microscope and image analysis software SIS-2 at Philips-FEI Center of Electron Microscopy, Eindhoven, the Netherlands in March 2001.

Training in Germany

- Advanced training in the field of electron microscopy at Bonn, Federal Republic of Germany, Nov. 1976 – June 1978.

-Training on cell culture, FISH & Comet Assay at BGFA in Bochum, Germany, Aug. - Sept. 1999.

-Training on stem cell isolation and culture at BGFA in Bochum, Germany, October 2003 and February 2004.

Training in Austria

- Training on preparation of semithin and ultrathin sections for electron microscopy at Leica Ultramicrotomy Center, Vienna, Austria, Feb – March 2001.

-Training program on cryosectioning ultramicrotomy for TEM sample preparation at LEICA company, Austria in July 2012.

Training in Poland

-Training on hepatocyte culture at Mossakowski Medical Research Center, Department of Surgical Research& Transplantology, Polish Academy of Sciences, Poland in 2011

Fellowship at *center for engineering in Medicine department of surgery Massachusetts General Hospital ,* ***Harvad Medical School USA***

❖ Scientific and technological experience

- ***The application and use of immunoelectron labeling and***

molecular biological techniques for diagnosis and research purposes.

- ***Experience in the ultrastructure diagnosis of liver, kidney, muscle and haematological diseases.***

- ***The department has good experience concerning the pathological and immunological ultrastructural changes occurring in blood cells, liver, urinary and gastrointestinal tract secondary to schistosoma infection and some endemic diseases especially viral hepatitis and their complications.***

- ***Study of carcinomatous changes at an ultrastructural level.***

- ***Special experience in early detection of bladder carcinoma through ultrastructure examination of exfoliated urothelial cells in voided urine samples.***

- ***Ultrastructure identification and study of micro-organisms intracellularly and in culture.***

- ***Study of some endemic parasites especially schistosoma worms and detection of the effect of anti parasitic drugs and immunological changes that affect them due to host immune response.***

- ***Evaluating efficacy and toxicity of newly discovered drugs on the liver, kidney, bone marrow and other important systems in experimental models and ultrastructural assessment of pathological changes of therapeutic regimens on human body organs whenever needed.***

- ***Planning experimental animal designs for research work.***

❖ Titles of done or running projects

- ***Hepatic fibrosis (1983-1989). Financed by the Academy of Scientific Research and Technology.***

- ***Effect of repeated infection with Schistosoma mansoni and repeated treatment with praziquantel on worms and liver of infected mice. (1992-1997). Financed by the Academy of Scientific Research and Technology.***

- ***Evaluation of colchicine with or without praziquantel in control of murine Schistosomal hepatic fibrosis (1992-1995). Financed by the Ministry of Health and United State Agency for International Development (USAID).***

- ***Immunohistopathological and electron microscopic study of urinary bladder schistosomiasis. Theodor Bilharz Research Institute (TBRI) (1991-1994). Financed by TBRI***

- ***Evaluation of a new long acting Somatostatin analogue "Octreotide" on hepatic fibrosis and vascular changes in***

Schistosoma mansoni infection (1995-1997). Financed by USAID and the Egyptian Ministry of Health.

- ***Ultrastructural study of the effect of chemotherapeutic agents Praziquantel and Propranolol on liver vasculature in albino mice infected with Schistosoma mansoni (1995-1997). Financed by TBRI***

- ***Ultrastructural and serological evaluation of the effect of pentoxifylline and anti-TGF β on hepatic fibrosis in murine schistosomiasis (1998-2001).Financed by TBRI.***

- ***Laboratory protocol for the investigation of urinary bladder carcinoma on top of Schistosomiasis (2000-2004).Financed by TBRI***

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- ***New modalities in the diagnosis, prognosis and therapy of chronic liver diseases and their complications (2000-2005) Financed by TBRI.***

- ***Endothelin-1 production by mononuclear cells in portal hypertensive patients (2003-2005).Financed by TBRI.***

- ***Study of hemopoietic stem cells in chronic liver disease (2005-2007).Financed by TBRI.***

- ***Stem cell therapy in hepatic disease (2005-2007).Financed by TBRI.***

- ***Role of Hepatic stellate cell, myofibroblast and fibroblast in hepatic fibrosis on top of hepatitis C Virus infection : an ultrastructural and immunohistochemical study (2010-2013). Financed by*** STDF

- ***Electron microscopic and time kill study of the effect of linezolid alone and combined with other antibiotics on methicillin-resistant staphylococcus (2011-2013). Financed by TBRI***

- ***Modulatory effect of stem cell microenvironment of injured liver tissue on extrinsically administered stem cells (2012-2015). Financed by TBRI***

- ***Ultrastructural Study of Mitochondrial Changes in Relation to Carbamoyl Phosphate Synthetase 1 in Different Stages of Hepatitis C Virus Infection (2013-2016). Financed by TBRI***
- ***Impact of occult hepatitis B and C viral infection on the development of hepatocellular carcinoma (2013-2016) Financed by TBRI***
- ***Biofilm on endotracheal tubes (2013-2016). Financed by TBRI***

❖ Training & Scientific Consultation Services:

- Organization of bi-annual training courses in May and November for university graduates and post graduate candidates

-Excellent facilities for training on conventional and immunoelectron microscopy techniques.

- *The department gives the opportunity of two scholarships every two years for the fulfillment of M.Sc. in the field of ultrastructure pathology , haematology and microbiology.*
- *The department performs scientific consultations to internal and external researchers concerning specimen manipulation, processing and diagnosis.*

❖ Innovated technique

Mansy S.S.(2004)Agarose cell block Innovated technique for the processing of urine cytology for electron microscopy examination. ultrastructural pathology,28 : 15-21

*Sediment is resuspended in 1 ml of urine and transferred into an eppendorf tube.

*Centrifuged for 7 min and supernatant is discarded.

*Sedimented exfoliated urothelial cell is fixed in 4% buffered glutaraldehyde for 1 h.

The sediment is resuspended in 1 ml 2-1.3% agarose at 50oC

- **Recentrifuged for 7 min at 1500 rpm.**
- **Refregirated at 4oC for 30 min.**

The solidified agarose cell block is taken off

The conical part is divided longitudinally into halves.

Half is refixed in formalin and processed for preparation of paraffin block.

Half sectioned into tiny pieces and refixed in buffered 4% glutaraldehyde for 2 h

Address

Theodor Bilharz Research Institute. Imbaba Giza P.O. Box 30, Postal Code : 12411 Egypt.
Office phone : +(202) 35401019 + (202)35427640
Office Fax : (+202) 35408125 - (+202) 35406656
E-Mail : electrolab@tbri.gov.eg