



# 2018 RESEARCH REPORT

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مستشفى الملك فيصل التخصصي ومركز الأبحاث  
King Faisal Specialist Hospital & Research Centre  
مؤسسة عامة Gen. Org.



Our mission is to be a centre of excellence in biomedical research.

We are dedicated to the advancement of science and the translation of  
research findings into better healthcare.

We strive to provide an environment that enhances individual growth,  
collaboration, achievement and recognition.



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## A message from the Chief Executive Officer

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**Majid Alfayyadh, MD, MMM**  
Chief Executive Officer

The vision of King Faisal Specialist Hospital & Research Centre (KFSH&RC) is to advance medical research, innovation and technology. For several years, the Research Centre has consistently maintained a higher than average number of citations per paper worldwide, showcasing the dedication, efforts, and significant contributions of our scientists to biomedical knowledge worldwide and cementing our positive local and global reputation. In addition, these and the latest research findings will be critical in both KFSH&RC's Strategy and the Kingdom's 2030 Vision.

The many significant achievements within the Research Centre include those within the biomedical fields of the following: oncology, genetics, hereditary diseases, infectious diseases, cell and molecular biology, cardiovascular, transplantation, metabolic diseases, biomedical physics and radiation medicine, and radiopharmaceutical production. These achievements are particularly notable for advancing precision and personalized medicine. In fact, talented researchers at KFSH&RC have successfully conceived, developed, and implemented new diagnostic and treatment opportunities that have already resulted in real-life diagnostic platforms.

The accomplishments of the Research Centre make up a big part of the overall achievements of the Institution. This annual report showcases such capabilities and success; I thank the entire team who has meticulously worked on its content and design, and commend the outstanding efforts of the scientists, students, and staff and look forward to the Research Centre's continued success.





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## A message from the Executive Director

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**Ali S. Al-Zahrani, MD**  
Executive Director

As the newly appointed Executive Director of the Research Centre, I'm delighted to present the 2018 Research Annual Report. This Research Annual Report documents our achievements in 2018 and our continued efforts to contribute to the field of medical and scientific research towards achieving the vision of the King Faisal Specialist Hospital and Research Centre: "To be a world leader in healthcare through excellence and innovation."

The Research Centre has and is continuing to carry out high level medical and scientific research based on the research priority areas of the Hospital, i.e. cancer, heart disease, blood vessels, diabetes, environmental health, infectious disease, stem cell therapy, and genetics. In 2018, a total of 469 papers were published in various prestigious scientific journals by the scientific and clinical staff of the Organization with a total of 241 approved research proposals, 21.5 citations per paper, 9 filed patent requests and 3 granted patents. No doubt these efforts and future research plans will contribute to the advancement of science and the development of clinical practice, which will ultimately benefit patients.

I take this opportunity to thank all for their relentless efforts, contribution, dedication and commitment for making 2018 yet another remarkable year for research in King Faisal Specialist Hospital and Research Centre amidst the transformation process, and I would like to thank especially Dr. Sultan T. Al Sedairy, the former Executive Director, Research Centre for his valuable contribution to the development and success of the Research Centre and its staff during his tenure.

During 2018, apart from core research activities, the Research Centre has successfully made progress in its three Corporate Transformation Initiatives by the participating Research Centre Departments, namely; Genetics, Biomedical Physics and Cyclotron and Radiopharmaceuticals through the Corporate Transformation Office of the Organization. The three initiatives are: Clinical Genomics, Integrated Biomedical Physics Center and Emerging Radiopharmaceuticals Production for Delivering Precision Medicine. It is envisaged that these initiatives will be completed and operational by 2020/21. These major Transformation Projects will significantly contribute to innovative and better patient care.

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To expedite the research management process, the Research Centre will be launching a comprehensive online 'Research Information Management System (RIMS)' by CONVERIS through the Office of Research Affairs (ORA). The system will enable the research community, the Research Centre Management and Hospital Administration to explore the research productivity and achievements.

In alignment with the Corporate Strategic Plan: Vision 2022, several initiatives to improve the productivity of the Research Centre are planned for the current/upcoming year. Focus of these initiatives are: research capacity building, training and education and process improvement. Some of these initiatives will commence in 2019, while others will start in early 2020. It is anticipated that all initiatives will be completed/implemented by the end of 2021.

Excellence in research is achieved through strong research collaborations. Thus, in the coming year, the Research Centre will focus on establishing/augmenting research collaborations within and outside the country.

Research and innovation go hand in hand. As such, the Research Centre will focus on boosting an innovative culture where young researchers will be given the opportunity to actively engage in research, increase the senior scientists pool and create synergies between scientists and clinicians to perform more patient-centered research. In addition, to minimize the gap of skilled clinical research coordinators and research laboratory technicians in the Organization as well as the Kingdom of Saudi Arabia, we plan to provide well structured training and education opportunities to the younger generation to acquire necessary knowledge, skills and abilities in clinical research coordination and research laboratory technology.

I invite you to take a look at our accomplishments in 2018 and our plan for the current/upcoming year. I hope you enjoy reading this report.



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# **THE RESEARCH CENTRE**



# BIOMEDICAL PHYSICS DEPARTMENT

The Department had elicited great productivity and significant achievements during the year 2018, through its leading initiatives of delivering the highest standards of clinical services, research, consultations and continuing education in support of providing safe and quality patient care. We have started our clinical radiotherapy services for the King Abdullah Centre of Liver Diseases (KACO&LD) and continued to play a major role for the success of radiotherapy patient treatments and diagnostic imaging procedures through implementation of advanced techniques, and maintaining a radiation-safe environment for all KFSH&RC personnel, patients and the general public through our radiation safety programs. We continue to aim at upgrading our services through collaborations with recognized clinical and research departments and organizations and implement innovative approaches in line with international standards to achieve the best outcomes for our patients and to secure KFSH&RC position as one of the leading institutions nationally and internationally in the field of health care.

The implementation of our approved transformation project titled: "Integrated Biomedical Physics Center: Delivery of Precision", Sub-initiative #31, is proceeding remarkably. It is aimed at providing our institution with delivery of precision medicine in various fields of radiological specialties: diagnosis, treatment and radiation safety. The integrated Center will improve the quality, safety and cost effectiveness of radiation healthcare services, in collaboration with inter- and intra-institutional stakeholders. The various components of the integrated Center will not only have a significant impact in improving the quality, safety and cost effectiveness of radiation healthcare services, it will also place the Organization in a position where it will become self-sufficient with regards to some essential radiation services.

Moreover, the Department had also sustained its income producing activities through the services provided to over 100 institutions on a fee-for-service basis.

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#### CHAIRMAN

BELAL MOFTAH, PhD, FCCPM

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#### DEPUTY CHAIRMAN

REFAAT AL-MAZROU, MSc, FIPEM

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#### ADMIN

DENA ALASSAILAN, BSc  
RACHELLE ANNE BANTIQUE, BSN, RN  
HANAN SHETAYA, BSc  
REEM SULTAN, BSc  
JOSEPHINE VERIDIANO, BSc  
MOHAMMED A. MOHAMMED, BSc

## CLINICAL, RESEARCH, CONTINUING EDUCATION AND SUPPORT SERVICE ACHIEVEMENTS

- Key role of our Radiation Oncology Physics team in the effective and safe clinical utilization of the major radiotherapy treatment modalities for cancer patients at KFSH&RC.
- Major role in several critical projects for KACO&LD a related to radiological (radiology and radiotherapy) equipment procurement, shielding designs and acceptance testing and commissioning of state-of-the-art radiotherapy machines.
- Treatment of first-ever patient in the Middle East of Stereotactic Body Radiotherapy (SBRT) and High Dose Rate Brachytherapy (HDR).
- Awarding of Certificate for the Redesignation of KFSH&RC as the IAEA Collaborating Centre. The establishment of this collaborating center made KFSH&RC the first healthcare institution to become an IAEA collaborating center in the region.
- Implementation of the 37 million approved transformation project sub-initiative #31 titled "Integrated Biomedical Physics Center: Delivery of Precision Radiation Medicine" geared toward the establishment of the Integrated Biomedical Physics Centre - Delivery of Precision Radiation Medicine. Components are as follows: (a) Radiotherapy Treatment Planning and Consultation Center; (b) National Centre for Radiation Dosimetry/National Biodosimetry Laboratory; (c) Medical 3D Printing Core Facility; (d) Center for Functional Neuroimaging (CfN)".
- Implementation of the first "IAEA/ARASIA Regional Residency Training Program for Medical Physicists in Radiation Oncology" at KFSH&RC. Three IAEA sponsored residents completed the training program. Five other residents have been accepted into the program.
- Implementation of IAEA approved Nuclear Medicine Residency Program for Medical Physics professionals at KFSH&RC. This is a collaborative project among KFSH&RC, K.A. CARE and IAEA and one of its kind in the region. Three Saudi residents have been accepted into this program.
- Accreditation of our radiation physics procedures, machine output and the American RTOG protocols by the Radiological Physics Center of M.D. Anderson Cancer Center.
- Renewal of authorized regulatory agency (K.A.CARE) practice licenses for KFSH&RC for the year 2018 to import radioactive materials for (1) Radiotherapy, (2) Nuclear Medicine, (3) Gamma Facility including for Cs-137 for the Blood Bank irradiator, (4) Secondary Standard Dosimetry Lab for the Cesium-137 and Cobalt-60 sources, (5) XRad 320 Biological Irradiator, (6) Radiation Shielding Surveying, (7) Researches Using Radioactive Materials, (8) Cyclotron Machines (9) Transportation of Radiation Materials, and (10) Training of Radiation Safety Officers.
- Participation of the Thermoluminescent Dosimetry Lab in regional intercomparison exercise organized by the IAEA for the purpose of harmonizing radiation dosimetry practices within the region.
- Major upgrade of the Secondary Standard Dosimetry Laboratory (SSDL) which will allow our SSDL facility to continue to play a major role in providing secondary standard calibration across the Kingdom since our facility is the only facility in the Kingdom that is part of the IAEA/WHO Network for Secondary Standard Dosimetry Calibration laboratories. The SSDL Co-60 radiotherapy calibration facility is the first of its kind in the Gulf region. Our services are utilized by over two hundred clients throughout the Kingdom, some of which are from governmental agencies and others are from private sector.

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- Passing of the IAEA & MD Anderson (IROC) TLD/OSL irradiation as part of the annual external audit program for all of our radiotherapy clinical modalities.
  - Our experts contributed to testing the IAEA/AAPM small field dosimetry Code of Practice by collecting data from our state-of-the-art radiotherapy machines (TrueBeam linacs, Tomotherapy, CyberKnife).
  - Scientists showed that cervical cancer in Saudi Arabia is between the lowest in the region and that the incidence displays two peaks at around 43 and 61 years of age corresponding to social and cultural factors that may differ with other countries.
  - Development of novel pre-surgical mapping Arabic paradigms for functional MRI to be used clinically as a replacement of the WADA-test.
  - Development and testing of 3D gel dosimetry technique using optical laser scanner. This technique will allow specific patient quality assurance for radiation therapy patients.
  - Provided critical sterilization of bone grafts for the KFSH&RC Bone Bank, saving millions of Saudi Riyals.
  - Supervision of four master's degree students and 2 PhD students. Orientation of students of the food processing and preservation (352) course, twice a year as a part of the academic course, College of Food & Agriculture Sciences. Training of students (two from Al Faisal University and another two from King Saud University) one month each.
  - Provision of Biomedical Physics services including Thermoluminescent Dosimetry (TLD) radiation monitoring, equipment calibration and gamma sterilization for requests inside and outside KFSH&RC. A total of 27,115 personnel TLD badges were monitored during this year in addition to 800 leak tests. 4,580 Gamma sterilizations were completed by the Gamma Irradiation Facility. Calibration of 684 Survey meters, 170 Pocket dosimeters and 8 radiotherapy ionization chambers, irradiation of 7395 TLDs (personal dosimeters). We have processed more than 1400 external job orders (invoices, contracts and price quotations) for TLD monitoring, calibration and gamma irradiation services for over 300 clients.

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## OTHER ACHIEVEMENTS

- Organization and hosting of the 2018 International Conference on Radiation Medicine, [www.radmed.org](http://www.radmed.org). It was participated by more than 100 national and international speakers and attended by about 2,500 health professionals in and outside the kingdom. A total of 200 lectures were delivered and 55 workshops were conducted.
- Organization of Radiation Safety Officer Courses (4 courses per year) (30 CME hours each). Each course is attended by 30-60 participants. The course is licensed by KA CARE.
- Organized the 1<sup>st</sup> Medical Response to Radiation Emergencies Training Course in the Kingdom. A 1-week theoretical and practical activities with 28 lectures given by 12 speakers, 4 workshops and Radiation Emergency Drill. Delivered to employees of Ministry of Health that was attended by 50 Emergency Physicians, Radiologists, Medical Physicists and Radiation Safety Officers.
- Established the first cytogenetic biodosimetry laboratory in the region to estimate radiation doses received in cases of radiation overexposure.
- Acceptances testing and commissioning of 8 new radiation machines in KACOLD; 4 therapy machines (2 Tomotherapy and 2 Elekta linacs) + 5 imaging machines (2 Philips CTs, 1 Varian simulator, 1 Siemens PET/CT and 1 Philips MR scanner).
- Transfer of the 3D printing technology into clinical use with the HDR brachytherapy service as well as for the physics QA procedures.
- Radiation Knowledge Initiative: Administered and managed the 2018 International Radiotherapy Plan competition, which included five competitions in planning, 1770 participants from 97 countries.
- Radiation Knowledge was nominated as a finalist in the 2018 AAPM annual meeting as the one of best five international educational initiatives in the field of medical physics.
- Implementation of Calibration service for diagnostic Radiology with an overall uncertainty of 6 % with a recognized traceability to the IAEA. This service is presently the only one in the Gulf region.

## PUBLICATIONS

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- Appraisal of Mechanisms of Radioprotection and Therapeutic Approaches of Radiation Countermeasures. Krishna Mishra, Belal Moftah, Ghazi Alsbeih. *Biomed Pharmacother.* 2018 Jul 3;106:610-617. Doi: 10.1016/j.biopha.2018.06.150. PMID: 29990850.
- Ghazi Alsbeih. Exploring the causes of the low incidence of cervical cancer in Western Asia. *Asian Pac J Cancer Prev.* 2018 Jun 25;19(6):1425-1429.
- Alotaibi MA, Alsuhaibani ES and Alsbeih GA. Assessment of *In vitro* X-Ray Radiation Overexposure by Cytokinesis-Block Micronucleus Assay in Human Peripheral Blood Lymphocytes (HPBLs) in Saudi Population. *Cell Mol Biol* 2018, Vol 64(1): 148. DOI: 10.4172/1165-158X.1000148.
- Joanna Tobiasz, Najla Al-Harbi, Sara Bin Judia, Salma Majid, Ghazi Alsbeih, Joanna Polanska. Are Radiosensitive and Regular Response Cells Homogeneous in their Correlations Between Copy Number State and Surviving Fraction After Irradiation? I. Rojas and F. Ortuño (Eds.) IWBBIO 2018, LNBI 10813, pp. 197-208, January 2018. DOI: 10.1007/978-3-319-78723-7\_17. In conference proceeding book of the: 6<sup>th</sup> International Work-Conference on Bioinformatics and Biomedical Engineering (IWBBIO2018). Granada, Spain. 25-27 April 2018.
- S. A.Tijani, Salahuddin M. Kamala, Y. Al-Hadeethi, Mehenna Arib, M.A. Hussein, S.Wageh and L.A.Dim “Radiation shielding properties of transparent erbium zinc tellurite glass system determined at medical diagnostic energies”. *Journal of Alloys and Compounds.* Volume 741, 15 April 2018, Pages 293-299.
- István Csete, Paula Toroi, Andreas Steuer, Costas Hourdakos, Frantisek Gabris, Sibusiso Jozela, Antti Kosunen, João Cardoso, Vladimir Sochor, Linda Persson, Denis Glavič Cindro, Mehenna Arib and Mark Smekhov. “IAEA-SSDL bilateral comparisons for diagnostic level air kerma measurement standards”. *Physica Medica.* Volume 47 (2018), 9–15.
- Wolfgang Lechner, Paulina Wesolowska, Godfrey Azangwe, Mehenna Arib, Victor Gabriel Leandro Alves, Luo Suming, Daniela Ekendahl, Wojciech Bulski, José Luis Alonso Samper, Vinatha Panyam, Siri Srimanoroth, Milan Tomsej, Mikko Tenhunen, Stephen Kry, David Followill, Dietmar Georg, Julie Povall, David I. Thwaites and Joanna Izewska. “A multinational audit of small field output factors calculated by treatment planning systems used in radiotherapy”. *Physics & Imaging in Radiation Oncology.* Accepted for publication in Feb. 2018.
- *Journal of Gastrointestinal Cancer.* “Stereotactic Body Radiation Therapy (SBRT) Using CyberKnife in Oligometastatic Cancer Patients; Retrospective Evaluation, Single Institution Experience.” DOI: <https://doi.org/10.1007/s12029-018-0170-8>. Abdullah Alsuhaibani, Ahmed Elashwah, Abdullah Alkafi, Camelia Constantinescu and Faisal Alzorkany.
- *Journal of Applied Clinical Medical Physics.* “Quality assurance of Cyberknife robotic stereotactic radiosurgery using an angularly independent silicon detector”. DOI: 10.1002/acm2.12496. Sultan Alhujaili, Giordano Biasi, Faisal Alzorkany, Garry Grogan, Muhammed Al Kafi Jonathan Lane, Benjamin Hug, Abdullah Aldosari Sami Alshaikh, Pejman Farzad, Martin Ebert, Belal Moftah, Anatoly Rosenfeld, Marco Petasecca.
- *Radiation Physics and Chemistry* (2018) 149 90-10, “Physics elements of an algorithm for brachytherapy dose calculation in homogenous media for Ir192 source”.. <https://doi.org/10.1016/j.radphyschem.2018.04.004>. Eshraq Ababneh, Saed Dababneh, Shada Wadi-Ramahi, Jamal Sharaf.





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## BUSINESS OFFICE

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### BUSINESS COORDINATOR

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AHMED MASAWI, MSc

### MEMBERS

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Hanan Shetaya, BSc

Mohammed A. Mohammed, BSc

Lamia Alsahli, BSc

The mandate of the Business Office of the Biomedical Physics Department is to manage the business transactions on behalf of the sections that act as service providers to clients. There are over 300 clients which the business office deals with for the personal dosimeter, calibration and Gamma Irradiation services.

The Biomedical Physics Department offers various physics services to internal and external clients. Currently, all the transactions with the clients and the respective sections are managed by the Business Office manually. For that, and in order to automate the process associated with the Business Office; a team from the Department is working side to side with an external vendor to create special software which will facilitate and improve the efficiency and accuracy of transactions between the concerned sections, the clients and the business office. The software will also play a vital role in fulfilling the ISO 17025 quality management requirements.

## ACHIEVEMENTS

- In 2018, the Business office has processed over 820 service request for various services. Over 530 invoices were issued to reflect the charges associated with the services provided by the department. Around 55 new price quotations and contracts were issued to potential/ existing clients.
- The overdue amounts from invoices issued prior to 2018 were pursued and most clients are responsive and payments are being collected.
- The Business Office has also been involved in the planning and implementation of the Biomedical Physics Department Transformational initiative project.

### BUSINESS OFFICE DAILY OPERATIONS

<b>Customers Quesries B</b>	Phone calls - Fax - Email
	Personal visit
	Transferred by: Secretary, Sections Heads, Department Staff and the Chairman
<b>Queries About</b>	Biomedical Physics Department Services
	Price quotations
	Invoices
	Devices/ Items Status
<b>Daily Activity</b>	Checking the SRF with the Items by counting TLDs / devices (serial number / Model) / Other
	Log all information in the receiving log sheet
	Send to and receiving the items from the each BPD sections
	Payment follow up

## CLINICAL DOSIMETRY AND TREATMENT PLANNING UNIT

### HEAD

NAZER, GHADEER BSc, CMD

### MEMBERS

Abdulmajeed, Jazleen, BSc  
AlGhamdi, Huda, BSc  
AlQahtani Khaled, BSc  
Alsomali, Afrah, BSc  
Hassad, Osama, BSc, CMD  
Helmi, Arwa, BSc  
Safar, Wedyan, BSc, CMD

2018 has continued to follow the 2017 pattern of increasing planning volumes and more overall complexity in planning in the Clinical Dosimetry and Treatment Planning Unit (CDTPU). With new technologies we are able to treat more advanced cancer than in the past but it requires more planning time to achieve an optimum plan. There is an increase in the number of treatment plans primarily in Tomotherapy and Rapid Arc - our most labor intensive and highly technical techniques. This is good for the patient population but difficult for the limited number of qualified dosimetrists we have for planning.

One of our senior dosimetrists (Mrs. Wedyan Safar) has resigned this reporting year. The transfer of one senior dosimetrist (Ms. Noor Ghassal) from KFSH&RC-Jeddah to our department is in process to aid the staff shortage of the unit. We are utilizing physics staff to assist in the treatment planning section for the short term.

We plan to increase the number of qualified medical dosimetrists. We need to look not only at appropriate recruitment package but retention plans. Promotion of two section staff members is in process.

In addition, there will be as great deal of training and change as we move into the new King Abdullah Cancer Center and Liver Diseases (KACO&LD).

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## CLINICAL, RESEARCH, CONTINUING EDUCATION AND SUPPORT SERVICE ACHIEVEMENTS

- We continue to provide training in clinical dosimetry and have engaged the University of Southern Illinois, USA to assist in providing the education required for the Medical Dosimetry Certification Board– the only internationally recognized medical dosimetry certification.
- The Dosimetry staff continues to teach treatment planning to physics undergraduate and graduate students from different universities within the Kingdom and also to individuals from ARASIA member-countries.
- We also continue to work as a greater team with our Radiation Physics Section colleagues to provide mutual training in the different areas related to clinical dosimetry.
- We have streamlined processes and adjusted time frames for start of radiation treatment to allow staff the necessary time to create optimal radiation treatment plans. This was an important step to maintain safety and offer the best outcome for the patients.

### CORE SERVICE ACTIVITIES

ACTIVITIES	YEAR 2018
Monitor Unit (MU) Calculation/2-Dimensional Contour	0
Total Body Irradiation (TBI) Calculation	88
3-Dimensional CT Treatment Planning	1464
Electron Cut-out Measurement	64
Intensity Modulated Radiation Therapy (IMRT)	4
RapidArc	605
Tomotherapy	330
CyberKnife	115
TLD Dosimetry	18
Intraoperative	54
High Dose-Rate (HDR) Brachytherapy	73
Low Dose-Rate (LDR) Brachytherapy	0
Clinical Consultation	150
<b>TOTAL PROCEDURES</b>	<b>2965</b>
<b>PATIENTS</b>	<b>1300</b>
<b>MANHOURS</b>	<b>14,560</b>

\* Manhours calculated by taking the average number of Dosimetrists/Medical Physicists on duty(7) working on the above procedures for an average of 40 hours per week for 52 weeks of the year. This figure approximately accounts for Annual Leave, Over-time and also the limited times when we have a lull in patients numbers (Eid, etc).



## GAMMA IRRADIATION FACILITY

### HEAD

AKRAM AL-MOUSSA, MSC

### MEMBERS

Saad Bin-Jamaan, BSc  
Jonathan Antonio

The Gamma Irradiation Facility (GIF) is one of the core facilities of the Biomedical Physics Department in the Research Centre. The Facility is ISO 9001-2000 certified. It operates with three primary goals, namely: (1) to sterilize health care products for the needs of the KFSH&RC departments, and to provide this service commercially to health care products manufacturers all over the Kingdom; (2) to transfer radiation-processing technology to the country encouraging new industries; and (3) to provide a high activity radioactive source for variety of research projects.

The Gamma Irradiation Facility has continued to provide sterilization services for the Hospital departments and other institutions on a fee for service basis. Sterilization of different items such as pharmaceuticals for Tabuk Company and Riyadh Pharma Company and some frequent customers, such as National Guard Hospital. The staff of the facility is trying to develop the facility services to follow the latest technology and stay in competition with new very fast irradiators. New product can be manufactured here in the KFSH&RC if we achieve the new technology development, which is the hydrogel wound dressing; a special composition for the hydrogel was developed in GIF laboratory.

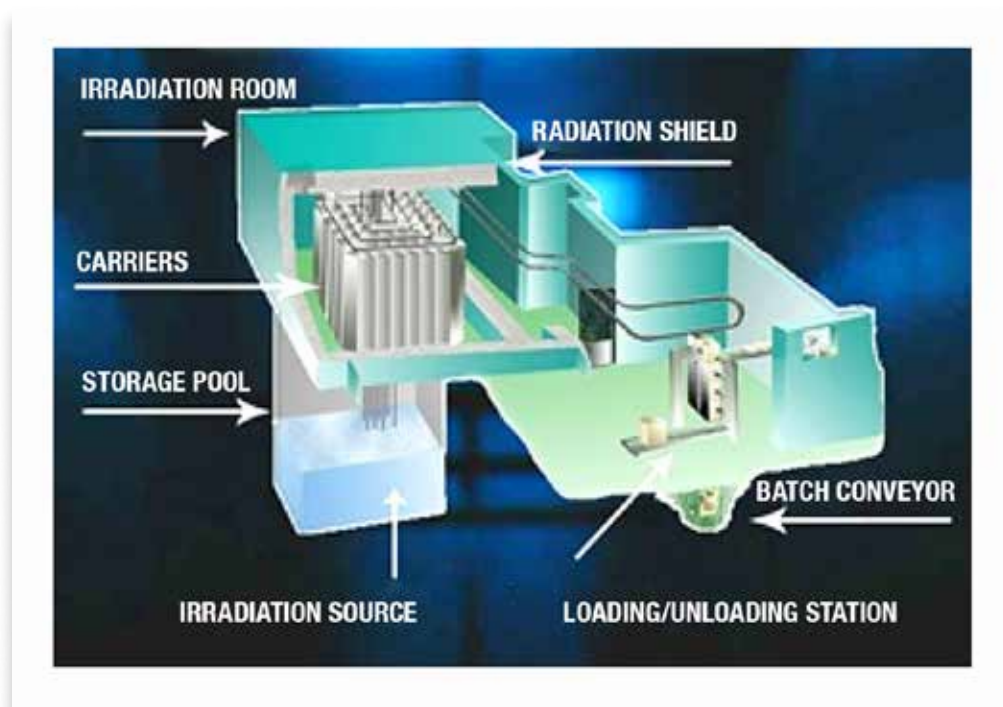
GIF is working on new project for replacement of the radioactive source installed in 2002 and has 14 years old with electron beam technology will help in increasing the services of the facility and its income to the hospital and open the door for new health care technologies such as the Antibacterial Hydrogel Burn and Wound Dressings and fabrication of human corneal endothelial cell sheets on temperature-responsive culture dishes.

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## CLINICAL, RESEARCH, CONTINUING EDUCATION AND SUPPORT SERVICE ACHIEVEMENTS

- Continued to provide sterilization for hospital needs (Bone bank, Cell Biology, Comparison medicine and supplies of ART laboratory and biomedical research section).
- The visit of the GIF twice a year is fixed to be a part of academic course 352 تغذت, college of food science and agriculture, King Saud University.
- Renewal of ISO certification, auditing is going successfully without any major or minor comment, to keep always highest standards (this procedure has to be done annually and regularly otherwise we lose our ISO certificate).
- Dosimetry laboratory in GIF is working in cooperation with KACST on development of the 3 D Gel compositions. Upgrade of the laser scanner for the 3 D Gel is done. The new updated system will allow putting the 3 D gel verification system on the service for the KFSH&RC and other institutes that are using radiation therapy but they don't have the laser scanner and the 3 D technology.
- Visitors of the KFSH&RC visiting the facility every year, since it could be the only facility in the world attached to a hospital.
- GIF is working on new project for replacement of the radioactive source installed in 2002 and has 14 years old with electron beam technology will help in increasing the services of the facility and its income to the hospital and open the door for new health care technologies such as the Antibacterial Hydrogel Burn and Wound Dressings and fabrication of human corneal endothelial cell sheets on temperature-responsive culture dishes.
- The Facility has one of the best dosimetry laboratories in the region with annual inter-comparison program with National laboratory of RISO, DENMARK. We calibrate the Gamma Cells in KACST and they request our help in radiation dosimetry from time to time.







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## HEALTH PHYSICS SECTION

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### HEAD

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FAREED MAHYOUB, MSC.,  
MIPEM

### MEMBERS

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Noor Aleidan, BSc  
Ibrahim Al-Gain, MSc, MIPEM  
Shaima Alshora, BS  
Celestino S. Lagarde, BSc  
Sarah Alhazani, BSc

The Health Physics Section is committed to its mission of limiting the risks of exposures to patients, staff and members of the public. It is recognized by the International Atomic Energy Agency (IAEA) as a center for training in radiation protection and measurement. Its personnel radiation dose monitoring service is accredited by IAEA, thus meeting the international high standards for radiation protection. The Section maintains a thermoluminescent dosimetry (TLD) Laboratory that is licensed by the King Abdullah City for Atomic and Renewable Energy (KACARE) making it the only laboratory in the Kingdom to meet national regulatory requirements. Leak tests for private companies were also provided by the section.

The table below summarizes the accomplishments made by the Health Physics team for year 2018 in providing services to the KFSH&RC, to other facilities in the Kingdom of Saudi Arabia and neighboring countries.

Task Descriptions	Quantity
No. of radiation workers monitored for occupational doses	6,995
No. of personnel radiation monitoring performed	27,115
No. of Radiation workers monitored for occupational doses using the new OSL machine	60
Patients surveyed for radiation level	275
Patients rooms surveyed for radiation level	275
Patients rooms decontaminated	275
Leak test for sealed sources and radiation producing equipment	991
TLD badges irradiated for quality control of TLD readers of outside facilities	45
Internal TLD badges irradiated for quality control of TLD readers and users	6935
Consultative advice provided	15
Training courses & educational lectures provided	30
Training of section staff for the new OSL machine	2

## IMAGING PHYSICS SECTION

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### HEAD

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OMER DEMIRKAYA, PHD,  
DABSNM

### MEMBERS

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Refaat Y. Al-Mazrou, MSc,  
FIPEM  
Omar Mohamed Noor, MASc

During 2018, the Imaging Physics Section has sustained the provision of clinical medical physics services to the departments of Radiology, OR, Dentistry, Cath Lab and Radiotherapy of the KFSH&RC (Riyadh); the department of Radiology of the King Fahad National Children's Cancer Centre & Research (KFNCCC&R), Royal Palace satellite clinics and mobile vans. Imaging modalities served by our staff include: general digital radiography (DR), portable conventional and digital radiography, bone densitometry, conventional and digital fluoroscopy, angiography, conventional and digital mammography, cath lab, dental x-ray, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, positron emission tomography (PET)/CT and gamma camera and SPECT/CT systems.

Furthermore, our clinical services include consultation on new imaging applications, dose tracking in ionizing diagnostic imaging modalities such as CT and digital radiography, and shielding calculations for new imaging suites.

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## CLINICAL, RESEARCH, CONTINUING EDUCATION AND SUPPORT SERVICE ACHIEVEMENTS

- Most of the clinical services provided fall under the broad category of imaging equipment acquisition, implementation and proper operation. The process starts with request for proposal (RFP) preparation for the purchase of diagnostic imaging equipment and ending with implementation of a technologist-oriented quality control monitoring program supervised by a medical physicist. Maintenance of many of our quality control programs
- Section staff continue to perform (depending on the modality being tested) quarterly, semi-annual and/or annual testing, calibrations of imaging equipment and support devices such as dose calibrators, evaluating and implementing new imaging technologies, assisting with clinical trials, and performing patient radiation exposure/image quality optimizations.
- The amount of the clinical work has increased significantly with the purchase of new imaging equipment in the department of Radiology and in the KACOLD, the new Emergency Medical Services (EMS) and in the main hospital. In the past year, we have also performed the shielding calculations and verifications for a number of the new imaging suites in the EMS and the main hospital.
- The section staff contributed significantly for the successful hosting of the ICRM2018 and were actively contributed towards the preparation of the '2019 Radiation in Medicine Symposium and Workshops'
- There are three residents under training in the newly established residency program in Nuclear Medicine Physics in collaboration with the International Atomic Energy Agency (IAEA).
- The section staff has been contributing to the training of the Nuclear Medicine fellows and Radiology Residents in Riyadh by giving several lectures; The section staff has been contributing to the Radiation Safety Officer training course given to the radiation workers in the Kingdom.
- Participation in the Medical Physics and Radiation Safety Workshop, in Kuwait.

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## OTHER RESEARCH ACHIEVEMENTS

Project Title: Oncological applications of F-18 Fluorocholine PET/CT; a prospective study to evaluate its role in patients' management

Co-Investigator: Omer Demirkaya

- This project is a KACST funded project (RAC# 2151003) in which a new tracer, F-18 Fluorocholine, will be used in cancer patients. This is a prospective study to investigate the role of the tracer in patient management. We are currently collecting patients and analyzing patient data. We have several specific aims two which are: 1) to optimize the FCH injected activity and scan time which requires a multi-reader clinical study and 2) to compare the FCH uptake in diseased and normal liver and correlate the uptake in the diseased liver with the CHILD and MELD scores.





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## MOLECULAR AND FUNCTIONAL IMAGING

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### HEAD

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RAFAT MOHTASIB, PHD

### MEMBERS

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Ahmed Masawi, MSc

Aman Jobeir, MSc

Lamia AlSahli, BSc

The Molecular and Functional Imaging (MFI) group has pursued both intramural and extramural funding in congruence with its strategic plan.

We have an approved transformation project titled: “Integrated Biomedical Physics Centre: Delivery of Radiation Precision Medicine (Center of Neuro Functional Imaging).

We have two funded projects through KACST, titled “Advanced magnetic resonance imaging (MRI) for patients with mild cognitive impairment (MCI) and patients with Alzheimer’s disease (AD). (Reviewed by the American Association for the advancement of Science (AAAS) was highly recommended for funding from KACST). This project was closed at the end of January 2017 and a final report was submitted to KACST.

The other funded research project titled “Analysis of Neuroanatomic and Neurofunctional Substrates in Autism Spectrum Disorder”. In addition to our ongoing funded research project from SABIC titled “Anatomical and functional substrates in ASD”, (in collaboration with the University of Leuven, Healthcare Belgium and the Center for Autism Research at KFSH&RC). We have closed this project at the end of September 2017 and final report was submitted to KACST.

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## CLINICAL, RESEARCH, CONTINUING EDUCATION AND SUPPORT SERVICE ACHIEVEMENTS

- Establishing fMRI Protocol for Clinical Use: Comparisons of Different Language Paradigms in Arabic Speakers (Principle Investigator).
- Normal Sonographic Dimensions of Spleen and kidney for Children in KFSH&RC (Principle Investigator).
- Accuracy of Shoulder Ultrasound Examination in the Diagnosis of Rotator Cuff Pathologies, A single Center Retrospective Study (Principle Investigator).
- Novel and Familiar Faces Discrimination in Acquired Prosopagnosia: Combining Behavioral and fMRI data (Co-investigator).
- Advanced Magnetic Resonance Imaging (MRI): Multi Parametric Imaging For The Effect of fasting in Multiple Sclerosis (MS) (Co-investigator).
- Prevalence of Menisci and Anterior Cruciate Ligament Tear among Athletes in Saudi Arabia: A Retrospective Assessment with MRI (Co-investigator).
- Projection Modification from AP to PA in Selected Adult/ Pediatric Radiographic Procedures (Co-investigator).

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## OTHER RESEARCH ACHIEVEMENTS

- Radiation Risk Assessment of Female Patients Undergoing Uterine Artery Embolization Procedures (Co-investigator).
- Shear Wave Elastography (SWE) at the common extensor tendon elbow in the diagnosis of tennis elbow syndrome (Co-investigator).
- The Effectiveness of an abbreviated MRI protocol for High-Risk screening breast in order to Reduce patient dose, save time and resources (Co-investigator).

## PUBLICATIONS

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- Mohtasib RS, Alshamiri K, Jobeir A, Ambu-Saidi F, Masawi A, Alabdulaziz L, Bin Hussain F. (2019) Sonographic Measurements for Kidney Length in Normal Saudi Children: Correlation with Body Parameters. Manuscript ID is ASM-2018-0713 (Awaiting Production Checklist May-June 2019).
- Mohtasib RS, AlZahrani A, Asiri, Y, Rayes Z, AlShaaalan M. (2019). Accuracy of Shoulder Ultrasound Examination for the Diagnosis of Rotator Cuff Pathologies: A Single Centre Retrospective Study. Manuscript ID is ASM-2018-0465 (Awaiting Production Checklist May-June 2019).
- Eid, Ahmad M., Aljaser, Sarah M., AlSaud, Anoud N., Asfahani, Sultana M., Alhaqbani, Ohoud A., Mohtasib, Rafat S., Fryling, Mitch. (2017). Training Parents in Saudi Arabia to Implement Discrete Trial Teaching with their Children with Autism Spectrum Disorder. *Behavior Analysis in Practice*, 1-5. doi: 10.1007/s40617-016-0167-3
- Eid, Ahmad M., Aljaser, Sarah M., AlSaud, Anoud N., Asfahani, Sultana M., Alhaqbani, Ohoud A., Mohtasib, Rafat S., Fryling, Mitch. (2017). "Learning by Doing and Learning by Observing: Training Parents in Saudi Arabia to Implement the Natural Language Paradigm". *Journal of Developmental and Physical disabilities*. (It has been accepted with revisions, which has been submitted already for peer review. We are still waiting for final acceptance).

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## RADIATION BIOLOGY SECTION

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### HEAD

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GHAZI ALSBEIH, PHD

### MEMBERS

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Najla Al-Harbi, BSc  
Sarah Bin Judia, BSc  
Krishna Mishra, PhD  
Khaled Al-Hadyan, MS  
Maha Alrashdi, MSc

The discipline of radiation biology provides the basis of the many uses of radiation in medicine and allied health professions. It studies the effects of radiation from the primary interaction with living materials and organisms to mechanisms of repair and consequences of radiation exposure. The aim is to better understand and master this tool in health and medicine and, therefore, to improve its beneficial effects and avoid its hazardous potential.

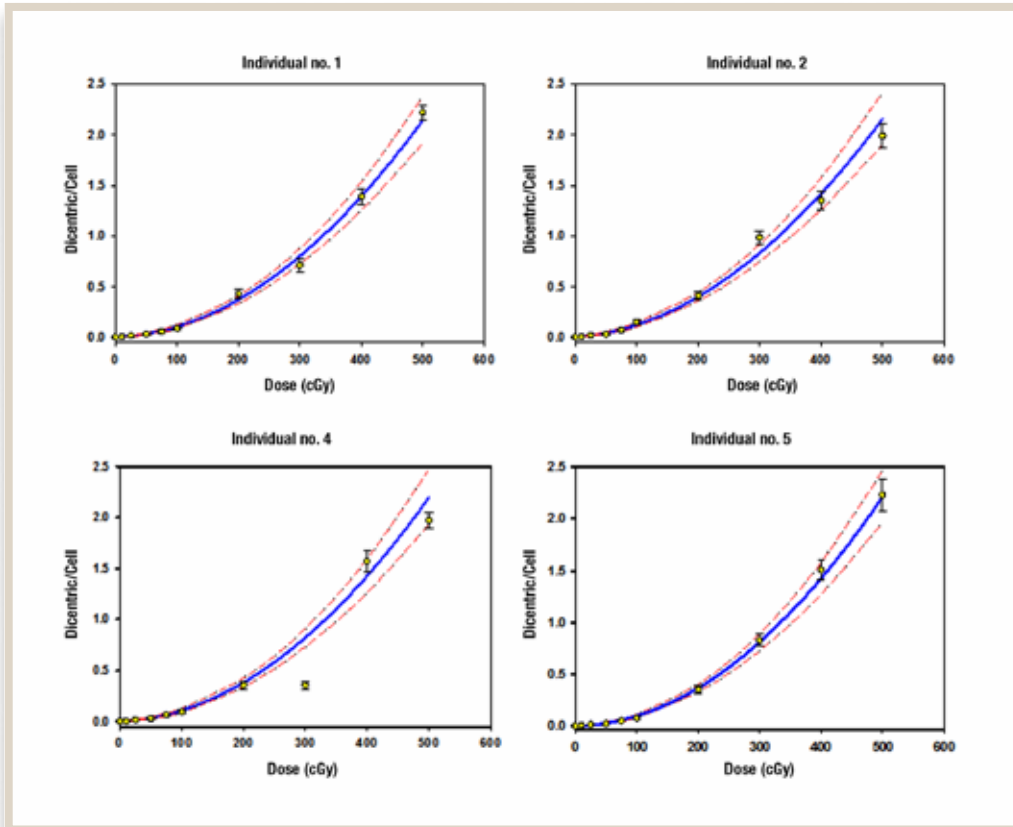
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## RESEARCH ACHIEVEMENTS

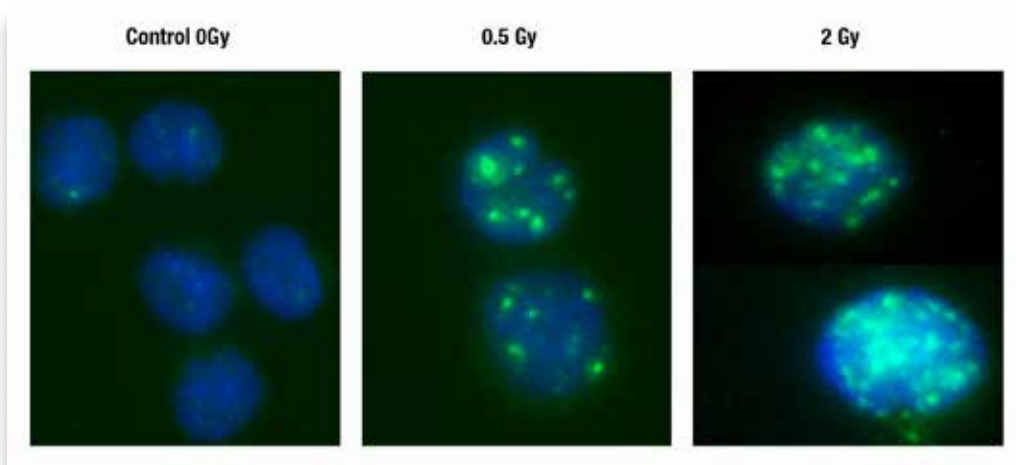
- We have demonstrated significantly low rate of human papillomavirus infection (HPV) in Saudi head and neck squamous cell carcinoma as compared to other populations.
- Assessed radiation doses received in cases of suspected accidental radiation exposures in industries and health institutes using specialized cytogenetic biodosimetry techniques available only in our department in the Kingdom
- Consultation to Ministry of Health, process samples for specialized biodosimetry assay to estimate radiation doses received in accidental radiation exposures. Blood samples from 6 suspected individuals having received accidental radiation exposure were processed, doses estimated and report submitted.
- Organize and conduct the 1<sup>st</sup> Medical Response to Radiation Emergencies Training Course in the Kingdom. Including 28 lectures, 12 speakers, 4 workshops and Radiation Emergency Drill (25 CME hours). Prepared for MoH physicians and RSO employees. 9–13 December 2018.

## OTHER RESEARCH ACHIEVEMENTS

- Completed project: Expand the National Biodosimetry Laboratory Capabilities using Micronuclei and Gamma-H2AX Foci to Assess Radiation Overexposure in Saudi Arabia. RAC/ORA # 2170 005.
- Ongoing project: Comparison between dicentric chromosome and gamma-H2AX foci assays in the evaluation of radiation overexposure. RAC/ORA # 2180 027.



Examples of individual dose response calibration curves for dicentric chromosomal aberrations.



Example of gamma-H2AX foci after irradiation as seen under fluorescence microscope.

## PUBLICATIONS

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- Alsbeih GA, Al-Harbi NM, Bin Judia SS, Khoja HA, Shoukri MM, Tulbah AM. Reduced rate of human papillomavirus infection and genetic overtransmission of TP53 72C polymorphic variant lower cervical cancer incidence. *Cancer*. 2017 Jul 1;123(13):2459-2466. doi: 10.1002/cncr.30635. Epub 2017 Apr 10. PMID: 28393355. RAC: 2160 300.
- Alsbeih G, Al-Meer RS, Al-Harbi N, Bin Judia S, Al-Buhairi M, Venturina NQ, Moftah B. Gender Bias in Individual Radiosensitivity and the Association with Genetic Polymorphic Variation. *Radiother Oncol*. 2016 Mar 14. pii: S0167-8140(16)00122-5. doi: 10.1016/j.radonc.2016.02.034. [Epub ahead of print]. PMID: 26987471. <http://www.sciencedirect.com/science/article/pii/S0167814016001225>. RAC# 2150 211.
- Al-Harbi NM, Bin Judia SS, Khoja HA, Shoukri MM, Alsbeih GA. Genetic Predisposition to Cervical Cancer and the Association with XRCC1 and TGFB1 Polymorphisms. *Int J Gynecol Cancer*. 2017 Sep 13. doi: 10.1097/IGC.0000000000001103. [Epub ahead of print] PMID: 28906311. RAC# 2170 201.
- Krishna Mishra, Belal Moftah, Ghazi Alsbeih. Appraisal of Mechanisms of Radioprotection and Therapeutic Approaches of Radiation Countermeasures. *Biomed Pharmacother*. 2018 Jul 3;106:610-617. Doi: 10.1016/j.biopha.2018.06.150. PMID: 29990850.
- Ghazi Alsbeih. Exploring the causes of the low incidence of cervical cancer in Western Asia. *Asian Pac J Cancer Prev*. 2018 Jun 25;19(6):1425-1429.
- Mishra K, Alsbeih G. Appraisal of biochemical classes of radioprotectors: evidence, current status and guidelines for future development. *3 Biotech*. 2017 Oct;7(5):292. doi: 10.1007/s13205-017-0925-0. Epub 2017 Aug 29. PMID: 28868219. RAC# 2170 057.
- Ghazi Alsbeih, Medhat Elsebaie, Hadeel Almana, Hatim Khoja, Asma Tulbah and Nasser Alrajhi. HPV infection in cervical and other cancers. *J Cancer Biol Res* 4(2): 1079 15 March 2016 (<http://www.jscimedcentral.com/CancerBiology/cancerbiology-4-1079.pdf>). RAC#2160 110.
- Zyla J, Badie C, Alsbeih G, Polanska J. Multigene P-value Integration Based on SNPs Investigation for Seeking Radiosensitivity Signatures. In: Ortuño F, Rojas I, editors. *Bioinformatics and Biomedical Engineering: Book Section*, Chapter 12. Cham: Springer International Publishing; 2016. p 125-134. DOI: 10.1007/978-3-319-31744-1\_12. [https://rd.springer.com/chapter/10.1007/978-3-319-31744-1\\_12](https://rd.springer.com/chapter/10.1007/978-3-319-31744-1_12)
- Joanna Tobiasz, Najla Al-Harbi, Sara Bin Judia, Salma Majid, Ghazi Alsbeih, Joanna Polanska. Are Radiosensitive and Regular Response Cells Homogeneous in their Correlations Between Copy Number State and Surviving Fraction After Irradiation? I. Rojas and F. Ortuño (Eds.) *IWBBIO* 2018, LNBI 10813, pp. 197-208, January 2018. DOI: 10.1007/978-3-319-78723-7\_17.
- Alotaibi MA, Alsuhaibani ES and Alsbeih GA. Assessment of *In vitro* X-Ray Radiation Overexposure by Cytokinesis-Block Micronucleus Assay in Human Peripheral Blood Lymphocytes (HPBLs) in Saudi Population. *Cell Mol Biol* 2018, Vol 64(1): 148. DOI: 10.4172/1165-158X.1000148.



## RADIATION ONCOLOGY PHYSICS SECTION

### HEAD

BELAL MOFATAH, PHD, FCCPM

### MEMBERS

Al-Delajjan, Saad, MS  
Al-Kafi, Mohd Abdullah, MSc  
Al-Najjar, Waleed, PhD, DABR, ABMP  
Al-Selham, Hind, MSc  
Al-Shammari, Shorug, MSc  
Alsaleh, Habib, PhD  
Alshreef, Abdullah, MSc  
Al-Zorkany, Faisal, MSc  
Ashmeg, Sarah, BSc  
Constantinescu, Camelia, PhD  
Hussain, Mohamed Abrar, PhD, DAB  
Mahyoub, Fareed, MSc, MIPEM  
Mwidu, Umar, MSc, DABR  
Nobah, Ahmed, MSc, DABR  
Santos, Rikka Maureen, MSc  
Sharure, Belal, MSc  
Shehadah, Mamoun, MSc, DABR  
Wadi-Ramahi, Shada PhD, DABR

The Radiation Oncology Physics (ROP) Section of the Biomedical Physics Department continues to provide a distinguished clinical service and scientific contribution on five major radiotherapy treatment modalities namely, TomoTherapy, CyberKnife, TrueBeam, Nucletron HDR, Mobetron and Intrabeam. The services include machine related QC, patient related QA and direct clinical involvement with the clinical treatment. The senior members of our Radiation Oncology Physics team also provided locum coverage for KFSH&RC-Jeddah as needed. The calibration of our machines have been audited and accredited by the Imaging and Radiation Oncology Center (IROC) of the MD Anderson Cancer Center, USA and the International Atomic Energy Agency (IAEA).

In the section's pursuit for quality patient care, innovations and improvements in clinical service now include: HDR Brachytherapy: CNC milled multi-channel vaginal cylinder, and 3D Printing humanoid skull phantom with bone and tissue equivalent materials.

The Radiation Oncology Section plays a very active role at the national and international level to enhance the training of physics and physics-related specialties in the health care industry. The section continuously receives trainees from universities, Ministry of Health and other countries to provide high quality training.

## CLINICAL, RESEARCH, CONTINUING EDUCATION AND SUPPORT SERVICE ACHIEVEMENTS

- Key role of our Radiation Oncology Physics team in the effective and safe clinical utilization of the major radiotherapy treatment modalities for cancer patients at KFSH&RC.
- Major role in several critical projects for KACO&LD related to radiological (radiology and radiotherapy) equipment procurement, shielding designs and acceptance testing and commissioning of state-of-the-art radiotherapy machines.
- Treatment of first-ever patient in the Middle East of Stereotactic Body Radiotherapy (SBRT) and High Dose Rate Brachytherapy (HDR).
- Acceptance testing and commissioning of 8 new radiation machines in KACO&LD; 4 therapy machines (2 Tomotherapy and 2 Elekta linacs) + 5 imaging machines (2 Philips CTs, 1 Varian simulator, 1 Siemens PET/CT and 1 Philips MR scanner).
- Transfer of the 3D printing technology into clinical use with the HDR brachytherapy service as well as for the physics QA procedures.
- Implementation of the first “IAEA/ARASIA Regional Residency Training Program for Medical Physicists in Radiation Oncology” at KFSH&RC. Three IAEA sponsored residents completed the training program. Five other residents have been accepted into the program.
- Accreditation of our radiation physics procedures, machine output and the American RTOG protocols by the Radiological Physics Center of M.D. Anderson Cancer Center.
- Radiation Knowledge Initiative: Administered and managed the 2018 International Radiotherapy Plan competition, which included five competitions in planning, 1770 participants from 97 countries. Radiation Knowledge was nominated as a finalist in the 2018 AAPM annual meeting as the one of best five international educational initiatives in the field of medical physics.
- Our experts contributed to testing the IAEA/AAPM small field dosimetry Code of Practice by collecting data from our state-of-the-art radiotherapy machines (TrueBeam linacs, Tomotherapy, CyberKnife).
- The section accommodated two postgraduate students from Australia: (MSc) Mr Masoud Jalayer and (PhD) Mr Mohammad Al-Towairqi under the supervision of Dr. Belal Mofteh and Dr. Shada Wad AlRamahi.
- In support to the residency program, the senior physicists organized the Residents’ Didactic Course on a weekly basis. Its aim is to provide further erudition not only to residents, but to interested trainees as well.
- Dr. Belal Mofteh and Dr. Shada Wadi-Ramahi are part of the lecturers for the on-going RSO course that is held frequently at KFSH&RC.
- Mr Ahmad Nobah was hand-picked to join the Medical 3DP Fellowship Course that took place in Stanford School of Medicine.
- During the Asbar World Forum, Mr Nobah, along with the KFSH&RC 3D Printing team were invited to present and facilitate a Medical 3D Printing Workshop.
- Dr Shada Wadi Alramahi was invited to be an external examiner at the Kurdistan Board of Radiation Oncology

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## OTHER ACHIEVEMENTS

- The section organized several courses and workshops under the umbrella of the International Conference on Radiation Medicine (ICRM2018) last 11-15 February 2018. Staff members presented talks and conducted workshops to an audience composed of many physicists, dosimetrists and radiation oncologists from Saudi Arabia and the region.
- The ROP section had active role in the Vision 2030 of Saudi Arabia and contributed two transformational projects among the other contributions from the other sections of Biomedical Physics.

**A. Machine related Quality Control**

	Test/energy or test/linac	#Energies or # linacs	Frequency/year	Total tests in 2018
Beam Output Constancy	1	28	260 times (daily)	7280
Beam Quality (x-ray)	1	10	12 times	120
Beam Energy (e)	1	18	12 times	216
Optical Distance Indicator	1	5	264 times	1320
Laser Localization	1	5	264 times	1320
Field Coincidence	2	5	12 times	120
Flatness & Symmetry	1	28	12 times	1680
HDR source strength	1	1	4	4
HDR position accuracy	1	1	3 times /week* 50weeks	150
<b>Total number of machine related tests</b>				<b>12210</b>

**Table B. Patient Related Quality Control**

	Total# of plans	# of QC/plan	Total tests in 2018
Rapid Arc	836	2 on average	605
TBI Calculation /Dosimetry	88 Patients	1	88
3D Plan	1372 (plans)	1	1464
TomoTherapy	315 (plans)	1	330
IMRT	5 (plans)	1	4
CyberKnife	130	1	115
Grid	patients	1	8
Electron Cutout Measurement	patients	1	64
IORT (Mobetron)	patients ( treatment fields)	1	35
IORT (Intrabeam)	patients	1	13
TSET	0	0	0
HDR treatment	patients	1	73
LDR patients	0	0	0

Above data represent the work done by the physics staff of the section. The physics staff has to perform QC for each treatment plan that is produced by the Clinical Dosimetry and Treatment Planning unit before it is approved for clinical implementation. In some specialized procedures, such as HDR, IORT, Cyberknife, the physicists are directly involved in the treatment planning as well as its QC.

**Table C. Machine related work at KACO&LD**

	# of bunkers	# linacs
Radiation Survey	N/A	N/A
Acceptance testing	9	4
Commissioning	9	4

Efforts on the section level continue for retention and for hiring of qualified staff. Training of potential staff members of Saudi nationality has also continued especially in the Clinical Dosimetry and Treatment Planning unit.



FIVE MAJOR RADIOTHERAPY TREATMENT MODALITIES AT KFSH&RC

## PUBLICATIONS

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- *Journal of Gastrointestinal Cancer*. “Stereotactic Body Radiation Therapy (SBRT) Using CyberKnife in Oligometastatic Cancer Patients; Retrospective Evaluation, Single Institution Experience.” DOI: <https://doi.org/10.1007/s12029-018-0170-8>. Abdullah Alsuhaibani, Ahmed Elashwah, Abdullah Alkafi, Camelia Constantinescu and Faisal Alzorkany
- *Journal of Applied Clinical Medical Physics*. “Quality assurance of Cyberknife robotic stereotactic radiosurgery using an angularly independent silicon detector”. DOI: 10.1002/acm2.12496. Sultan Alhujaili, Giordano Biasi, Faisal Alzorkany, Garry Grogan, Muhammed Al Kafi Jonathan Lane, Benjamin Hug, Abdullah Aldosari Sami Alshaikh, Pejman Farzad, Martin Ebert, Belal Moftah, Anatoly Rosenfeld, Marco Petasecca
- *Radiation Physics and Chemistry* (2018) 149 90-10, “Physics elements of an algorithm for brachytherapy dose calculation in homogenous media for Ir192 source”.. <https://doi.org/10.1016/j.radphyschem.2018.04.004>. Eshraq Ababneh, Saed Dababneh, Shada Wadi-Ramahi, Jamal Sharaf
- Proceedings of the AAPM 60<sup>th</sup> meeting, Nashville, July 29<sup>th</sup> – August 2<sup>nd</sup> 2018. 3D Printed patient-specific mould for HDR GYN treatment, Shada Wadi-Rmah, N. Jastanyeh, Camelia Constantinescu, Ahmad Nobah, Francois DeBlois
- Proceedings of the AAPM 60<sup>th</sup> meeting, Nashville, July 29<sup>th</sup> – August 2<sup>nd</sup> 2018. “How flexible is the pass/fail limits of the Gamma index for plan QA? A 10-year single institution experience”, S. AIMohsen, S Wadi-Ramahi, A. NObah, B. Moftah
- Abdullah Alsuhaibani, Ahmed Elashwah, Abdullah Alkafi, Camelia Constantinescu and Faisal Alzorkany “Stereotactic Body Radiation Therapy (SBRT) Using CyberKnife in Oligometastatic Cancer Patients; Retrospective Evaluation, Single Institution Experience.” *Journal of Gastrointestinal Cancer*. DOI: <https://doi.org/10.1007/s12029-018-0170-8>.
- “Quality assurance of Cyberknife robotic stereotactic radiosurgery using an angularly independent silicon detector”. *Journal of Applied Clinical Medical Physics*. Sultan Alhujaili, Giordano Biasi, Faisal Alzorkany, Garry Grogan, Muhammed Al Kafi Jonathan Lane, Benjamin Hug, Abdullah Aldosari Sami Alshaikh, Pejman Farzad, Martin Ebert, Belal Moftah, Anatoly Rosenfeld, Marco Petasecca. DOI: 10.1002/acm2.12496.
- “Physics elements of an algorithm for brachytherapy dose calculation in homogenous media for Ir192 source”. *Radiation Physics and Chemistry*. Eshraq Ababneh, Saed Dababneh, Shada Wadi-Ramahi, Jamal Sharaf. DOI: <https://doi.org/10.1016/j.radphyschem.2018.04.004>.

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## RADIATION SAFETY OFFICE

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### HEAD

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FAREED MAHYOUB, MSC,  
MIPEM

### MEMBERS

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Ibrahim Al-Gain, MSc, MIPEM  
Celestino Lagarde, BSc

The Radiation Safety Office (RSO) has continued to ensure the safe use of radiation throughout the hospital. The radiation safety program acts as the outline the role of RSO in achieving its objectives. There are mainly two aspects to RSO responsibilities; one related to the national regulatory body i.e. King Abdullah Center for Renewable and Nuclear Energy (K.A.CARE) and the second one is related to the enforcement of national and international regulations within the vicinity of the hospital.

RSO has continued to demonstrate to the national regulatory body, K.A.CARE, our continuous eligibility to maintain our license to operate a radiotherapy facility and a Scientific Research Facility. The RSO has also submitted the necessary paperwork to K.A.CARE in order to prove our continuous eligibility to maintain our license to operate a Secondary Standard Dosimetry Laboratory (SSDL), a Health Physics Lab where leak test are performed and a Thermoluminescent Dosimetry Laboratory.

## SUPPORT SERVICE ACTIVITIES

- Inspection of more than 420 radioactive sources that were imported for various end users within the hospital; Inspection and the proper upgrade of radiation units at the Secondary Standard Dosimetry Laboratory Section at KFSH&RC.
- Survey and inspection of more than 3,600 boxes containing radioactive materials produced by KFSH&RC Cyclotron Department before shipping to the end users; Calculation for radiation shielding for Radionuclide and Cyclotron Operations.
- Disposal of more than 730 used technetium-99 generators; Completed 1,990 leak tests.
- Conduct of investigation of about 15 staff whose occupational dose exceeded the ALARA level set by the hospital
- 60 Internal bioassays were performed to check the internal dose obtained by staff working with open sources.
- Shielding verification for the new nuclear medicine and diagnostic facilities established at King Abdullah Center for Oncology and Liver Diseases (KACOLD); Annual shielding test and verification for Radiology, CathLab, Pain Clinic and other departments using radioisotopes and radiation producing machines in compliance with K.A.CARE regulations.
- More than 560 barrels containing decayed radioactive active wastes were safely disposed of through the Environmental Services at KFSH&RC.

## OTHER ACTIVITIES

- Training and educating more than 100 medical physics staff working for the Ministry in Radiation Protection.
- Participation in Radiation Safety Officer courses held quarterly organized by the department.



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## SECONDARY STANDARD DOSIMETRY LABORATORY

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### HEAD

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MEHENNA ARIB, PHD

### MEMBERS

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Omar Noor, MASc

Heba Al-Humidan, BSc

Maryam Alkudaibi, BSc

The Secondary Standard Dosimetry Laboratory (SSDL) in the Biomedical Physics Department of KFSH&RC-Riyadh has continued to provide high accuracy in radiation measurements and dosimetry for all applications of ionizing radiation. With the installation in 2014 of a  $^{60}\text{Co}$  unit and a two X-ray machines, the KFSH&RC's SSDL became the only active laboratory in the Middle East region offering the calibration of therapy level ionization chambers in terms of absorbed dose to water and diagnostic radiology in terms of air kerma.

Our SSDL provides high quality calibration services for radiation measuring instruments used within the hospital and extends its calibration services throughout the Kingdom and the Gulf region. The calibration and Measurements Capabilities of the KFS&HRC's SSDL include the calibration of radiation protection measuring instruments using ISO 4037 gamma and x-rays beams and reference beta sources, the calibration of ionization chambers used in radiotherapy using a  $^{60}\text{Co}$  unit and X-rays (T1 to T4 qualities), the calibration of instruments used in diagnostic radiology using RQR, RQA and RQT x-ray beam qualities, the verification of neutron detectors using high energy linear accelerators and reference irradiation in terms of air kerma, ambient and personal dose equivalent in  $^{60}\text{Co}$  and  $^{137}\text{Cs}$  gamma beams as well as in X-ray beams.

The SSDL is running an ISO 17025 quality system which guaranties a highly Sophisticated and accurate radiation measurement. The calibration of radiation measuring instruments is performed using high standardized irradiation facilities and reference sources against secondary standards traceable to Primary Standard Dosimetry Laboratories and/or to the reference laboratory of the International Atomic Energy agency.

This report summarizes the activities of the SSDL during 2018.

## CLINICAL/RESEARCH ACTIVITIES

- Our SSDL participated to a Coordination Research Project with the IAEA for testing the new TRS 384 code of practice for small fields used in radiotherapy. Measurement performed in two conventional linear accelerators, one cyberknife and one tomotherapy, allowed us to check the procedures proposed by the code. The results are being prepared for a publication in an international journal.
- Finalization of the experimental optimization of HVL Measurements for Diagnostic Radiology X-ray beams. The work realized by a Master Student at our SSDL was aiming at enhancing the reference X-ray beam qualities (RQR) through optimizing the half-value layer (HVL) measurements. The best measurement and calibration capabilities for diagnostic radiology at the KFSHRC's SSDL were established. The results are under consideration for publication.
- Modification of the Cobalt-60 therapy level calibration unit using Brain Lab small fields diameter collimators. This project is aiming at establishing calibration procedures for small volume ionization chambers for the measurement of absorbed dose in small fields. When established, our Laboratory will be the only SSDL worldwide offering such calibration services. The experimental work is still under progress
- Establishment of calibration capabilities using Cs-137 gamma source and lead attenuators. This procedure was performed in the framework of a Master student from Al Imam University. All the parameters related to the new procedure were determined and optimized. More work needs however to be done to check if the spectra of the gamma beam are not disturbed by the attenuators.
- One Master Student from King Saud University performed her experimental work on the establishment and improvement of calibration capabilities for diagnostic radiology RQR beam qualities. Thesis defended in April 2018

## OTHER ACTIVITIES

- Participation of the SSDL head as an expert to the Training course on the Establishment of a Secondary Standards Dosimetry Laboratory and a Quality Management System organized by the IAEA in Vienna, Austria, from 17 to 21 December 2018. More than 150 participants worldwide attended this course.

During 2018, the distribution of the calibration per month, without the TLDs and OSLs, is given by the Figure 1. The figures 2 and 3 show the number of instruments calibrated per year since 2008.

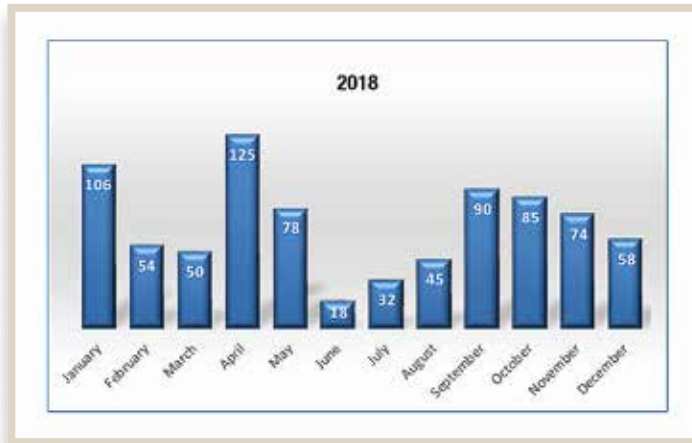


Figure 1. Number of instruments calibrated in 2018.

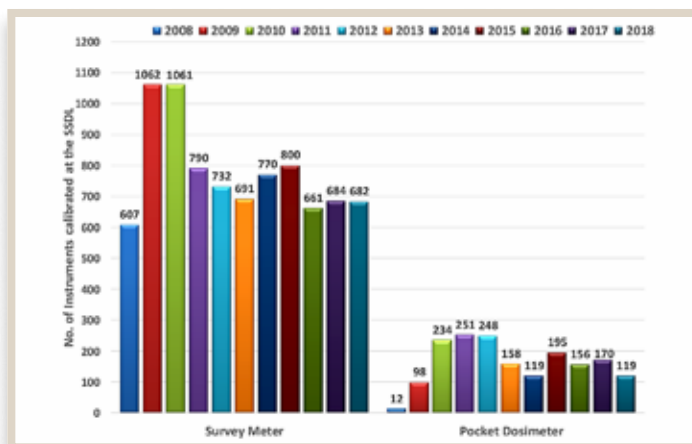


Figure 2. Type and number of instruments calibrated.

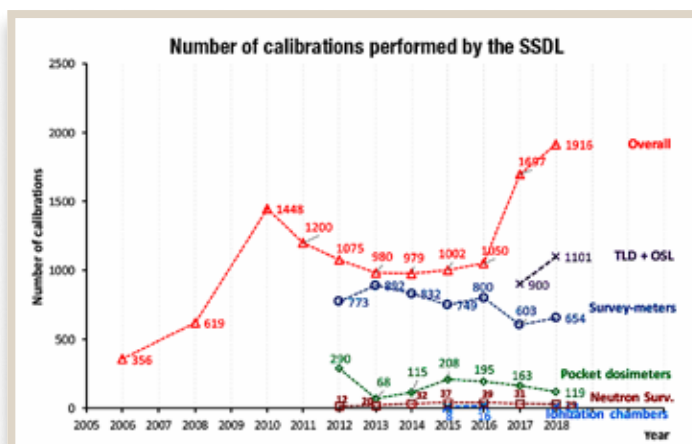


Figure 3. Variation of the number of instruments calibrated since 2006.

## PUBLICATIONS

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- S. A.Tijani, Salahuddin M. Kamala, Y. Al-Hadeethi, Mehenna Arib, M.A. Hussein, S.Wageh and L.A.Dim “Radiation shielding properties of transparent erbium zinc tellurite glass system determined at medical diagnostic energies”. *Journal of Alloys and Compounds*. Volume 741, 15 April 2018, Pages 293-299
- István Csete, Paula Toroi, Andreas Steuer, Costas Hourdakakis, Frantisek Gabris, Sibusiso Jozela, Antti Kosunen, João Cardoso, Vladimir Sochor, Linda Persson, Denis Glavič Cindro, Mehenna Arib and Mark Smekhov. “IAEA-SSDL bilateral comparisons for diagnostic level air kerma measurement standards”. *Physica Medica*. Volume 47 (2018), 9–15
- Wolfgang Lechner, Paulina Wesolowska, Godfrey Azangwe, Mehenna Arib, Victor Gabriel Leandro Alves, Luo Suming, Daniela Ekendahl, Wojciech Bulski, José Luis Alonso Samper, Vinatha Panyam, Siri Srimanoroth, Milan Tomsej, Mikko Tenhunen, Stephen Kry, David Followill, Dietmar Georg, Julie Povall, David I. Thwaites and Joanna Izewska. “A multinational audit of small field output factors calculated by treatment planning systems used in radiotherapy”. *Physics & Imaging in Radiation Oncology*. Accepted for publication in Feb. 2018.

# BIostatISTICS, EPIDEMIOLOGY AND SCIENTIFIC COMPUTING

CHAIRMAN

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EDWARD B. DE VOL, PHD



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## BIostatISTICS SECTION

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HEAD

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EDWARD B. DE VOL, PHD

The biostatistics section within the department of BESC provides a full range of biostatistical techniques, from initial design of research studies, to design of appropriate data collection methods, to analysis, to interpretation, and the generation of results for publication purpose.

## RESEARCH ACHIEVEMENTS

- Collaborators and research ideas with the Departments of Pediatrics and Pharmacy (Project #: BESC# 20150101a)
- Research proposals with CHLA and KFSH investigators (Project #: BESC# 20150101b)
- Data Clinics (Project #: BESC# 20150101c)
- Quality improvement project with the COO-R office (Project #: BESC# 20150101i)
- Patient Relations analytical support (Project #: BESC# 20150101j)
- Mortality benchmarking (Project #: BESC# 20150101k)
- i2b2 deployed in the Department of Pediatrics (Project #: BESC# 20150101l)

## OTHER ACHIEVEMENTS

- Establish an agreement with some academic institutions to offer clinical research methods courses in KFSH&RC (Project #: BESC# 20150101f).
- Should Ross procedure be considered a feasible alternative for adult patients who require AVR? Single centre patients' long-terms outcome, clinical and echocardiographic study. PI: Pergola Valeria.
- Clinical Trials office (Project #: BESC# 20150101t).
- First Study of Pattern of Epinephrine Auto Injector Prescription for Anaphylaxis in a Large Tertiary Care Hospital in Saudi Arabia (Project #: RAC# 2121 057, BESC# 20130724A).
- Retrospective Analysis of Patients Profile Having Intravascular Hemolysis with Prosthetic Heart Valves: Experience At KFSH&RC (Project #: RAC# 2111 109, BESC# 20131117A).



## PUBLICATIONS

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- Abdelmoneim Eldali. Etiology of optic atrophy: a prospective observational study from Saudi Arabia.
- Abdelmoneim Eldali. Effect of Downstaging and Bridging of Hepatocellular Carcinoma on Survival Following Liver Transplant: A Single Center Experience. *Exp Clin Transplant*. Mar 2017. [http://ectrx.org/forms/ectrxcontentshow.php?doi\\_id=10.6002/ect.TOND16.L4&year=2017&volume=15&issue=2&supplement=2&makale\\_no=0&spage\\_number=7&content\\_type=PDF](http://ectrx.org/forms/ectrxcontentshow.php?doi_id=10.6002/ect.TOND16.L4&year=2017&volume=15&issue=2&supplement=2&makale_no=0&spage_number=7&content_type=PDF).
- Abdelmoneim Eldali. The Relationship between 25 (OH) D Levels (Vitamin D) and Bone Mineral Density (BMD) in a Saudi Population in a Community-Based Setting. *PLoS One*. Jan. 2017. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0169122>.



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## CLINICAL TRIALS OFFICE

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HEAD

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EDWARD B. DE VOL, PHD

The Department of Biostatistics, Epidemiology & Scientific Computing Clinical Trials Office offers comprehensive study design, data and project management, analysis, and regulatory support services to investigators conducting clinical trials. We assist with studies supported by institution and foundation grants and industry contracts, including investigator-initiated trials.

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## ACHIVEMENTS

- Authorized by the RC Executive Director to be the point of contact for Saudi Arabian Food and Drug Authority for regulatory registration – 8 trials have been registered during the year and 11 are currently undergoing registration.
- Collaborating with Medical and Clinical Affairs in developing their Clinical Trials Unit, a clinical facility with the staffing and equipment resources to support early and late phase clinical trials.
- Eleven trials are being managed by the Clinical Trials Office in collaboration with various investigators across the hospital, e.g. from Neurosciences, Anesthesia, Physical Therapy, Oncology, and others.

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## DISEASOME RESEARCH GROUP

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HEAD

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DILEK COLAK, PHD

The mission of Diseasome Research Group/Program (DRG) is to focus on research, services and teaching and training in the areas of computational medicine and disease genomics to identifying better and more accurate markers for disease diagnosis, prediction of prognosis and therapeutic outcome in Saudi population. Our research projects are related to development and application of statistical and computational genomics techniques to better understand human diseases and the mechanisms underlying them, including several complex diseases, such as cancer, cardiovascular disease, neurological, metabolic and developmental diseases and others. Genome-wide molecular measurements, data mining, and bioinformatics approaches have provided the means to explore human diseases from a molecular basis. We perform integrated analysis of genome-wide molecular measurements with the molecular networks of interaction for understanding the molecular architecture of diseases and pathways underlying diseases. Discovering relevant disease biomarkers specifically for our Saudi patients greatly accelerates diagnostic, predict patient survival and therapeutic outcome related efforts. Indeed, this is one of the main targeted outcomes of our program and perfectly fits the vision 2030, National Transformation Program's directives for the Ministry of Health, KFSHRC's strategic priorities. More detailed info about our group and its activities are available at our website (<http://10.248.201.19/Diseasome/index.html>).

## RESEARCH ACHIEVEMENTS

- Dr. Colak and her team has published over 20 journal articles during 2016-2018 in various fields, such as cancer genomics, cardiovascular genomics, neurogenetics, bioinformatics, and systems biology, in peer reviewed prestigious journals, including International Journal of Cancer, PLoS ONE, American Journal of Human Genetics, Cerebellum, Journal of Medical Genetics, Clinical Genetics, Breast Cancer Research and Treatment, Journal of Genetics and Genomics, Breast Cancer Research and Treatment, OMICS, and Human Genetics.
- Colak et al performed integrated left ventricular global transcriptome and proteome profiling in human end stage dilated cardiomyopathy (DCM) in Saudi patients and identified sixteen potential biomarker genes and significantly altered pathways. The results should contribute towards better management of the disease. The study is published in PLOS ONE.
- Dr. Colak in collaboration with the department of genetics, NIH, National Human Genome Research Institute, UCLA and other international institutions, described ten similarly affected individuals from six unrelated families of different ethnic origins having bi-allelic truncating variants in TMEM94, that are associated with neurodevelopmental delay, congenital heart defects, and distinct facial dysmorphism. A manuscript is published in The American Journal of Human Genetics.
- In collaboration with the Molecular Oncology department, Colak et al identified the BRCA1/2 germline mutational frequencies of Arab breast cancer and ovarian cancer by using next generation sequencing (NGS) data from 173 unrelated patients. BRCA1 and BRCA2 (BRCA1/2) genes are heavily involved in mammalian cell DNA repair processes. Thus, the loss of function in either protein causes genetic instability and subsequent cancer development in breast and/or ovaries. The germline mutations in BRCA1 and BRCA2 are known to increase the lifetime risk of breast and/or epithelial ovarian cancer development. A manuscript is published in Breast Cancer Research and Treatment.
- Dr. Colak and her collaborators have shown before that PD-L1 is expressed in breast cancer and its expression is associated with higher proliferative capacity and resistance to therapy. We asked whether PD-L1 is associated with Cancer stem cells (CSCs) in breast cancer. CSCs represent a subpopulation of tumor cells that are resistant to therapy and able to re-initiate and maintain tumors. Recently, CSCs were found to have an immunomodulatory effect through recruitment of regulatory T-cells and upregulation immunosuppressive molecules like PD-L1 at least in two types of cancer namely: melanoma and glioma. Results show high degree of correlation ( $P < 0.001$ ) between gene expression signature of stemness and PD-L1 expression in breast cancer. A manuscript is published in International Journal of Cancer.
- Dr. Colak and her collaborators investigated the effect of hepatitis B virus X protein (HBx) and its deletion mutants on cell cycle progression in human hepatoma cells. The HBx is a viral trans-activator that plays a crucial role in pathogenesis of hepatocellular carcinoma (HCC) via an unknown mechanism. The role of HBx in modulating cell proliferation and programmed cell death is replete with controversies. In this study, we have shown that HBx-WT and its mutants play a critical role in the pathogenesis and progression of HCC by modulating cell cycle regulatory proteins. A paper is published in Cellular Physiology and Biochemistry.

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## OTHER RESEARCH ACHIEVEMENTS

- Colak et al reviewed and summarized existing methodologies and computational tools for network-based analysis of complex diseases and molecular relationships among apparently different disorders and human disease network. The authors then performed network-based analysis of Saudi genomic dataset for idiopathic dilated cardiomyopathy (IDCM), and identified significant subnetworks associated with the disease. This study is published in Journal of Genetics and Genomics.
- Colak et also performed an expert review on Biomolecular databases and subnetwork Identification approaches that are of interest to Big Data community, which is published in OMICS: A Journal of Integrative Biology.
- Dr. Colak (and her research assistant/students) presented research outcomes at international/local conferences and received 1<sup>st</sup> Place Awards at two international conferences (in UK and Jeddah) and additional two 1<sup>st</sup> Place Awards in Poster Competition in local scientific conferences (AlFaisal University and KSU Research Days).
- Worked on over 20 ORA-approved projects that are in line with hospital's strategic priorities, as PI or Co-I. Initiated new collaborations with clinical and research departments, including Genetics, Oncology, Infection and Immunity, Medical Genetics, Molecular Oncology, Comparative Medicine, Surgery and Organ Transplantation Center departments, as well as external institutions, such as John Hopkins and Dana-Farber Cancer Institute, Boston. Her research projects received ~9,000,000 SAR grant funding (~2M as PI) from KACST/NSTIP, KSDRC, KSU-KACST and individual sponsors.
- Served in Editorial board of peer-reviewed international journals: Genomics (Advisory Editorial Board Member) and PloS One (Editorial Board Member).
- Awarded four best publication awards in KFSHRC Annual Research Days.
- Published a book chapter on Hereditary Disorders and Human Mutations of Iron-Sulfur Assembly Genes.
- Co-supervised two master students from King Saud University (KSU) and trained over 15 students from KSU, AlFaisal University, Princess Nourah University, and others. Provided consultancy services in the areas of computational medicine, genomics, and bioinformatics, biostatistics, and systems biology.

## PUBLICATIONS

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- Colak D, Alaiya AA, Kaya N, Muiya NP, AlHarazi O, Shinwari Z, Andres E, Dzimiri N. Integrated Left Ventricular Global Transcriptome and Proteome Profiling in Human End-Stage Dilated Cardiomyopathy. *PLoS One*. 2016;11(10):e0162669. doi: 10.1371/journal.pone.0162669. PubMed PMID: 27711126; PubMed Central PMCID: PMC5053516.
- Al-Harazi O, Al Insaif S, Al-Ajlan MA, Kaya N, Dzimiri N, Colak D\*. Integrated Genomic and Network-Based Analyses of Complex Diseases and Human Disease Network. *J Genet Genomics*. 2016;43(6):349-67. doi: 10.1016/j.jgg.2015.11.002. PubMed PMID: 27318646.
- Al-Harazi O, El Allali A, Colak D\*. "Biomolecular Databases and Subnetwork Identification Approaches of Interest to Big Data Community: An Expert Review.", *OMICS*. 2019 Mar;23(3):138-151. doi: 10.1089/omi.2018.0205.
- Alhuqail A-J, Alzahrani A, Almubarak H, Al-Qadheeb S, Alghofaili L, Almoghrabi N, Alhussaini H, Park BH, Colak D, Karakas B. High prevalence of deleterious BRCA1 and BRCA2 germline mutations in arab breast and ovarian cancer patients. *Breast Cancer Research and Treatment*. 2018. doi: 10.1007/s10549-017-4635-4.
- Almozyan S, Colak D, Mansour F, Alaiya A, Al-Harazi O, Qattan A, Al-Mohanna F, Al-Alwan M, Ghebeh H. PD-L1 promotes OCT4 and Nanog expression in breast cancer stem cells by sustaining PI3K/AKT pathway activation. *Int J Cancer*. 2017. doi: 10.1002/ijc.30834. PubMed PMID: 28614911. (best publication award for 2017, KFSH&RC)
- Al-Muhaizea MA, AlMutairi F, Almass R, AlHarthi S, Aldosary MS, Alsagob M, AlOdaib A, Colak D, Kaya N. A Novel Homozygous Mutation in SPTBN2 Leads to Spinocerebellar Ataxia in a Consanguineous Family: Report of a New Infantile-Onset Case and Brief Review of the Literature. *Cerebellum*. 2018;17(3):276-85. doi: 10.1007/s12311-017-0893-2. PubMed PMID: 29196973.
- Stephen J, Maddirevula S, Nampoothiri S, Burke JD, Herzog M, Shukla A, Steindl K, Eskin A, Patil SJ, Joset P, Lee H, Garrett LJ, Yokoyama T, Balandina N, Bodine SP, Tolman NJ, Zerfas PM, Zheng A, Ramantani G, Girisha KM, Rivas C, Suresh PV, Elkahloun A, Alsaif HS, Wakil SM, Mahmoud L, Ali R, Prochazkova M, Undiagnosed Diseases Network m, Kulkarni AB, Ben-Omran T, Colak D, Morris HD, Rauch A, Martinez-Agosto JA, Nelson SF, Alkuraya FS, Gahl WA, Malicdan MCV. Bi-allelic TMEM94 Truncating Variants Are Associated with Neurodevelopmental Delay, Congenital Heart Defects, and Distinct Facial Dysmorphism. *Am J Hum Genet*. 2018;103(6):948-67. doi: 10.1016/j.ajhg.2018.11.001. PubMed PMID: 30526868.
- Al Negherly L, Kenana R, Al Bakheet A, Al Mass R, Al Mutairi F, Al Sagob M, Qari A, Huma R, Colak D, Daghestani M, Kaya N, Al Sayed M. A Systematic Genetic Assessment of ARFGEF2 Mutations in Periventricular Heterotopia. *International Journal of Genetics and Genomics*. 2018;6(1):11.
- Al-Anazi MR, Nazir N, Colak D, Al-Ahdal MN, Al-Qahtani AA. Deletion and Functional Analysis of Hepatitis B Virus X Protein: Evidence for an Effect on Cell Cycle Regulators. *Cell Physiol Biochem*. 2018;49(5):1987-98. doi: 10.1159/000493670. PubMed PMID: 30235448.



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- Al-Hassnan ZN, Albawardi W, Almutairi F, AlMass R, AlBakheet A, Mustafa OM, AlQuait L, Shinwari ZMA, Wakil S, Salih MA, Al-Fayyadh M, Hassan SM, Aljoufan M, Al-Nakhli O, Levy B, AlMaarik B, Al-Hakami HA, Alsagob M, Colak D, Kaya N. Identification of novel genomic imbalances in Saudi patients with congenital heart disease. *Molecular Cytogenetics*. 2018;11(1):9. doi: 10.1186/s13039-018-0356-6.
  - Patel N, Shamseldin HE, Sakati N, Khan AO, Softa A, Al-Fadhli FM, Hashem M, Abdulwahab FM, Alshidi T, Alomar R, Alobeid E, Wakil SM, Colak D, Alkuraya FS. GZF1 Mutations Expand the Genetic Heterogeneity of Larsen Syndrome. *Am J Hum Genet*. 2017;100(5):831-6. doi: 10.1016/j.ajhg.2017.04.008. PubMed PMID: 28475863; PubMed Central PMCID: PMC5420357.
  - Shinwari ZMA, Almesned A, Alakhfash A, Al-Rashdan AM, Faqeih E, Al-Humaidi Z, Alomrani A, Alghamdi M, Colak D, Alwadai A, Rababh M, Al-Fayyadh M, Al-Hassnan ZN. The Phenotype and Outcome of Infantile Cardiomyopathy Caused by a Homozygous ELAC2 Mutation. *Cardiology*. 2017;137(3):188-92. doi: 10.1159/000465516. PubMed PMID: 28441660.
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  - Al-Hassnan ZN, Shinwari ZM, Wakil SM, Tulbah S, Mohammed S, Rahbeeni Z, Alghamdi M, Rababh M, Colak D, Kaya N, Al-Fayyadh M, Alburaiqi J. A substitution mutation in cardiac ubiquitin ligase, FBXO32, is associated with an autosomal recessive form of dilated cardiomyopathy. *BMC Med Genet*. 2016;17:3. doi: 10.1186/s12881-016-0267-5. PubMed PMID: 26768247.
  - Shaheen R, Anazi S, Ben-Omran T, Seidahmed MZ, Caddle LB, Palmer K, Ali R, Alshidi T, Hagos S, Goodwin L, Hashem M, Wakil SM, Abouelhoda M, Colak D, Murray SA, Alkuraya FS. Mutations in SMG9, Encoding an Essential Component of Nonsense-Mediated Decay Machinery, Cause a Multiple Congenital Anomaly Syndrome in Humans and Mice. *Am J Hum Genet*. 2016;98(4):643-52. doi: 10.1016/j.ajhg.2016.02.010. PubMed PMID: 27018474; PubMed Central PMCID: PMC4833216.
  - N Kaya, Z Al-Hassnan, M Abdulrahim, M Aldosary and D Colak. Hereditary Disorders and Human Mutations of Iron-Sulfur Assembly Genes, Mitochondrial Diseases Eylem Taskin, Celal Guven and Yusuf Sevgiler, *IntechOpen*, 2018.
  - Barnawi R, Al-Khaldi S, Colak D, Tulbah A, Al-Tweigeri T, Fallatah M, Monies D, Ghebeh H, Al-Alwan M. beta1 Integrin is essential for fascin-mediated breast cancer stem cell function and disease progression. *Int J Cancer*. 2019. doi: 10.1002/ijc.32183. PubMed PMID: 30719702.



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## EPIDEMIOLOGY RESEARCH SECTION

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HEAD

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YASMIN AL TWAJRI, PHD

The Epidemiology Section conducts hospital and community-based epidemiological research, aimed at addressing the distribution of health status in the population and enhancing the knowledge of disease occurrence, causation, treatment and prevention. A diverse epidemiology research staff works to maintain an intellectual environment that facilitates the integration of biological, social, and analytic approaches.

Research includes developing the highest quality epidemiologic research with the aim of establishing preventive measures through traditional, molecular, and clinical epidemiology. Ten new projects are initiated annually. Teaching activities by the Epidemiology Section scientists and staff, either as invited speakers, lecturers, or through training of interns, contribute to the local public health knowledge infrastructure. Also, the Section strives to provide services to the community by giving technical advice, and assistance to other institutions.

Overall, the Epidemiology Section aims to promote translational research to bridge the gap between epidemiology and the clinical and public health applications. Results of these studies have provided the basis for several national public health policy concerns.

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## RESEARCH ACHIEVEMENTS

- The Saudi National Mental Health Survey(SNMHS), is a state-of-the-art national health survey aimed at measuring the epidemic of mental illness and coexisting health problems among Saudis. 4004 interviews were collected from different regions in Saudi Arabia. Currently, data analysis is in progress. 2000 saliva samples collected during the interviews were sent to genetics labs at KFSH&RC for extraction and freezing until further analyses. Discussions are ongoing with scientists in the Saudi Human Genome study to discuss potential collaboration and to cover cost of genomic analysis.
- Dr. Yasmin Altwajri became a Visiting Faculty at Harvard University – School of Medicine. She was working closely with the data analysis team, developing each facet of the analysis plan for the SNMHS, and discussing the output and results.
- The SNMHS is also collaborating with the Saudi eHealth Analytics (SeHA) Platform at KACST and MIT. This collaboration will allow the researchers to perform advanced analytics like machine learning using SNMHS data to explore new mechanisms and risk factors related to mental health, which will contribute to advanced diagnostics
- Trained more 29 epidemiology interns from Princess Noura University from in year 2018.
- Designed and implemented a comprehensive pilot health initiative for BESC employees, called the Wellness Program. It is primarily designed to increase the overall health of an individual in the workplace. Due to the success of the project, a wellness program for whole hospital is being designed. Manuscript submitted.
- In collaboration with Internal Medicine Department a study was conducted on “Functional status assessment and Quality of Life of Saudi elderly in outpatients’ clinics. This study will help physicians to improve their clinical practice about functional status assessment of elderly patients. Manuscript is being written.
- In collaboration with KFSH&RC Department of Medicine: a study was conducted on “Age at menopause and severity of menopausal symptoms in Saudi HIV infected women”. Manuscript submitted.

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## OTHER RESEARCH ACHIEVEMENTS

- The Epidemiology Section organized the KFSH&RC Mental Health Hackathon, which was part of the largest MIT Hacking Medicine – Saudi Arabia, in collaboration with KACST. Members from the Department participated with two teams and were among the top 20 winner teams.
- Mobile diabetes health app clinical trial project: testing the effectiveness of a mobile app (designed and developed at KACST), which uses behavioral economics (nudging) tactics and crowd gamification, to influence healthy behavior among diabetic patients.

## PUBLICATIONS

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- Hyder, S., Bilal, L., Akkad, L., Lin, Y. C., Al-Habeeb, A., Al-Subaie, A., & Altwajiri, Y. (2017). Evidence-based guideline implementation of quality assurance and quality control procedures in the Saudi National Mental Health Survey. *International journal of mental health systems*, 11(1), 60.
- Shahab, M., Al-Tuwajiri, F., Bilal, L., Hyder, S., Al-Habeeb, A. A., Al-Subaie, A., & Altwajiri, Y. (2017). The Saudi national mental health survey: methodological and logistical challenges from the pilot study. *International journal of methods in psychiatric research*, 26(3), e1565.
- Mneimneh, Z. N., Hibben, K. C., Bilal, L., Hyder, S., Shahab, M., Binmuammar, A., & Altwajiri, Y. (2018). Probing for sensitivity in translated survey questions: Differences in respondent feedback across cognitive probe types. *Translation & Interpreting*, 10(2), 73-88. <https://doi.org/10.12807/ti.110202.2018.a06>.

## REGISTRIES CORE FACILITY UNIT

### HEAD

MAHA ALEID, PHD

### MEMBERS

Manal Al-Marzouqi  
Ebtissam Al-Jarba  
Abeer Al-Firm  
Nada Bawyan  
Hala Al-Assiry  
Fatima Al-Zubi  
Ruksana Rehna  
Sara Al-Kaf  
Nahlah Alsagabi

The Registries Unit is positioned organizationally within BESC. It is headed by Dr. Maha Al-Eid who directly supervises the following staff – Manal Al-Marzouky, Ebtissam Al-Jarba, Abeer Al-Firm, Nada Bawyan, Hala Al-Assiry, Fatima Alzubi, Ruksana Rehna and Sara Al-Kaf. Approximately midway through 2016, Dr. Al-Eid was assigned to head the unit. This new leadership has served to sort out those registries to which full and comprehensive support should be provided, and those that should be suspended. This was a strong and decisive strategic decision by the leadership and has served to benefit the Department as a whole. Given the above, a strong effort was made since 2016 to source the personnel support for already established (but suspended) registries from the Departments in which they originated. In addition, individuals interested in establishing new registries have been advised on the need for personnel funding to support the registries to come from the respective Departments. It is believed that this model will all the long-term sustainment to be secured.

## PUBLICATIONS

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- Aleid M, Muneer A, Renshaw S, George J, Jenkinson AD, Adamo M, Elkalaawy M, Batterham R, Ralph DJ, Hashemi M, Cellek S. Early Effect of Bariatric Surgery on Urogenital Function in Morbidly Obese Men. *The Journal of Sexual Medicine*. 2017 Jan 10. PMID: 28087357
- Al Sebayel M, Abaalkhail F, Alabbad S, Albahili H, Elsiey H, Aleid M, Al-Hamoudi W. Liver Transplantation in the Kingdom of Saudi Arabia. *Liver Transplantation*. 2017 June 26. doi: 1002/lt.24803. PMID:28650090
- Systematic Prospective Follow Up for Better Understanding of Clinical Characteristics of Patients with PH Disease (SAUDIPH) Registry. Al-Mousa H, Al-Saud B, *Front Immunol*. 2017 Jun 26;8:678. doi: 10.3389/fimmu.2017.00678. eCollection 2017
- Primary Immunodeficiency Diseases in Saudi Arabia: a Tertiary Care Hospital Experience over a Period of Three Years (2010-2013). Al-Saud B, Al-Mousa H, Al Gazlan S, Al-Ghoniaim A, Arnaout R, Al-Seraihy A, Elshorbagi S, Elsayed N, Afzal J, Al-Dhekri H, Al-Muhsen S. *J Clin Immunol*. 2015 Oct;35(7):651-60. doi: 10.1007/s10875-015-0197-6. Epub 2015 Sep 22.



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## SCIENTIFIC COMPUTING SECTION

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HEAD

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EDWARD B. DE VOL, PHD

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## ACHIEVEMENTS

- Comprehensive Implantable Medical Device Registry:
- Conducted 20 pre pilot workshops for the comprehensive implantable medical device registry for all 4 devices and 4 different teams within each hospital (Coronary Stent device, ICD, Hip implant, knee implant)
  - John Hopkins Aramco Healthcare
  - King Faisal Specialist Hospital, Jeddah
  - National Guard Healthcare, Riyadh
  - King Fahad Medical City, Madihan
  - King Faisal Specialist Hospital Riyadh
  - King Fahad Medical City, Riyadh
- Comprehensive Implantable Medical Device Registry: Successful completion and handover of the phase 1 of the comprehensive implantable medical device registry for the Saudi Food and Drug Authority, followed by the pilot run.
- Converis implementation: Hospital wide Implementation and configuration of the Research Management system.
- National Cancer Registry: Successful Transfer and implementation of the National Cancer Registry to the Saudi Health Council.

## PUBLICATIONS

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- Designing and Developing a Multi-Center/Multi-Device National Registry for Implantable Medical Devices. By: Baig MA, Househ M, Shagathrh FA, Zahrani SA, Alanazi A, Saab YA, Afzal J. *Studies in health technology and informatics*, Volume: 251 Pages: 219-222 Published: 2018. PMID: 29968642. <https://www.ncbi.nlm.nih.gov/pubmed/29968642>
- Developing a Policy and Procedure Framework and Manual for a National Comprehensive Implantable Medical Device Registry in Saudi Arabia. Househ M, Alshagathrh F, Khalifa M, Al-Surimi K, Moll S, Alsaab Y, Alanazi A, Alhamad A, Baig MA, Afzal J. *Studies in health technology and informatics*, Volume: 251 Pages: 215-218. Published: 2018. PMID:29968641. <https://www.ncbi.nlm.nih.gov/pubmed/29968641>
- Developing an Evidence-Based Clinical Dataset for the Comprehensive Implantable Medical Device Registry (CIMDR). Afzal J, Househ M, Alshagathrh F, Roomi A, Alanazi A, Alsaab Y, Shahbaz A, Baig MA. *Studies in health technology and informatics*, Volume: 251 Pages: 167-170 Published: 2018. PMID: 29968629. <https://www.ncbi.nlm.nih.gov/pubmed/29968629>



# CELL BIOLOGY

The Department of Cell Biology is completing its 7<sup>th</sup> year of existence. The Department focuses on the temporal and spatial relationships between extra-cellular stimuli and intracellular second messenger generation. Stimulus-response coupling is studied in a variety of conditions, namely innate immune responses, xeno-and-allogeneic interactions, nucleo-cytoplasmic signaling and aberrant signaling in diseases such as the metabolic syndrome, adipogenesis/obesity, and lung fibrosis. Our scientists continue to obtain external research funding, and train Saudi Nationals at the pre- and post-doctoral levels.

The Department has four main sections: Xenotransplantation Section, Diabetes Research Section, Aerobiology Section, and Cell Imaging and Molecular Signaling.

CHAIRMAN

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FUTWAN AL MOHANNA,  
PHD, FRSB, FRS

## RESEARCH ACHIEVEMENTS

- Establishment of a role of the calcium binding protein S100 in the pathogenesis of pulmonary fibrosis. This has led to the identification of two novel gene variants in S100A3 and S100A13 in Saudi patients with atypical interstitial lung disease which are involved in the pathophysiology of pulmonary fibrosis.
- Establishment of a novel surgical modification of successful experimental cardiac xenotransplantation between two rodent species.
- Glucocentric, obesogenic and behavioral characterization of KK/HIJ mouse model for diabetes research.
- Establishment of VCP positive/alpha galactosyl-transferase negative/ neomycin negative mouse strain for cervical heterotopic heart transplantation between mouse and rats as a model for xenotransplantation.
- Cloning and identifying tear fluid IgA from Camel as a target in mucosal immunity towards Mers-CoV infection. This was the basis for KACST Grant Project No. 42-1
- Established that N-Methyl D-aspartate (NMDA) receptors may be involved in Aspartame-induced insulin intolerance and weight gain. Employed a competitive NMDA receptor antagonist to improve glucose homeostasis, and identified key gene networks activated in the hypothalamic-pituitary-adrenal (HPA) pathway associated with aspartame exposure and NMDA receptor antagonism.

## OTHER ACHIEVEMENTS

Two patent applications have been filed one provisional and one full. The provisional will be turned into full application within the year. These are:

- The use of S100A13 in the diagnosis and treatment of lung fibrosis. "Atypical-Associated-Mutation-Binding –Protein S100A13. Al Mutairy EA, Khalid M and Al-Mohanna F. U.S. Application Ref: 517559US Serial Number of 62/746, 058 with a Filing Date of October 16, 2018.
- Method for treating pulmonary fibrosis using S100A3 Protein. Al Mutairy EA, Khalid M and Al-Mohanna F. U.S. Application Ref: 513629US Serial Number of 16/155, 371 with a Filing Date of October 9, 2018.

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## XENOTRANSPLANTATION RESEARCH

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HEAD

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FUTWAN AL MOHANNA, PHD,  
FRSB, FRS

Xenotransplantation provides an alternative for transplantation within end-stage failure patients waiting for a suitable organ donor. However, problems such as tissue compatibility, immunological and rejection reactions still exist. Therefore tissue engineering research has the potential to overcome these hurdles. In recent years different models have been established using synthetic or natural polymers scaffolds. Compared to those, biological scaffolds showed more promising cell growth, integration and survival rate. One of the projects this section is working on is the establishment of a biological scaffold in a rat model by decellularizing the heart resulting in a cell-free biological scaffold with preserved extracellular matrix protein content, and intact vasculature. Proteomic analysis is carried out in order to characterize the essential growth factors and molecules required to optimize cell growing and maturation when seeded. Rat embryonic stem cells are isolated, characterized and differentiated into cardiac cells in order to repopulate the decellularized scaffold in an attempt to allogeneize a xenograft. A number of human cell types: endothelial, fibroblast and induced pluripotent stem cell-generated cardiac cells are used to recellularize the rat scaffold. In addition, two human induced pluripotent stem cell lines (iPSc) are differentiated into cardiac cells. This model represents a step toward allogeneizing a cardiac xenograft.

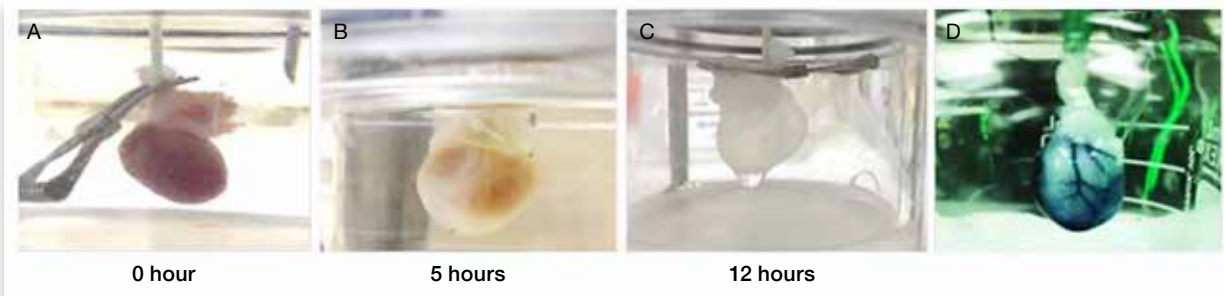
A further area of Departmental research is the characterization of surgically-produced animal models of heart disease which are comparable with human pathologies in order to test the effects of various treatment modalities, as well as establishing future directions for innovations in cardiovascular and thoracic surgery. This includes aortic or pulmonary artery banding techniques for the pressure-overload, myocardial infarction or ischemic reperfusion models of the left ventricle, and osmotic pump implantation for delivery of pharmaceuticals.

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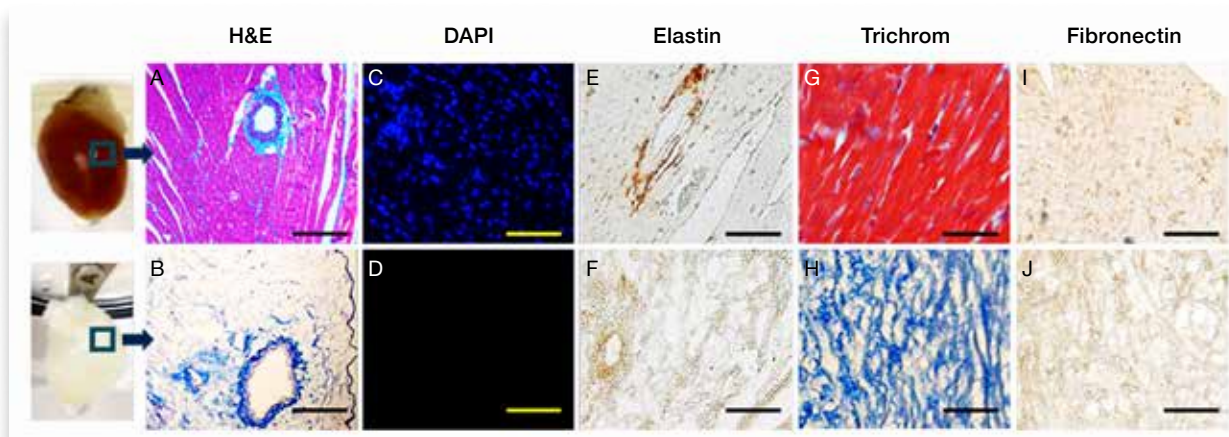
## RESEARCH ACHIEVEMENTS

- PhD Degree and successful Thesis defense “Establishment of vascularized cardiac tissue using human induced pluripotent stem cell generated-cardiomyocytes.” 10.12.2018. Wurzburg University, Germany.
- Establishment of cervical xenotransplantation of VCP expressing donor hearts into rats.
- Establishment of modified surgical model of xenotransplantation.
- Established a method for preparing Stromal Vascular Fractions (SVF) from rat epididymal and peritoneal fat pads which will be characterized during differentiation and adipogenesis. Differentiation of SVF cells is assessed by monitoring the activity of glycerol-3-phosphate dehydrogenase and expression of transcription factors associated with adipocyte differentiation (PPAR gamma and C/EBP beta). Levels of gene expressions and involved in adipogenesis proteins (such as FAS, FABP4, SCD1 and perilipin) are measured. The characterized SVFs will be used for different studies such as the effects of calcium and zinc during differentiation and adipogenesis phases and calcium oscillation.

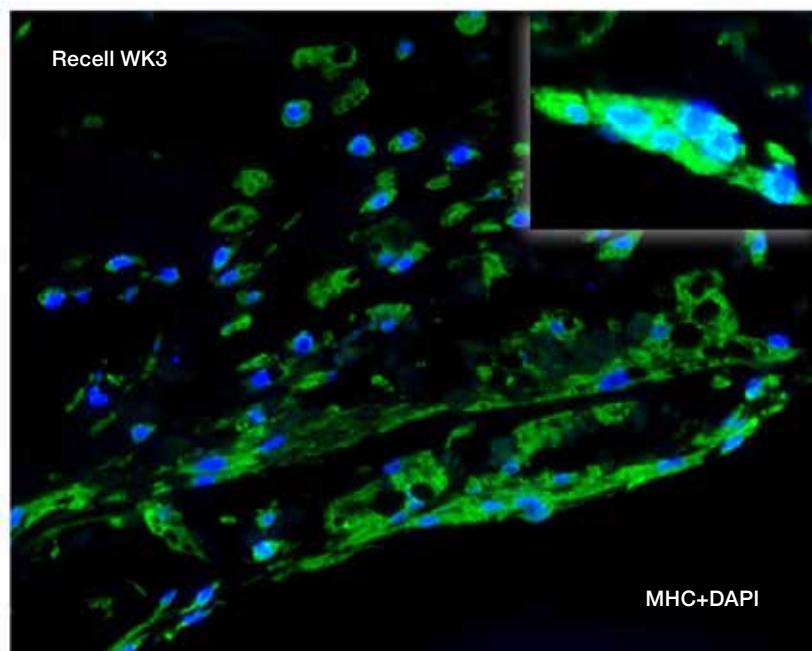




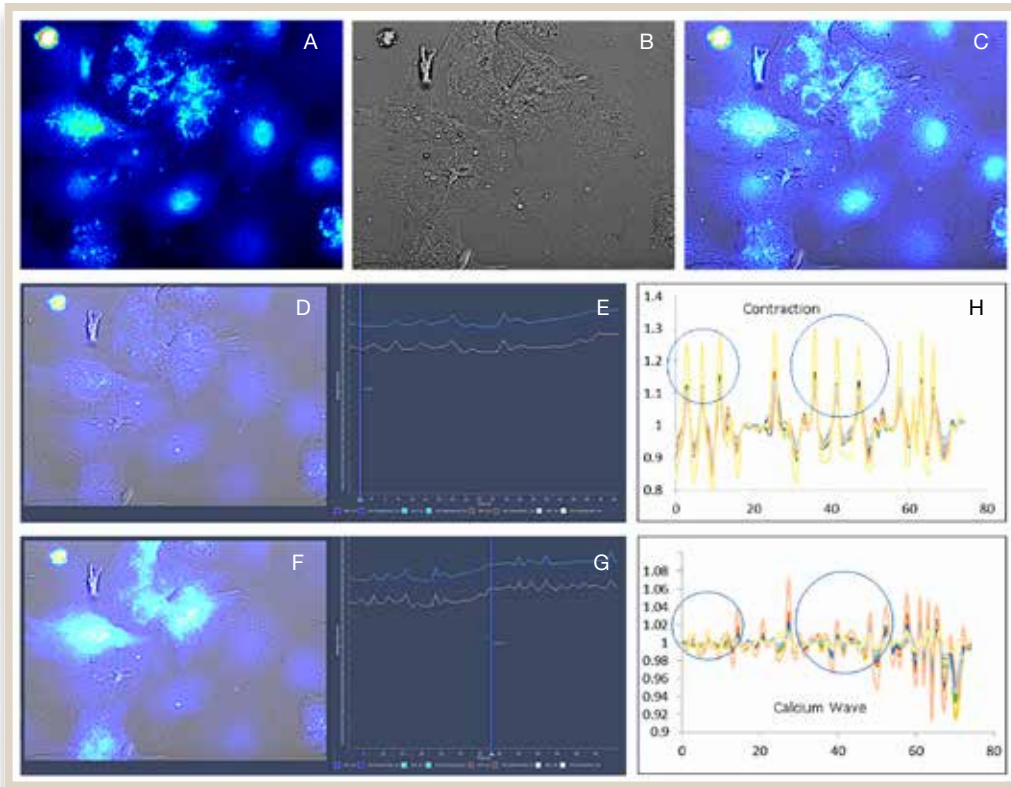
The decellularization of a rat heart, retrograde flow started through the aorta with 1% SDS under constant pressure 77mmHg. (A) Starting point 1% SDS, (B) 5 hours later 50% of the heart was decellularized, (C) 12 hours later the heart was completely transparent and cell free. Trypan blue indicates intact vasculature bed post decellularization.



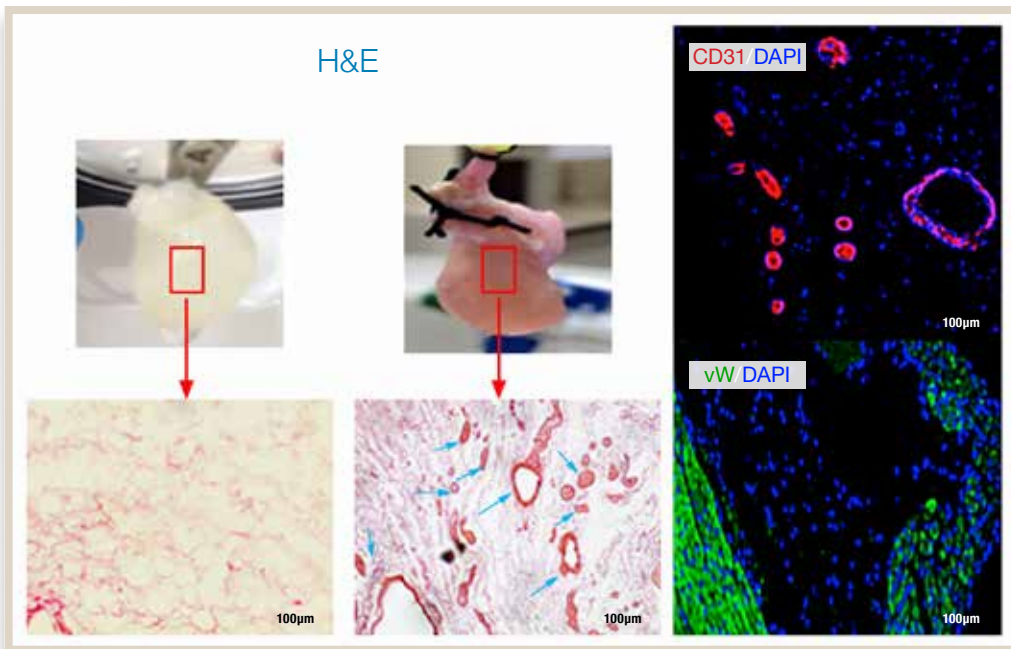
Histological staining of cadaveric and decellularized rat heart: H&E (A, B) indicate the removal of cells nuclear substance. DAPI fluorescence staining (C, D) was negative in decellularized tissues. Trichrome (G, H), elastin (E, F) and fibronectin staining (I, J) showed the preservation of ECM proteins.



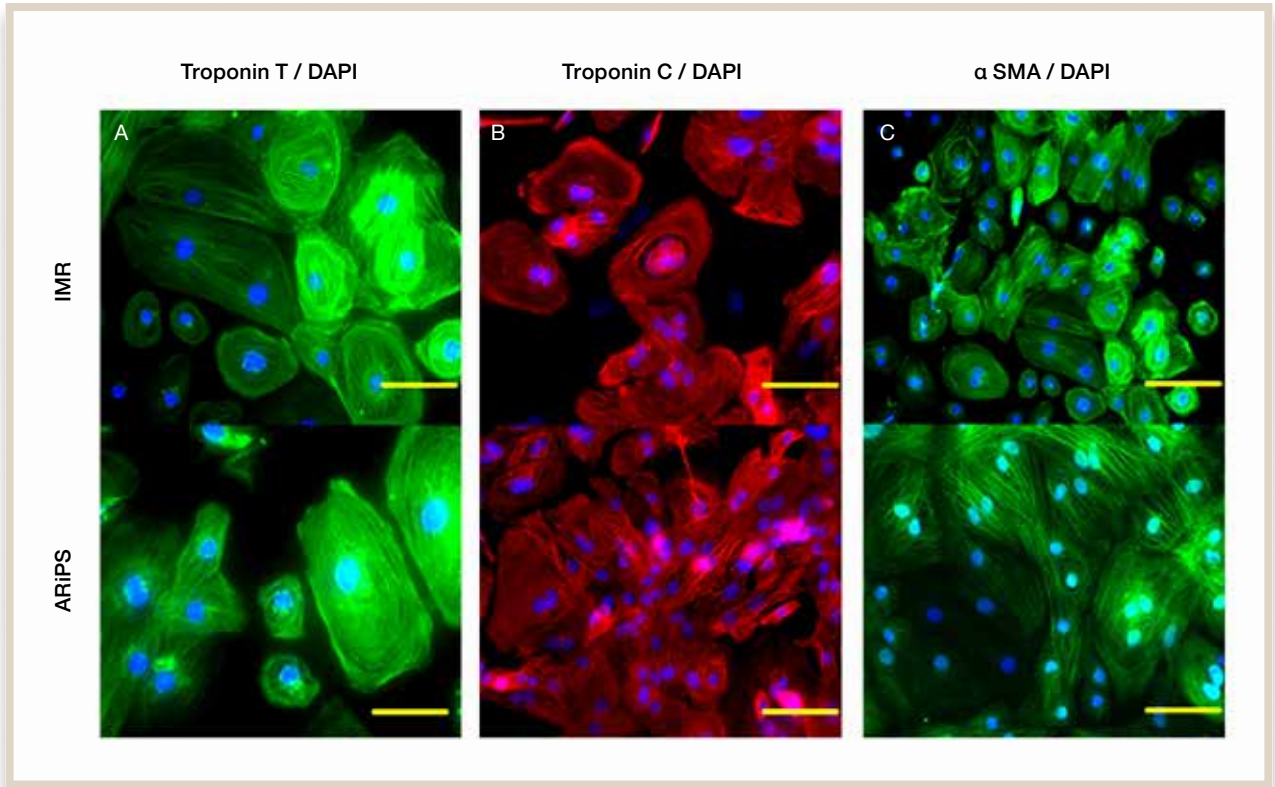
The scaffold was reseeded with rat neonatal cardiac myocytes.



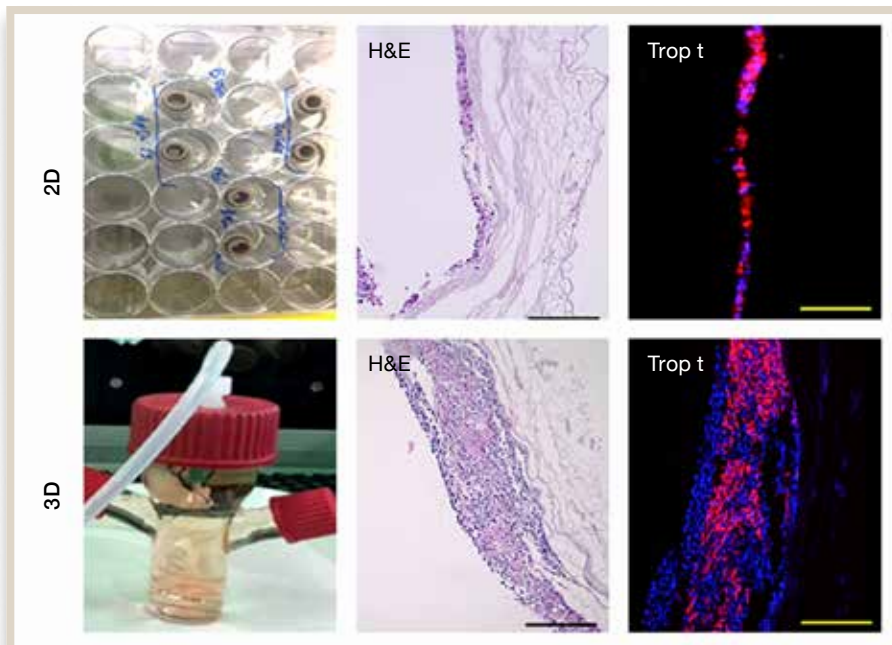
Coupling of calcium wave from contraction in multiple cells (rat ESC) that are differentially labeled with intracellular calcium indicator. (A) Intracellular calcium maps, corresponding Normarski, superimposed images of (A&B, D&F) are calcium maps at different times during the recording of images with the corresponding traction spikes seen in (E&G), respectively. (H) demonstrates the possible decoupling of calcium waves from contraction at the time of experiment.



H&E staining in decellularized and revascularized scaffolds. While the decellularized scaffold showed an absence of cells (left panel), reseeded scaffold showed new vascularization with different size of blood vessels 20–50 micron (middle panel). Endothelialization markers in rat scaffold of 3D dynamic culture; CD31 positive cells were around blood vessels at cell junction. VE cadherin the second marker was positive and found at cell junction area.



Immunofluorescence staining for cardiac markers of both IMR and ARIPs generated cardiac cells. (A) Troponin T, (B) Troponin C, and (C)  $\alpha$ -Smooth muscle actin (SMA).



2D and 3D culture of cardiac tissues using human endothelial cell and cardiac cells.



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- Al-Anazi A, Parhar R, Saleh S, Al-Hijailan R, Inglis A, Al-Jufan M, Bazzi M, Hashmi S, Conca W, Collison K, Al-Mohanna F. Intracellular calcium and NF-kB regulate hypoxia-induced leptin, VEGF, IL-6 and adiponectin secretion in human adipocytes. *Life Sci*. Nov 2018 .
- Weigel T, Schmitz T, Pfister T, Gaetzner S, Jannasch M, Al-Hijailan R, Schürlein S, Suliman S, Mustafa K, Hansmann A. Three-dimensional hybrid pacemaker electrode seamlessly integrates into engineered, functional human cardiac tissue *in vitro*. *J. Sci Rep*. 2018 Sep 28;8(1):14545.
- Shamseldin HE, Alasmari A, Salih MA, Samman MM, Mian SA, Alshidi T, Ibrahim N, Hashem M, Faqeih E, Al-Mohanna F, Alkuraya FS. A null mutation in MICU2 causes abnormal mitochondrial calcium homeostasis and a severe neurodevelopmental disorder. *Brain*. 2017 Nov 1;140(11).
- Zou M, Baitei EY, Bin Essa HA, Al-Mohanna FA, Parhar RS, St-Arnaud R, Kimura S, Pritchard C, Alzahrani AS, Assiri AM, Meyer BF, Shi Y. Cyp24a1 Attenuation Limits Progression of Braf<sup>V600E</sup>-Induced Papillary Thyroid Cancer Cells and Sensitizes Them to BRAF<sup>V600E</sup> Inhibitor PLX4720 *Cancer Res*. 2017 Apr 15;77(8):2161-2172.
- Parhar RS, Zou M, Al-Mohanna FA, Baitei EY, Assiri AM, Meyer BF, Shi Y. IL-12 immunotherapy of Braf(V600E)-induced papillary thyroid cancer in a mouse model. *Lab Invest*. 2016 Jan;96(1):89-97. doi: 10.1038/labinvest.2015.126.
- Reem Al Hijailan Sebastian Schürlein, Tobias Weigel, Asifqbal Kadari, Christoph Rücker, Frank Edenhofer, Heike Walles, Jan Hansmann. Generation of a Human Cardiac Patch Based on a Reendothelialized Biological Scaffold (BioVaSc). *Advanced Biosystems*. (2017).
- Tobias Weigel, Tobias Pfister, Tobias Schmitz, Maren Jannasch, Sebastian Schürlein, Reem Al Hijailan, Heike Walles, Jan Hansmann' Flexible tissue-like electrode as a seamless tissue-electronic interface. *BioNanoMaterials*. (2017)
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- Ling J, Brey C, Schilling M, Lateef F, Lopez-Dee ZP, Fernandes K, Thiruchelvam K, Wang Y, Chandel K, Rau K, Parhar R, Al-Mohanna F, Gaugler R, Hashmi S. Defective lipid metabolism associated with mutation in klf-2 and klf-3: important roles of essential dietary salts in fat storage. *Nutr Metab (Lond)*. 2017 Feb 28;14:22. doi: 10.1186/s12986-017-0172-8. eCollection 2017. PMID: 28261316.

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#### HEAD

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KATHARINE COLLISON, PHD,  
FRSC, FRSB

#### MEMBERS

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ANGELA INGLIS, MSC  
ROSARIO UBUNGEN  
JENNIFER THIAM, BSM  
PRINCESS JOIE MATA  
SARAH FAROOQ

## DIABETES RESEARCH

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Diabetes is a progressive and multifactorial disease in which a complex genetic background interacts with environmental factors resulting in insulin resistance and subsequent failure of pancreatic beta cells to compensate. Saudi Arabia has one of the highest prevalence rates for obesity and diabetes in the world, therefore research into diabetes and its comorbidities should be a major focus. Additionally, patients with diabetes are burdened with higher rates of depression, anxiety and cognitive behavioral deficits linked to aberrant CNS insulin signaling. Animal models of diabetes are an invaluable tool for studying the pathogenesis and treatment of diabetes, the etiology of diabetes-associated comorbidities and complications, as well as research into viable pharmacological and nutritional interventions. One area of our research involves characterizing rodent diabetes models in terms of obesogenic and glucocentric phenotype as well as their suitability for behavioral research studies.

Patients with diabetes are advised to reduce their consumption of sugar, and products containing non-nutritive sweeteners (Diet foods and drinks) are a popular choice. Aspartame is a non-nutritive sweetener (NNS) used in over 6000 dietary products, despite epidemiological studies which have associated NNS consumption with an increased risk of diabetes, heart disease and weight gain. However association doesn't prove cause. We were the first to publish data from a mammalian animal model demonstrating that chronic consumption of aspartame causes insulin intolerance and weight gain, as well as impaired spatial cognition and memory. Moreover we examined the potential of pharmacological blockade of N-Methyl D-Aspartate receptors (NMDARs) as a means of normalizing aspartame-impaired insulin tolerance. NMDARs have recently been characterized in pancreatic beta cells, and there is currently some interest in developing NMDAR antagonist compounds for use as adjunct anti-diabetes drugs. We have identified changes in gene expression in response to aspartame and NMDA receptor blockade.

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## RESEARCH ACHIEVEMENTS

- Gluco-centric, obesogenic and behavioral characterization of KK/HIJ mouse model for diabetes research.
- Established that N-Methyl D-aspartate (NMDA) receptors may be involved in Aspartame-induced insulin intolerance and weight gain. Employed a competitive NMDA receptor antagonist to improve glucose homeostasis, and identified key gene networks activated in the hypothalamic-pituitary-adrenal (HPA) pathway associated with aspartame exposure and NMDA receptor antagonism.
- Diagnostic value of cardiac computed tomography angiography in patients with left bundle branch block and abnormal single photon emission computed tomography (P.I. Dr. Bandar Al-Ghamdi).
- The predictive value of heart rate variability in critical illness (P.I. Dr. Nawal Salahuddin).
- Carbapenem versus beta-lactam/ beta-lactamase inhibitor combination therapy for blood stream infections caused by extended spectrum beta-lactamase (ESBL)-producing Enterobacteriaceae; retrospective cohort study (PI: Ali Omrani).

## PUBLICATIONS

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- Collison KS, Inglis A, Shibin S, Saleh S, Andres B, Ubungen R, Thiam J, Mata P, Al-Mohanna FA. Effect of developmental NMDAR antagonism with CGP 39551 on aspartame-induced hypothalamic and adrenal gene expression. *PLoS One*. 2018 Mar 21;13(3):e0194416. doi: 10.1371/journal.pone.0194416.
- Mohamed Shoukri. Analysis of Correlated Data with SAS & R 4<sup>th</sup> edition. Chapman and Hall/CRC Press, Boca Raton, Florida. 500 pages, April 2018.
- Mohamed Shoukri and Futwan Al-Mohanna. Extending the Behrens-Fisher Problem to testing equality of slopes in linear regression: The Bayesian Approach. *Open Journal of Statistics*, 2018, 8, 284-301. <https://doi.org/10.4236/ojs.2018.82018>.
- Ahmed Fathala, Mervat Aboulkheir, Mohamed M. Shoukri, Hani Alsergani. Diagnostic accuracy of N-ammonia myocardial perfusion imaging with PET-CT in the detection of coronary artery disease. *Annals of Saudi Medicine*. <http://dx.doi.org/10.21037/cdt.2018.10.12>
- Ahmed L. Fathala, Faisal Mohammed Alabdulkarim, Mohamed Shoukri, Muhannad Alanazi. Association between breast arterial calcifications found on mammography and coronar artery calcifications in asymptomatic Saudi women. *Ann Saudi Med*. 2018; 38(6) 433-438.
- Bright Varghese, Mushira Enani, Mohammed Shoukri, Sameera AlJohani, Hawra Al, Ghafli, Sahar AlThawadi, Sahal Al Hajoj. The first Saudi Arabian national inventory study revealed the upcoming challenges of highly diverse non-tuberculous mycobacterial diseases. *PLOS- Neglected Trop Dis* 12(5): e0006515. Published: May 25, 2018. <https://doi.org/10.1371/journal.pntd.0006515>
- Nawal Salahuddin, Azam Shafquat, Qussay Marashly, Khaled Juan Zaza, Mohamed Sharshir, Moazzum Khurshid, Zeeshan Ali, Melissa Malgapo, Mouhamad Ghyath Jamil, Mohamed Shoukri, Mohammed Hijazi, and Bandar Al-Ghamdi. Increases in Heart Rate Variability Signal Improved Outcomes in Rapid Response Team Consultations: A Cohort Study. *Cardiology Research and Practice*, Volume 2018, Article ID 1590217, 8 pages: <https://doi.org/10.1155/2018/1590217>
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- Collison KS, Inglis A, Shibin S, Andres B, Ubungen R, Thiam J, Mata P, Al-Mohanna FA. Differential effects of early-life NMDA receptor antagonism on aspartame-impaired insulin tolerance and behavior. *Physiol Behav*. 2016 Sep 15;167:209-221. doi: 10.1016/j.physbeh.2016.09.011. [Epub ahead of print]





## ALLERGY AND MEDICAL AEROBIOLOGY

### HEAD

HASNAIN M. SYED, PHD,  
FACAAI, FAAAAI

### MEMBERS

HALIMA AL-SINI  
ALANOUD AL-QASSIM  
ABDULRAHMAN AL-SOBHI  
MUBARAK AL-ENIZI  
CHERYL MIJARES  
MARY ANN FERNANDEZ

- Allergy and Medical Aerobiology lab is involved in identifying and analyzing local and regional allergens for the benefit of the citizens of this country. We have already SFDA approved products launched this year for diagnosis and treatment under “Allergotek Program”. We are working to launch an allergen monitoring Services Program as well.
- To add local allergens, indigenous pollen are collected from the fields and fungal spores are cultured in the lab, for purification.
- “Allergy to Samsun Ant” project with allergy clinic for the patients in our region is under process.
- Under the advice of the Ex-CEO office, a project on allergy to Conocarpus, in collaboration with Ministry of Water and Agriculture, has been submitted to KACST.
- A project: The “Holy Sites allergens” is a collaboration with KAAU, Jeddah, has been submitted for funding.
- An Aeroallergen Monitoring project in the Eastern province with the National Guard Hospital, Dammam has also been submitted.

## RESEARCH ACHIEVEMENTS

- SFDA registration and licensing of Allergotek products for marketing in the Gulf Region.
- Processing and quality control of 1000grams of indigenous raw pollen for Allergotek production.
- Publication of one paper in ISI journal resulting from the NSTIP Project No.: 13-BIO814-20, completed in 2017.
- Submission of another paper to International Journal of Public Health and Clinical Sciences (ISI Journal), resulting from the NSTIP Project No.: 13-BIO814-20 for final closure of the Project, completed in 2017.
- Participated in the Global Health Exhibition of KFSH&RC, 10-12 September 2018 at Riyadh International Convention and Exhibition Center.
- Participated in the SFDA Exhibition with King Faisal Specialist Hospital International Holding Company, 24-27 September 2018 at Riyadh International Convention and Exhibition Center.
- Publication of a total of five (5) full length papers, all in International Journals, during 2017 – 2018.

## OTHER ACHIEVEMENTS

- Allergotek Diagnostic and Therapeutic products were finally approved by Saudi Food and Drugs Authority. License was awarded for marketing in Saudi Arabia and The Gulf Region.
- Processing and quality control of 1000grams of indigenous raw pollen for Allergotek production.
- Fellow in Training: Training of Three (3) Fellows from Allergy & Immunology, Department of Medicine, King Faisal Specialist Hospital and Research Centre for 3 months, September to November 2018.
- Presented lab activities for two days to 2 groups of 40 female students from the Scientific Club, Botany & Microbiology Section, King Saud University.
- Participation at Saudi FDA Exhibition, Allergotek booth, King Faisal Specialist Hospital International Holding Co., 24-27 of September 2018 at the Riyadh International Convention and Exhibition Center.

## PUBLICATIONS

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- Hasnain SM, AlQassim AA, Alsini HA, Al-Frayh AS, Almohanna FA, Shoukri MM, Al-Sedairy ST, 2018. Indoor sensitizers of allergy and asthma in coastal and non-coastal regions of Saudi Arabia. *Int Res J Med Med Sci*, 6(4): 113-119.
- Hasnain SM, Alqassim A, Al-Frayh A. Diagnosis of Allergy: IgE Mediated Cross-Reactions Amongst Selected Asthma Elicitors. *Journal of Disease and Global Health*, 10(4): 111-122, 2017.
- Hasnain SM, Alsini HA, Almohanna F, Alfrayh A, Alrayes, H, Munshie HS, Alsedairy ST. Allergic sensitization: Prevalence of Fel d 1 Cat allergen in homes in Saudi Arabia, *Journal of Disease and Global Health*, 10(2):58-66, 2017.
- Hasnain SM, Alqassim A, Alsini HA, Alsobhi, A, Almohanna F, Alfrayh A, Alsedairy S. Impact of Indoor Allergenic Fungal Spores in Saudi Arabia. *Int J Recent Sci Res*. 8(5), pp. 16912-16916, 2017.
- Hasnain SM, Alqassim A, Al-Frayh A, Al-Mehdar, H. Alsedairy, S, Almohanna, F. Allergic Implication of Bla g1 and Bla g2 in homes in Saudi Arabia. *Journal of Disease and Global Health*, 10(1): 27-33, 2017.
- Al-Frayh AR, Shakoor Z, Hasnain SM. Family history of atopy as a risk factor for childhood asthma and allergic disorders in Saudi Arabia. *Journal of Disease and Global Health*, 8(1): 18-25, 2016.
- Hasnain SM, Alsini HA, Gad-El-Rab MO AND Alaiya AA. "Amaranthus Pollen Allergens: Protein Diversity and Impact on Allergy Diagnosis. *International Journal of Chemical, Environmental & Biological Sciences (IJCEBS)* Volume 4, Issue 1 (2016) ISSN 2320-4087 (Online).
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- Hasnain SM, Alqassim A, Hasnain S, Al-Frayh A. Emerging Status of Asthma, Allergic Rhinitis and Eczema in the Middle East. *Journal of Disease and Global Health*, 7(3): 128-136, 2016.
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# CELL IMAGING AND MOLECULAR SIGNALLING

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## HEAD

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FUTWAN AL MOHANNA, PHD,  
FRSB, FRSC

## MEMBERS

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HUSSEIN AL-HINDAS, MVD  
RANA AL-RABIAH, MSc  
AZIZAH AL-ANAZI, MSc  
SARAH AL NASSAR, MSc  
SOMAYA AL-QATTAN, MSc

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## RESEARCH ACTIVITIES

- This is an integrated technology based approach to molecular signaling and cellular imaging. We provide technical expertise in cell biology to many researchers within and without the Research Centre. A number of imaging technologies are available in this facility, including ion-imaging microscopy and real-time live cell confocal imaging.
- Quantitative intra cellular ion analysis and imaging is performed using the Axio vision, CLSM and Cell sense (image analysis software).

# CLINICAL STUDIES AND EMPIRICAL ETHICS DEPARTMENT

The Clinical Studies and Empirical Ethics Department conducts clinical, pharmacokinetic, and empirical ethics studies on healthy volunteers and educates and trains research professionals. It also provides infrastructure for qualified clinical and empirical ethic research by members of KFSH&RC and aspires to promote collaboration among basic scientists and clinical investigators. The Department maintains the vision of a world-class entity, and is guided by the core values of Islamic morality, clinical caring, scientific quality, artistic creativity, social responsibility, and industrial productivity. Members of the Department are on the editorial board of BMC Medical Ethics and 3 biotech Journals, provide direct patient care, and participate in institution-wide educational and organizational activities. The Department has three sections: clinical studies, empirical ethics, and drug analysis laboratory.

CHAIRMAN

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MUHAMMAD M. HAMMAMI,  
MD, PHD, FACP, FACE

## RESEARCH ACHIEVEMENTS

- Vitamin-D2 (D2) treatment has been associated with a decrease in 25-hydroxy (25(OH)) vitamin-D3 (D3) level, suggesting that D3 treatment would be preferred to raise total 25(OH) vitamin-D (D) level. We have shown that compared to placebo, D3 treatment is associated with a decrease in 25(OH)D2 level similar in magnitude to D2-treatment associated decrease in 25(OH)D3 level; however, the D3-placebo difference in 25(OH)D2 level is shorter-lasting. Further, changes in 25(OH) D2 and 25(OH) D3 levels were correlated with each other and with baseline 25(OH)D levels, suggesting a novel regulatory mechanism. Such mechanism could be exploited in determining the illusive, likely population-specific, normal 25(OH) D levels. (RAC 2161235).
- We developed and fully validated UPLC-MS/MS assays for cortisol level in human plasma, urine, and saliva (RAC 2160008).
- Substituted judgment assumes adequate knowledge of patient's mind-set. We have shown that despite high self-reported surrogate's decision making confidence and healthcare-preferences familiarity, family surrogates are variably inadequate in simulating life-story narratives. Further, simulation accuracy may not follow the next-of-kin concept and is 38% based on shared background. The data suggest that substituted judgment doesn't fulfill the self-determination principle and the extended-autonomy thesis and that other models of surrogate's decision making, such as population based indicators, the Golden Rule, and familism may be more suitable. (RAC 2161073).
- Circumferential negative pressure wound therapy (NPWT) is commonly used to manage wounds and enhance the healing process. A theoretical concern was recently raised that circumferential NPWT may have a negative effect on perfusion distally. In a randomized study, we have shown that circumferential negative intermittent pressure of 125 mmHg applied to the mid-arm of healthy volunteers for 9 hours does not adversely affect digital O<sub>2</sub> saturation. (RAC 2181026).
- Measuring both serum amylase and lipase in the setting of acute pancreatitis is not recommended and monitoring changes in amylase and lipase levels after diagnostic results is of little added value. We retrospectively reviewed amylase and lipase tests that were performed at KFSH&RC over 12-month. We found out that one third of amylase/lipase testing are superfluous, mainly due to simultaneous amylase/lipase testing. Since only 0.6% of simultaneous amylase/lipase tests showed diagnostic amylase with non-diagnostic lipase levels, quality improvement initiatives should be directed at reducing this low-value practice. (RAC 2181078).
- Surrogate medical decision-making is often requested from/provided by family members of decisionally-incompetent adult patients. Twenty eight principles/factors have been shown to influence, to varying degrees, surrogate decision-making in Western cultures. The aim of the ongoing two studies is to explore the relative importance of these principles/factors in surrogate medical decision-making (personal preferences and perceived norm) by Middle Easterns and Non-Arab Asians, using Q-methodology. (RAC 2181009 and RAC 2181004).



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## OTHER ACHIEVEMENTS

- Continued to provide 2-week semiannual Clinical Research Professionals' Course (CRPC) accredited for 55.25 CME hours and Diploma in Clinical Research by AACME:
  - 23<sup>rd</sup> CRPC (15 – 26 April 2018).
  - 24<sup>th</sup> CRPC (21 Oct. – 01 Nov. 2018).
- Continued to provide semiannual High Performance Liquid Chromatography Course (HPLC/LCMS):
  - 15<sup>th</sup> HPLC & LCMS Course (13 - 15 March 2018).
  - 17<sup>th</sup> HPLC & LCMS Course (27-29 Nov. 2018).
- Developed new course for Clinical Research Coordinators
- Developed and validated assays for 7 drugs/hormones.
- Collaborate with University of California San Diego on a research project.
- Generated SR 112, 500 from training/teaching activities.
- Led a work group to establish Clinical Research Department within MCA.

## PUBLICATIONS

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- Muhammad M. Hammami, Sophia J. S. De Padua, Rajaa Hussein, Eman Al Gaai, Nesrine A. Khodr, Reem Al-Swayeh, Syed N. Alvi and Nada Binhashim. Generic-reference and generic-generic bioequivalence of forty-two, randomly-selected, on-market generic products of fourteen immediate-release oral drugs. *BMC Pharmacology & Toxicology* 2017; 18(1):78 DOI: 10.1186/s40360-017-0182-1.
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- Muhammad M. Hammami, Safa Hammami, Eman Al Gaai, Faduma Abdi Farah, and Sophia JS De Padua. Drug\*placebo interaction effect may bias clinical trials interpretation: hybrid balanced placebo and randomized placebo-controlled design. *BMC Medical Research Methodology*. 2016; 16:166.DOI:1186/s12874-016-0269-1URL: <http://www.biomedcentral.com/1471-2288/16/166>.
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  - Rajaa F Hussein, Syed N Alvi, and Muhammad M Hammami. Rapid Determination of Metoclopramide Level in Human Plasma by LC-MS/MS Assay: *Am J PharmTech Res.* 2018; 8(5) ISSN: 2249-3387.
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# CENTER OF AUTISM RESEARCH

The Center for Autism Research (CFAR) keeps on satisfying its main goal to progress toward becoming and remain an outstanding center in finding, intercession, preparing and research of Autism Spectrum Disorder (ASD). Since January 2018, The number of children diagnosed with Autism Spectrum Disorder (ASD ) were 100 by multi-disciplinary team. To carry out advanced research, translation and training to gain an accurate and more in-depth understanding of the causes of Autism the center has conducted important activities that was added to its important achievements such as Registered behavior technician training (RBT) provided by Board Certified Behavior Analysis (BCBA) for 40 hours to qualify individuals to sit for RBT Board exam with total of 65 graduates. Moreover, ( The Hanen Center's family –focused programs for parents are led by Hanen Certified speech-language pathologists (SLPs) was conducted for 12 of different families.. Also, First Steps workshop was conducted at CFAR and specialist from CFAR visited Tabuk to give workshops and diagnosis for a total of 45. Translating, design and copyright approval of all SPM and SPM-P questionnaires to Arabic and other OT home program materials for families. Continuing the social responsibility towards individuals with ASD Riyadh bank has undertaken sponsoring the center for Autism research 2018.

DIRECTOR

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HESHAM ALDHALAAN

## RESEARCH ACHIEVEMENTS

- Maternal Exposure to Plasticizers (Phthalates&Bisphenol A) and its Link to Autism Spectrum Disorders: A Prospective Cohort Study. RAC# 2180 005. Dr.Hesham Aldhalaan, Dr.Maha Alnemer and Dr. Mohamed M.Shoukri, Dr.Eman Alsaleh.“Standardization of Neuropsychology Tests for Saudi Arabian Children”, approved by ORA April 2018–ongoing. RAC#2181 032. Dr.Hesham Aldhalaan and Dr.Haya Aljoudi
- The Reliability and Validity of the Arabic Sensory Processing Measure-Preschool-Home (SPM-P-H) for Autism in Saudi Arabia. RAC Project RAC # 2181 139. Dr.Hesham Aldhallan (principal investigator), Shahad Alkhalifah.
- Autism Teachers Questionnaire: A Longitudinal Study of Teaching Practices of Students with ASD (ATQ). RAC# 2171076. Dr.Hesham Aldhalaan (principal investigator ) Ahmed Jumaa, Fahad Alnemry, Ohoud Alhaqbani.
- Efficacy of Clobazam in Dravet Syndrome. Approved by ORA December 2018. RAC# 2181 125. Suad Alyamani, (principal investigator), Meznah Alshwameen, Omar Dabbagh, Mohammed Almohaizea, H Aldhalaan, Sameena Khan, Aziza Chedrawi, Musad Abukhlaid.
- 1<sup>st</sup> progress report: Naturalistic teaching approaches to develop spontaneous vocalization and augmented communication in children with autism spectrum disorder. Project # 2171 209. Ahmad Eid.

## OTHER ACHIEVEMENTS

- Migrated Patients' Appointment scheduling from Google Calendar to a new Cloud Solution named Shedul.
- Started using the cloud solution Airtable (spreadsheet-database hybrid Application) that'll help facilitating the CFAR management and staff regular shared work by lowering the different versions issue.
- Updating and creating a new registration form for CFAR website.
- Applied behavioral analysis : Registered Behavior Technician Onsite training courses. This unique onsite training was designed in both Arabic & English Lang to meet the Behavior Analysis Certification Board (BACB) requirement of 40-hr training to qualify individuals to sit for RBT Board exam.
- Additional achievements of CFAR for 2018:
  - Funds received from Riyadh bank June 2018
  - Golden sponsorship for 2<sup>nd</sup> Epilepsy and EEG review course 2018
  - We have achieved collaboration Agreement with the following:
    - ◆ Kuwait Autism Center for training
    - ◆ Ministry of Defense for training

## PUBLICATIONS

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- Psychometric Properties of the SPM-P for Autism Children in Saudi Arabia. Submitted for publication *Psychometric Properties of SPM-P and SPM* (ORA approved; in data collection process). Research Presentations: Psychometric Properties of the SPM-P for ASD Children in KSA- ASD National Conference, Riyadh, April 2018.
- Assessment of Parental Acceptability and Preference for Behavioral Interventions for Childhood Problem Behavior in Saudi Arabia—2018. The study assessed the treatment acceptability and preference for common behavior management strategies with parents of children with Autism Spectrum Disorder in Saudi Arabia.
- Feasibility Of Responsive Teaching With Mothers And Young Children With Autism In Saudi Arabia. *Journal of Early Intervention* 2018 <https://doi.org/10.1177/1053815118789176>.
- Further delineation of Temtamy syndrome of corpus callosum and ocular abnormalities. Published in *American Journal of Medical Genetics*. Part A. March 2018. <http://www.ncbi.nlm.nih.gov/pubmed/29383837>.
- Validation of the Arabic version of the Social Communication Questionnaire. Mohammed Aldosari, Eric Fombonne, Hesham Aldhalaan, Mohammed Ouda, Saba Elhag, Hawraa Alshammari, Iman Ghazal, Asma Alsaleh, Tala Alqadoumi, Richard Thomson, Mohanad Al Khasawneh, Mohamed Tolefat and Fouad Alshaban. Published in *Autism Journal*, Jan 2018, <https://journals.sagepub.com/home/aut>.
- Learning by Doing and Learning by Observing: Training Parents in Saudi Arabia to Implement the Natural Language Paradigm. Ahmad M. Eid, Ohoud A. Alhaqbani, Sultana M. Asfahani, Mashail Alaql, Anoud N. Al Saud, Rafat S. Mohtasib, Hesham M. Aldhalaan, Mitch J. Fryling. Published in *Journal of Developmental Disabilities*, 2017. # Springer Science+Business Media New York 2017.
- Training Parents in Saudi Arabia to Implement Discrete Trial Teaching with their Children with Autism Spectrum Disorder. Ahmad M. Eid, Sarah M. Aljaser, Anoud N. Al Saud, Sultana M. Asfahani, Ohoud A. Alhaqbani, Rafat S. Mohtasib, Hesham M. Aldhalaan, Mitch Fryling. Published in *Behavioral Analysis Practice*, Jan 2017. *Behav Analysis Practice*. DOI 10.1007/s40617-016-0167-3
- Progressive Cavitating Leukoencephalopathy in an Infant Baby: A Case Report. *Journal of Neurology and Neuroscience*. Rayya Almarwani, Fahad Alsayed, Ehab Showki, Khalid Alahmadi, Hesham Aldhalaan, Published: Nov 09, 2018 Doi: 10.21767/2171-6625.1000274.
- Tuberous Sclerosis Complex: Clinical Spectrum and Epilepsy. A Retrospective Chart Review Study, *Translational Neurosciences Journal*, Nov 2018. Suliman Almobarak, Mohammad Almuhaizea, Musaad Abukhaled, Suad Alyamani, Omar Dabbagh, Aziza Chedrawi, Sameena Khan, Hesham Aldhalaan, RAC#2180 344. <https://www.ncbi.nlm.nih.gov/pubmed/30479846>.
- Telehealth Services For Children With Autism Spectrum Disorders In Rural Areas Of The Kingdom Of Saudi Arabia: Overview And Recommendations. Shahad Alkhalifah, Hesham Aldhalaan, Published in *JMIR Pediatrics and Parenting*. 2018 <https://doi:10.2196/11402>.
- Feasibility Of Responsive Teaching With Mothers And Young Children With Autism In Saudi Arabia. Turki Alquraini, Ali Al-Odaib, Hesham Al Dhalaan, Haniah Merza and Geral Mahoney. *Journal of Early Intervention* 2018 <https://doi.org/10.1177/1053815118789176>.





# COMPARATIVE MEDICINE DEPARTMENT

The Department of Comparative Medicine's mission is to support biomedical research and advance patient care through the provision of high quality animal modeling. Our laboratory animal modeling and care program complies with the established standards of the "Guide for the Care & Use of Laboratory Animals" in accordance with both national and international standards. The Department strives to produce novel, as well as to refine existing animal models while encouraging the use of alternatives to animal research. The department research activities focus on two main areas; infertility and reproductive health and organ transplant research utilizing various genomic and phenomic tools.

CHAIRMAN

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ABDALLAH MOHAMED ASSIRI,  
DVM, PHD

## RESEARCH ACTIVITIES

- Researchers identified that perfusion of decellularized rat liver scaffolds with gelatin hydrogels, significantly increased the number of cells that were retained in the decellularized liver scaffolds. Our results strengthened the feasibility of developing bioengineered liver surrogates utilizing decellularized liver scaffolds.
- The research team found that IL-8 plays a key role in the activation of breast CAAs, and acts as a major mediator for their paracrine pro-tumorigenic effects. Thereby, targeting CAAs through inhibiting the IL-8 pathway could be of great therapeutic value.
- Researchers showed a positive correlation between human sperm PLCzeta protein localization pattern and levels and sperm quality and healthy embryogenesis, respectively. These findings could potentially help to improve assisted reproductive technologies (ART) outcomes in human infertile patients.
- Our group has successfully established a knockout model for PLCzeta protein to study its role in successful fertilization and oocyte activation.
- We have successfully characterized Dcaf17<sup>-/-</sup> mouse model and shown that Dcaf17 is not only an essential protein for normal sperm production but a major player in protein homeostasis in the mouse testis.
- We reported that C5a signaling has potential to preserve microvasculature and rescue allograft from a sustained hypoxic/ischemic phase, limits airway tissue remodeling through the induction of Treg-mediated immune tolerance.
- Further investigation of the underlying mechanism of the cardiomyopathy caused by the FBXO32 mutation in humans. FBXO32-dependent dysregulation of the ATF2 pathway leads to a concomitant activation of the ER stress- and apoptosis- pathways in patients carrying the FBXO32 mutation.

## OTHER ACHIEVEMENTS

- Successful creation of the first animal model in Saudi Arabia using CRISPR/Cas gene editing technology
- Isolation and culture of liver organoids from mice and rats which can be used for drug discovery and tissue regeneration for the first time in Saudi Arabia
- Conducting three (3) courses in collaboration with King Saud Medical City, entitled "Advances in Surgical Hemostasis Workshop"
- Conducting a course in collaboration with King Saud bin Abdulaziz University For Health Sciences, entitled "Advanced Trauma Operative Management (ATOM) course"
- Conducting three (3) courses in collaboration with Neurosciences Department, entitled "Advanced Microsurgery Hands-on Course"

## PUBLICATIONS

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- Complement factor and T-cell interactions during alloimmune inflammation in transplantation. Khan MA, Shamma T. *J Leukoc Biol.* 2018 Dec 11. doi: 10.1002/JLB.5RU0718-288R.
- Vasculature reconstruction of decellularized liver scaffolds via gelatin-based re-endothelialization. Meng F, Almohanna F, Altuhami A, Assiri AM, Broering D. *J Biomed Mater Res A.* 2018 Dec 3. doi: 10.1002/jbm.a.36551.
- IL-8 Activates Breast Cancer-Associated Adipocytes and Promotes Their Angiogenic and Tumorigenic Promoting Effects; Al-Khalaf HH, Al-Harbi B, Al-Sayed A, Arafah M, Tulbah A, Jarman A, Al-Mohanna F, Aboussekhra A. *Mol Cell Biol.* 2018 Nov 5. pii: MCB.00332-18. doi: 10.1128/MCB.00332-18
- Effects of camel milk in dyslipidemia: A randomized clinical trial; Mohammaddin, A., Rohra, D.K., Mortaja, S., Abanmi, S., Al Saati, O., Cahusac, P.M.B., Khawaja, R.A., Al-Selaihem, A., Al-Omran, Y. Published September 2018; *International Dairy Journal* <https://doi.org/10.1016/j.idairyj.2018.03.015>.
- Selective decline in the prevalence of slowly adapting type I mechanoreceptors during development; Cahusac, P.M.B. & Senok, S.; Published August 2018; *International Journal of Developmental Neuroscience* <https://doi.org/10.1016/j.ijdevneu.2018.04.001>
- Pluripotent stem cells: induction and self-renewal. Abu-Dawud R, Graffmann N, Ferber S, Wruck W, Adjaye J. *Philos Trans R Soc Lond B Biol Sci.* 2018 Jul 5;373(1750). pii: 20170213. doi: 10.1098/rstb.2017.0213.
- 1S, 3R-ACPD; Peter M.B.Cahusac; Elsevier Reference Module in Biomedical Sciences; Published July 2018, <https://doi.org/10.1016/B978-0-12-801238-3.96907-1>
- Deletion of DDB1- and CUL4-associated factor-17 (Dcaf17) gene causes spermatogenesis defects and male infertility in mice; Asmaa Ali, Bhavesh V. Mistry, Hala A. Ahmed, Razan Abdulla, Hassan A. Amer, Abdelbary Prince, Anas M. Alazami, Fowzan S. Alkuraya & Abdullah Assiri; Published: 15 June 2018; *Scientific Reports* | (2018) 8:9202 | DOI:10.1038/s41598-018-27379-0
- Effect of Xanthine Oxidase Inhibition on Arterial Stiffness in Patients With Chronic Heart Failure; Manal M Alem, Abdullah M Alshehri, Peter MB Cahusac, Matthew R Walters *Clinical Medicine Insights: Cardiology*, 12:1-10. Published June 5, 2018; <https://doi.org/10.1177/1179546818779584>
- Pluripotent stem cells: induction and self-renewal; R. Abu-Dawud, N. Graffmann, S. Ferber, W. Wruck, J. Adjaye Published 21 May 2018.DOI: 10.1098/rstb.2017.0213 in *Journal: Philos Trans R Soc Lond B Biol Sci.*
- C5a Blockade Increases Regulatory T Cell Numbers and Protects Against Microvascular Loss and Epithelial Damage in Mouse Airway Allografts. Khan MA, Alanazi F, Ahmed HA, Vater A, Assiri AM, Broering DC.; *Front Immunol.* 2018 May 24;9:1010. doi: 10.3389/fimmu.2018.01010. eCollection 2018.
- TGFβ1-Induced Differentiation of Human Bone Marrow-Derived MSCs Is Mediated by Changes to the Actin Cytoskeleton; Elsafadi M, Manikandan M, Almalki S, Mobarak M, Atteya M, Iqbal Z, Hashmi J, Shaheen S, Alajez N, Alfayez M, Kassem M, Abu Dawud R, and Mahmood A; *Journal: Stem Cells Int.* publishing date: 2018 Feb 15;2018:6913594; PMID: 29535777

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- Metabolomics Based Profiling of Dexamethasone Side Effects in Rats. Malkawi, Abeer; Alzoubi, Karem ; Jacob, Minnie; Matic, Goran; Ali, Asmaa; Al Faraj, Achraf; Almohanna, Falah; Dasouki, Majed; Abdel Rahman, Anas; Front. Pharmacol., 16 February 2018 | <https://doi.org/10.3389/fphar.2018.00046>.
  - Whole liver engineering: A promising approach to develop functional liver surrogates; Fanwei Meng, Abdallah Assiri, Dipok Dhar, Dieter Broering; 14 May 2017; DOI: 10.1111/liv.13444
  - Cyp24a1 attenuation limits progression of BrafV600E-induced papillary thyroid cancer cells and sensitizes them to BRAFV600E inhibitor PLX4720. Zou M, Baitei EY, BinEssa H, Al-Mohanna FA, Parhar R, St-Arnaud R, Kimura S, Pritchard CA, Alzahrani AS, Assiri AM, Meyer B, Shi Y. Cancer Res. 2017 Feb 27. pii: canres.2066.2016. doi: 10.1158/0008-5472.CAN-16-2066. [Epub ahead of print], PubMed PMID: 28242615.

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## LABORATORY ANIMAL SERVICES (LAS)

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### HEAD

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FALAH ALMOHANNA, DVM,  
MSC

### MEMBERS – KFSHRC-SITE

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ROLANDO MONZAGA  
PIO OLIVERAS  
ALBERTO CAPUNO  
BAHAA SALEM  
TALAL ALASMARI

### MEMBERS – KFNCCC-SITE

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WILFREDO ANTIQUERA  
BALTAZAR CADUCIO  
MONA SALEH  
MOHAMED TAHA NUR  
MICHAEL GUITTAP

The LAS maintains quality laboratory animals and provides associated technologies for basic and translational research that is undertaken by scientists and physicians. The LAS maintains animal well-being and ensures that prudent, ethical and scientific use of animals is in accordance with both national and international guidelines. The LAS staff is committed to implement CMD health and biosecurity program which is integral component of providing quality services.



Animal Technician checks animal health.



Animal Technician operates the Sterilizer.



Animal Technician changes soiled cages.

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## EXPERIMENTAL SURGERY AND DIAGNOSTIC IMAGING

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### HEAD

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GORAN MATIC, DVM

### MEMBERS

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FARRAJ ALSAMER

LUDIMINA APILADO, RN

SAHAR SALEM, RN

State-of-the-Art experimental surgical facilities that are designed to perform acute, survival procedures and cadaver dissections for research and training purposes. The section provides a unique opportunity for surgeons and researchers to develop and refine surgical skills and to explore new innovations. The section consists of veterinary anesthetists, perfusionist, surgeons and nurses. The section operates 2 large animal surgical theaters, 3 rodent surgical procedure rooms and microsurgery theater with 7 stations. The diagnostic imaging section is equipped with X-ray and ultra-sound.



CMD Operating Room Theater.



Microsurgery Course.



Cardiovascular Training.



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## COMPARATIVE PATHOLOGY AND DIAGNOSTIC LABORATORY

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### ACTING HEAD

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ABDULLAH ASSIRI, DVM, PHD

### MEMBERS

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HALA AHMED

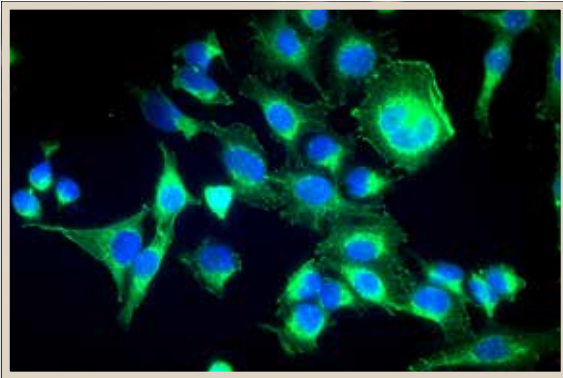
The section aids investigators to characterize pathological progress of natural and/or induced diseases in animal models. This section offers complete animal health screening, histology, clinical pathology and diagnostic services for laboratory animals that are used in biomedical research and training at KFSH&RC. The section plays important role on implementing KFSHRC animal biosecurity and environmental screening as part of quality assurance practice.



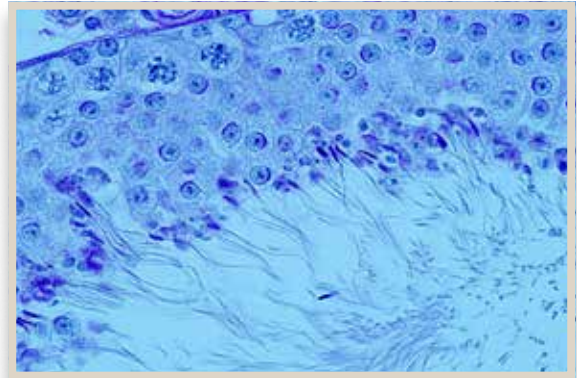
Leica Microtome.



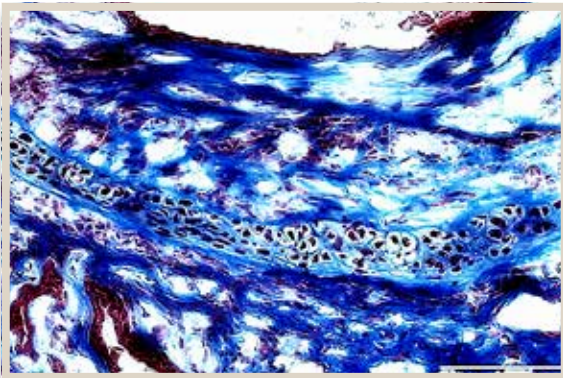
Histology Staining Machine.



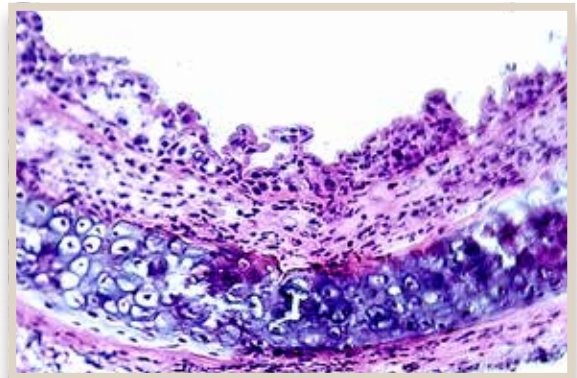
A549 Cell Stained by PRAME antibody.



PAS Staining of Acrosome in Testis.



Trachea Masson Trichrome Stain.



H&E staining of Trachea after Transplant.

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## COMPARATIVE FUNCTIONAL GENOMICS

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### HEAD

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ABDULLAH ASSIRI, DVM, PHD

### MEMBERS

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RAED ABU DAWUD, MSC, PHD

BHAVESH MISTRY, MSC, PHD

NADYA YACOUB, PHD

MOHAMED RAJAB

RAZAN ABDULLAH

MAHA ALANAZI

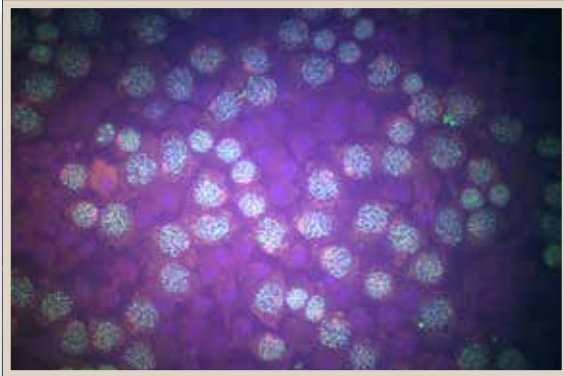
The section strives to characterize natural and/or induced animal models of physiological relevancy for important health problems such as infertility, endocrine disrupters, cancer, genetics, cardiovascular diseases and diabetes. The section provides various phenomic and genomic tools to investigate existing and emerging model organisms to address unique Saudi population diseases. We are currently working to investigate role of DDB1-CULL4A Associated Factor 17 (DCAF17) in spermatogenesis as potential mouse model for human azoospermia. In addition, the section is developing mouse genetic engineering to produce novel animal models for human diseases and assisted reproductive technologies for colony health, management and biobanking.



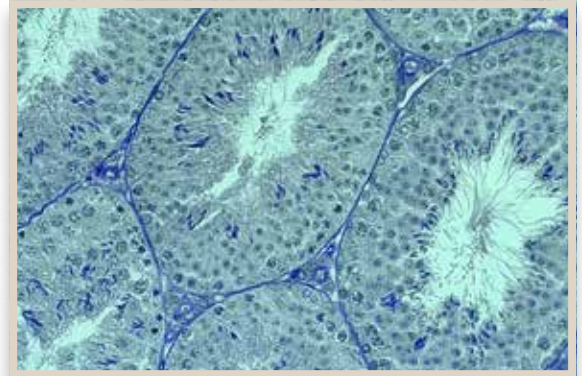
Staff member measures nucleic acid concentration using Nanodrop.



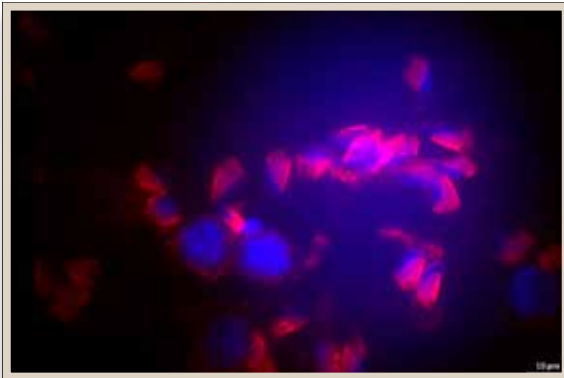
Staff member prepares polymerase chain reaction (PCR).



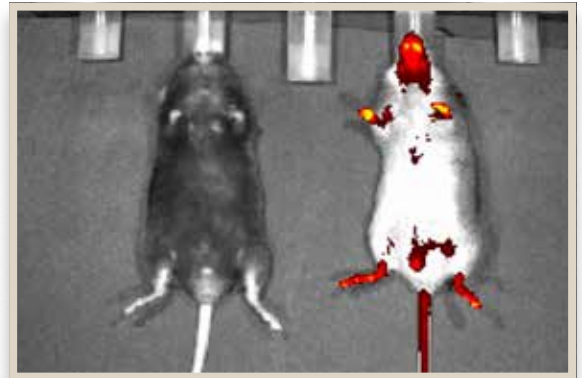
Immunofluorescence staining of mouse testis.



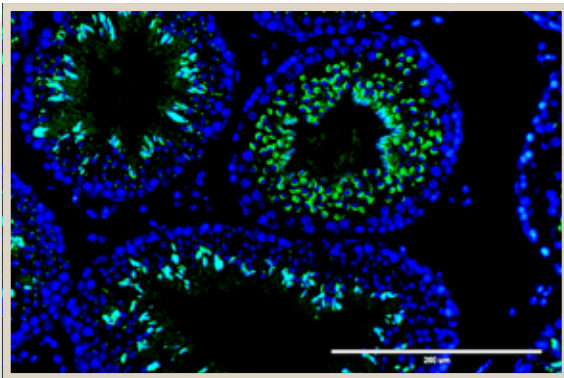
Periodic acid-Schiff (PAS) staining of mouse testis.



Immunofluorescence images in wild type mouse testicular cells.



Fluorescence images of wild type (WT) and chimeric (Ch) mice.



Immunofluorescence staining of mouse testis.

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## ORGAN TRANSPLANT RESEARCH

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### HEAD

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PROF. DIETER BROERING, MD,  
PHD, MBA, FEBS

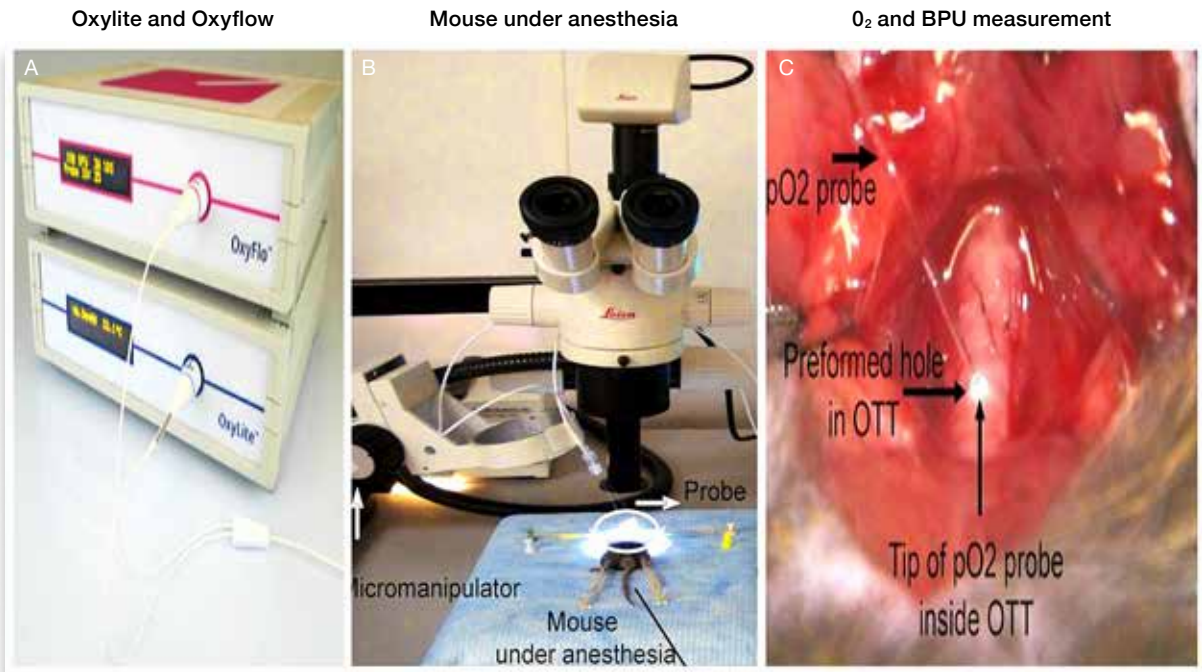
### MEMBERS

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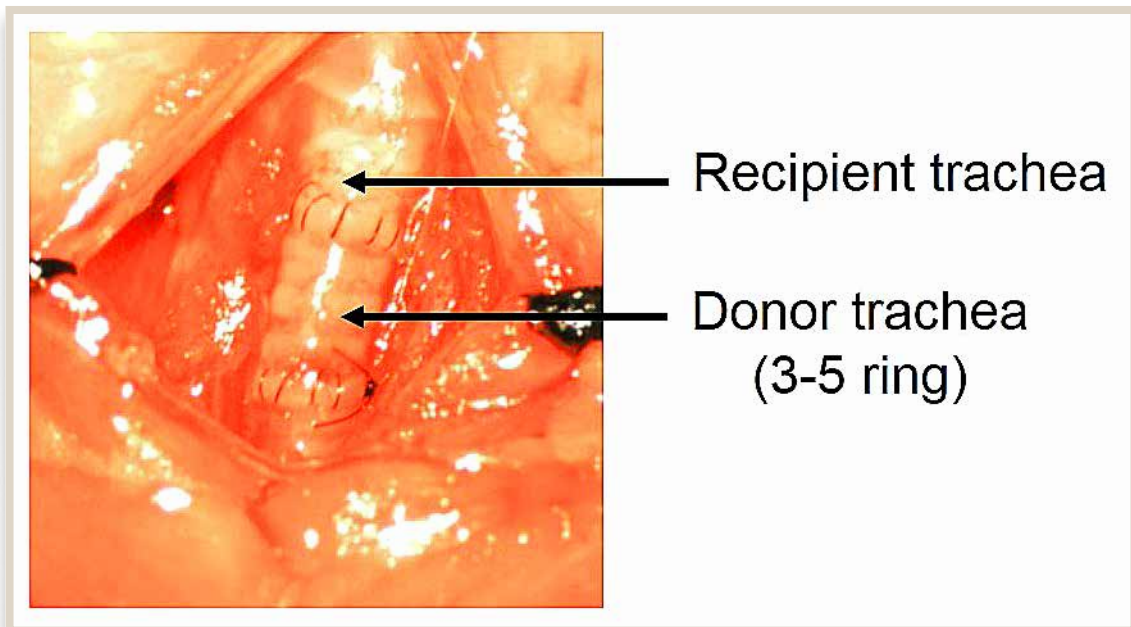
MOHAMMAD KHAN, MSC,  
PHD  
SHADAB KAZMI, PHD  
ABDULLAH ALTUHAMI

The Organ Transplant Research Section was established to provide basic transplantation research using molecular, cellular and animal models including non-human primates, and to extrapolate basic research findings into translational research with clinical applications. Ongoing projects including novel concepts of liver regeneration, tissue engineering, organ transplant immunological modulation and organ re-conditioning will develop innovative treatment modalities for patients with terminal organ failure.





Oxylite and Oxyflo based live assessment of tissue blood and oxygen levels during transplantation.



Mouse model of Orthotopic Trachea Transplantation.



Decellularized liver scaffold.



Recellularized liver scaffold.

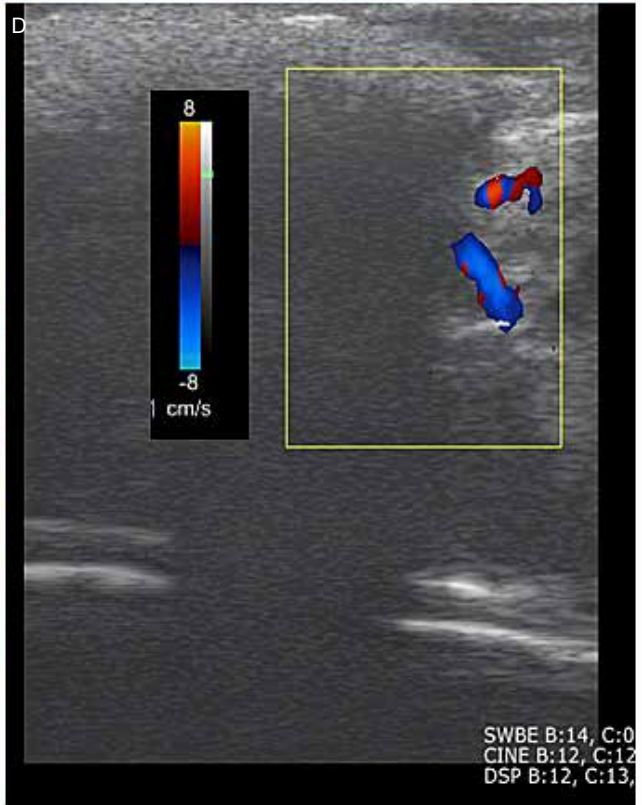
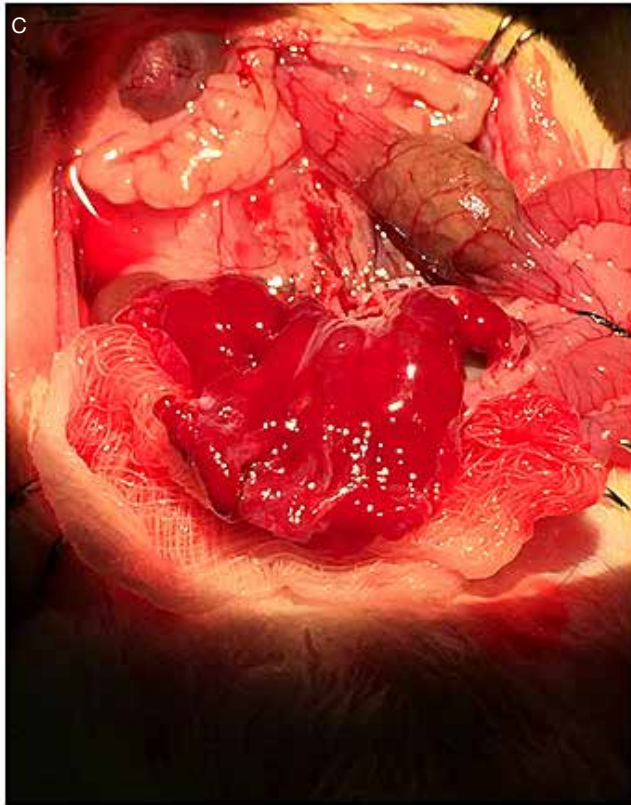
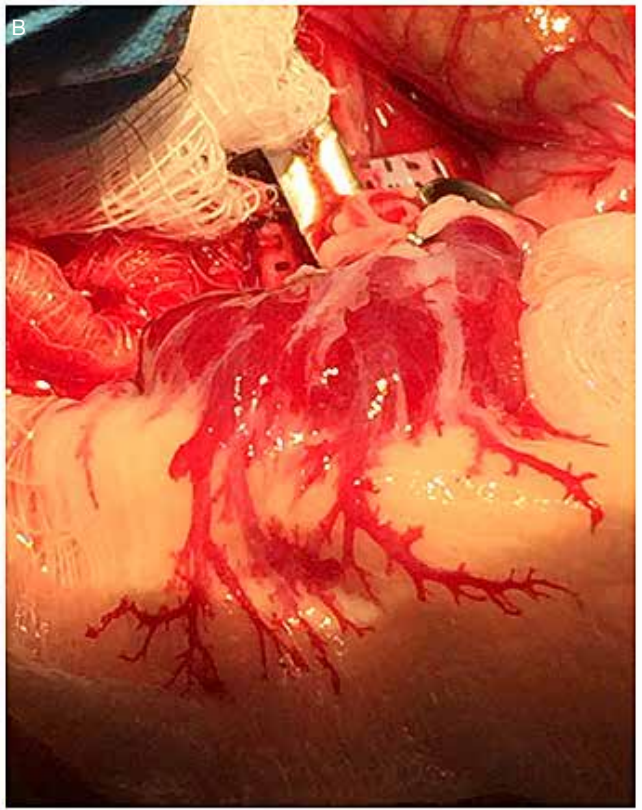
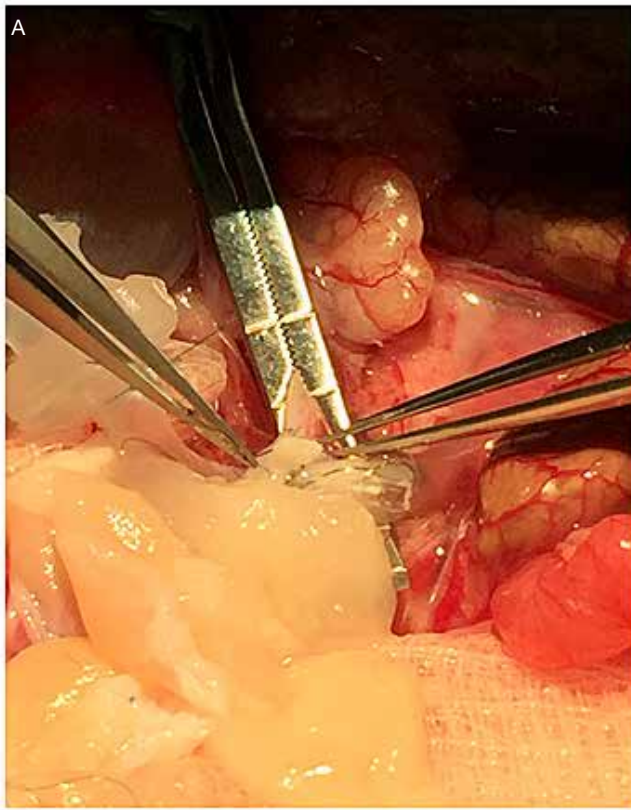


Blood distribution pattern in re-endothelialized.



Blood distribution pattern in decellularized liver scaffold.





(A) Transplantation of re-endothelialized liver scaffold. (B) Blood from the recipient rat entering the re-endothelialized liver scaffold. (C) Re-endothelialized liver scaffold filled with blood from the recipient rat. (D) Ultrasound imaging showing active arterial and venous flows in the re-endothelialized liver scaffold 1 hr following transplantation.



# CYCLOTRON & RADIOPHARMACEUTICALS DEPARTMENT

The Department of Cyclotron & Radiopharmaceuticals (C&R) practically functions as a small-scale pharmaceuticals manufacturing facility and performs two distinct functions in the Research Center: Radiopharmaceuticals manufacturing; and Radiotracer Research. The C&R Department holds an unparalleled position within the Research Centre, and indeed in the entire region. Uniqueness of this Department comes from its function of manufacturing a wide range of radiopharmaceuticals that are indispensable tools for diagnostic medical imaging and radiotherapy. Radiopharmaceuticals are distinctive pharmaceutical products labeled with radioisotopes of selective nuclear and physical characteristics. And, among these are the specialty products that are manufactured only in a cyclotron (a particle accelerator), which offer the safe diagnosis of a number of serious, life-threatening diseases including cancer.

The Department operates three (3) cyclotrons and a comprehensive manufacturing program and also engages in hypothesis driven research in developing radiotracers designed specifically for probing biochemical and physiological processes at the molecular level. These molecules hold a great promise in the design of new molecular radiopharmaceuticals for diagnosis and treatment of various diseases.

An overwhelming aim of the C&R Department is to make the Kingdom self-sufficient in all its radiopharmaceutical needs. Therefore, several new products are added at regular intervals. As a result, some 50 nuclear medicine centers in the Kingdom and abroad rely upon products manufactured in the C&R production facility. An obvious requirement for pharmaceutical manufacturing is the adherence to the national and international guidelines of Good Manufacturing Practices (GMP). C&R Department manufacturing protocols are not only designed to adhere to the regulatory requirements but also follow the ISO 9001:2015 Quality Management System for further quality enhancement.

On the research and development front, achievements include not only the customary extramural research grant funds and large number of international publications and presentations, but also the production and quality assurance protocols for new radiotracers, and indigenously fabricated complex devices for manufacturing radioisotopes and radiopharmaceuticals. The exceptional R&D efforts are ultimately leading towards ever more comprehensive radioisotope and radiopharmaceuticals manufacturing within the C&R Department and also resulting in significant cost saving for the Hospital.

CHAIRMAN

IBRAHIM AL JAMMAZ, PHD,  
FRSC

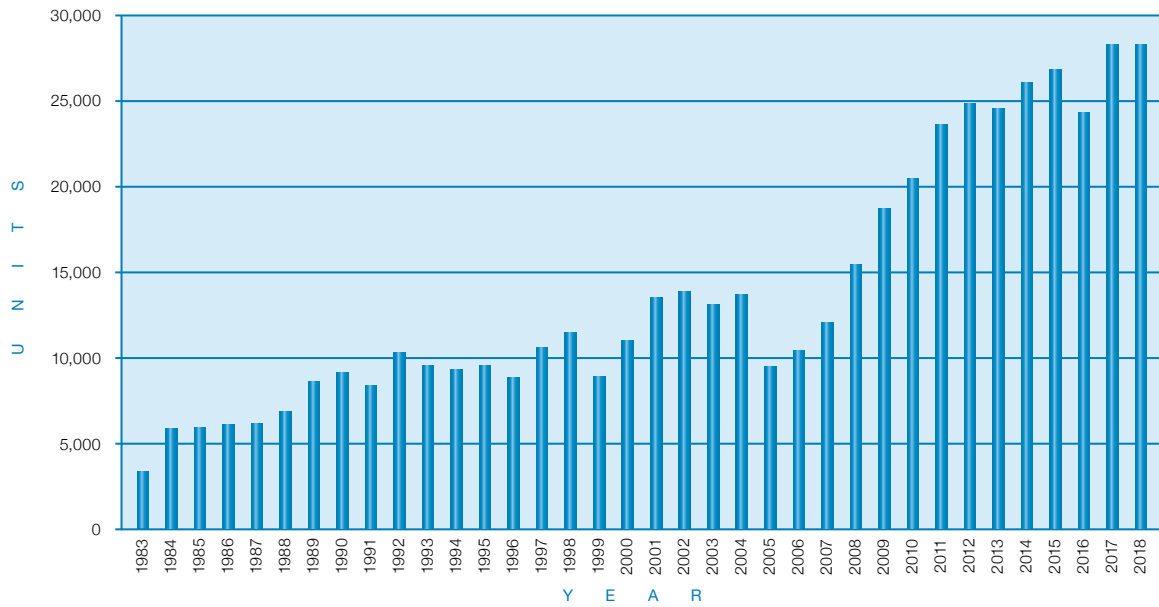
## ACHIEVEMENTS

- Participating in the Hospital Transformation program as a project owner entitled “Emerging Radiopharmaceuticals Production for Delivering Precision Medicine”.
- Cyclotron Section has developed a cooling system for PET target associated with the C-30 Cyclotron
- Achieving the Quality Management System objectives of radioisotopes production (January–December 2018):
  - Radiopharmaceuticals distribution of over 1, 200 numbers of batches produced;
  - Customer satisfaction of 96.6%;
  - Processes control of 99.5%;
  - Quality Specifications Achieved by 99.8%
- High throughput of F-18 Flurodeoxyglucose (FDG) Injection (January–December 2018):
  - Over 7000 Unit Doses of F-18 FDG delivered to KFSH&RC PET-CT Centers;
  - Over 7000 Unit Doses of F-18 FDG supplied to national PET-CT Centers
- Successful production and distribution of 25, 504 unit doses, generating revenues of ~28 million Saudi Riyals.
- Two new PET radiotracers have been developed and validated, and are being utilized for patient use:
  - a) Ga-68 PSMA
  - b) Ga-68 DOTA-TATE
- These tracers can be utilized for diagnosis of breast, prostate and neuroendocrine cancers.
- Cyclotron section has developed a newer version of the Krypton target system which is able to produce high activity of Krypton-81m through  $\text{natKr}(p, xn)^{81}\text{Rb}$  reaction. Application of the daughter Kr-81m is to perform perfusion studies in nuclear medicine departments. Target volume is 400 mL and is able to produce 4.0 mCi/ $\mu\text{A}\cdot\text{hr}$ .

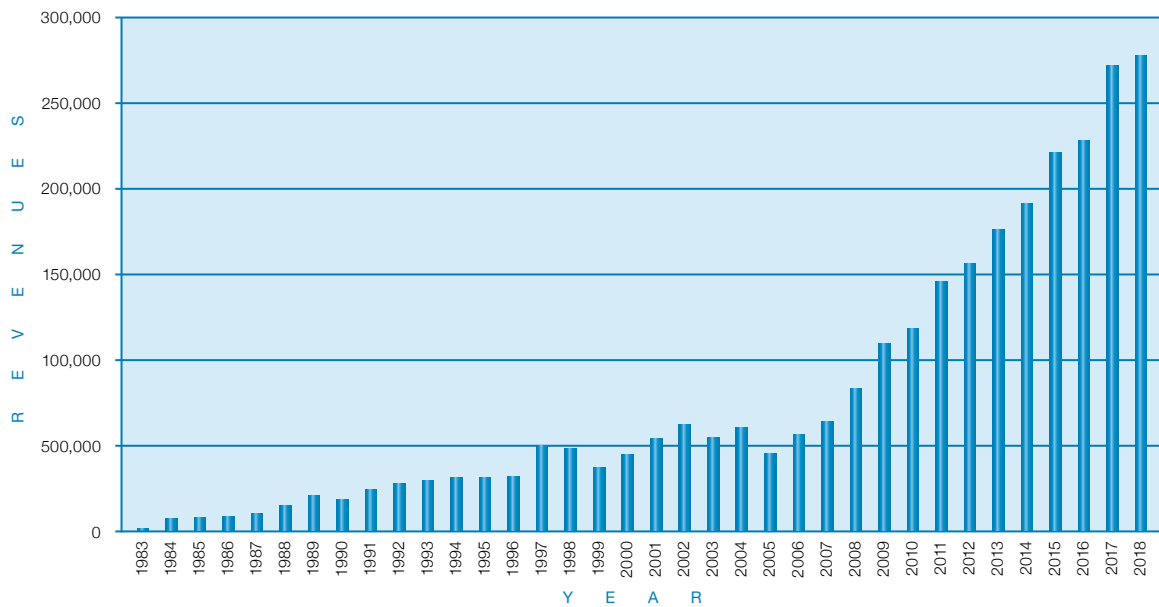
## OTHER ACHIEVEMENTS

- Novel  $^{177}\text{Lu}$  based therapeutic radiopharmaceuticals are under development, namely:
  - Lu-177 PSMA
  - Lu-177 DOTA-TATE
- National Production of Zirconium-89 for Tumor Imaging and Immunotherapy Planning
- Production and Utilization of Positron Emitters Copper-64/67 for Diagnostic and Therapeutic Applications.
- Radiolabeled Bioactive Peptides: Potential Molecular Targeting Radiopharmaceuticals for Cancer Imaging and Therapy
- Saudi Reference Laboratory for Cyclotron Research and its Medical Application, National Science, Technology and Innovation Plan.

### TOTAL UNITS PRODUCED



### TOTAL REVENUES GENERATED



## PUBLICATIONS

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- Subhani M. Okarvi, Ibrahim AlJammaz: Preparation and In Vitro and In Vivo Characterization of the Tumor-specific Antigen-derived Peptide as a Potential Candidate for Targeting Human Epidermal Growth Factor Receptor 2-positive Breast Carcinomas. *Anticancer Research* 38: 2823-2830 (2018).
- I. AlJammaz, B. Al-Otaibi and S. Okarvi, Synthesis of novel gallium-68 labeled rhodamine: A potential PET myocardial perfusion agent. *Applied Radiation & Isotopes* 8, 144:29-33 (2018).
- Mohammed Al-Qahtani, Yousif Al Malki, Hadeel Mutwali, Edward Helal-Neto and Ralph Santos-Oliveira, Ga-68 Nanoparticles and Ultra-small Nanoparticle: Next Generation of PET Radiopharmaceuticals, *Current Radiopharmaceuticals* 11, 123-129 (2018).
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- S.M. Okarvi, I. AlJammaz: Total solid-phase synthesis of DOTA-Functionalized tumor targeting peptides for PET imaging and therapy. *Eur. J. Nucl. Med. Mol. Imaging* (2018).
- S.M. Okarvi, I. AlJammaz: Characterization of a <sup>68</sup>Ga-labeled Angiotensin peptide coupled to Rhodamine for diagnostic imaging of heart. *Eur. J. Nucl. Med. Mol. Imaging* (2018).
- I. AlJammaz, S.M. Okarvi: Fast Radiofluorination and Characterization of a Novel Hybrid Peptide Analogs Based on Mucin and Folic Acid: Potential Breast/ovarian Cancers PET Imaging Agent. *Eur. J. Nucl. Med. Mol. Imaging* (2018).
- S.M. Okarvi, I. AlJammaz: Development and evaluation of a <sup>68</sup>Ga-labeled Angiotensin peptide coupled to Rhodamine for diagnostic imaging of heart. *American Journal of Nuclear Cardiology* (2018).
- S.M. Okarvi, I. AlJammaz: Effectiveness of intratumoral injection over intravenous administration of <sup>177</sup>Lu-labeled bombesin peptide for targeting breast cancer in xenografted mice models. *J. of WFNMB* (2018).
- S.M. Okarvi, I. AlJammaz: Preparation and preclinical evaluation of a novel HER2-targeted combo peptide for diagnostic imaging of HER2-positive breast cancers. *J. of WFNMB* (2018).

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- H. Kassim, S. Alhomaidi, K. Kezzar, I. Aljammaz, F. Alrumayan, "Detection and Measurement of the Background Radiation from CS30 Cyclotron", Journal of Radiation Measurement (In press).
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  - Mohammed Al-Qahtani, Hadeel Mutwali and Yousif Al-Malki (2018), "Radioiodination of Small Molecules and Short Peptides; the Effect of Oxidant Reagents Choice on the Radiochemical Yields", EJNMMI Radiopharmacy and Chemistry 2018, 3(Suppl 1):PP19, 24.
  - Mohammed Al-Qahtani, Yousif Al-Malki, Hadeel Mutwali and Mohei-Eldin Abouzied, (2018), "The Use of Nano-Sized Particles in Labelling New Class of Radiopharmaceuticals", EJNMMI Radiopharmacy and Chemistry 2018, 3(Suppl 1):PP20, 24.
  - Yousif Al-Malki, and Mohammed Al-Qahtani (2018), "Biological Investigations of a laminin Class Peptide that has a potential as a Diagnostic and Therapeutic Properties", EJNMMI Radiopharmacy and Chemistry 2018, 3(Suppl 1):PP21, 25.
  - Hadeel Mutwali, Yousif Al-Malki and Mohammed Al-Qahtani, (2018), "68Ga–Radiolabeling of Short Peptide with DOTA-NHS-ester investigated by HPLC", accepted for the 5<sup>th</sup> International Conference on Radiation Medicine (ICRM2018) held in KFSHRC, Riyadh, Saudi Arabia. 11 – 15 Feb.

#### BOOK CHAPTERS:

- S.M. Okarvi, H.R. Macke Radiolabelled peptides in Medical Imaging. Peptide Applications in Biomedicine, Biotechnology and Bioengineering. Woodhead Publishing – Elsevier Ltd. (2018).



# DEPARTMENT OF GENETICS

Centrally supported research programs and core services are hallmarks of the Department of Genetics. A primary objective of research undertaken in the department is to identify genes underlying Mendelian diseases. This is an important national objective as the incidence of these disorders in Saudi Arabia are 3-5 fold greater than the global rate and is a consequence of consanguineous or endogamous marriages which are common in the Kingdom. The social and economic cost of these disorders is very high. In economic terms each affected individual may cost the healthcare system in the order of SAR 5,625,000-37,500,000 each year. In a nation such as Saudi Arabia where there are >500,000 live births each year several thousand infants with Mendelian diseases are born annually. For these disorders, often there is no effective treatment and “prevention is the best cure”. Prevention is dependent on identifying the underlying cause(s) of each Mendelian disease in KSA. Many Mendelian diseases or mutations underlying them encountered in KSA are novel and will only be identified through local research efforts. In this regard KSA requires self-dependence and cannot rely heavily on research undertaken internationally. The Department of Genetics at KFSHRC is the ONLY entity in KSA that has effectively engaged this objective and can document the success of its research programs and importantly the translation of these to better therapeutic, diagnostic, screening and preventative applications. The participation of the Department in the Saudi Human Genome Program is a key factor in this regard. Much of the research conducted in the department utilizes cutting edge technologies provided through core facilities for sequencing, genotyping and nucleic acid extraction. In this regard the department also plays a major role in capacity building, training and education.

CHAIRMAN

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BRIAN F. MEYER, PHD

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## RESEARCH ACHIEVEMENTS

- Seventy-eight (78) scientific publications.
- More than 3,500 clinical exomes identifying 165 novel recessive candidate genes and confirming 69 previously reported candidate genes.
- Development of a custom microarray containing in excess of 2,500 pathogenic variants from the Saudi population to be utilized for carrier frequency estimations and pre-marital screening.
- Establishment of portals for Molecular Diagnostic testing, genomic sequencing and pre-marital screening.
- Establishment of a Saudi variant database resulting from the sequencing and analysis of >30,000 samples.
- Validation of two clinical oncology panels for profiling of adult and pediatric cancers.
- Development of a Flash Exome service with a TAT of 36 hours .

## OTHER ACHIEVEMENTS

- Development of two Arab specific custom microarrays for biobanking and pre-marital screening respectively.
- Clinical Genomics sub-initiative of KFSH&RC proposed, approved and being directed through the Department of Genetics.
- Hosted the KFSH&RC Precision Medicine 2018 Symposium.



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HEAD

NADA AL TASSAN

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## BEHAVIORAL GENETICS RESEARCH UNIT

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The main aim of the unit is to explore the molecular basis of complex disorders by studying multiplex families, where trait segregates, as well as sporadic single cases. Our research interests span many diseases and syndromes, including neurodegeneration, neurodevelopment, eye and reproductive system disorders.

In our laboratory we employ various Next generation sequencing platforms through the SHGP to identify novel causative and predisposing disease genes/mutations. We also optimize pre-designed and customized gene panels covering a wide range of diseases in order to be incorporated into routine diagnostic tests.

Beyond genetic screening, we dedicate our efforts to functionally characterize the identified mutations in the relevant *in vitro* systems in order to understand disease mechanisms. The ultimate goal of our research is to understand the molecular underlying mechanisms of these complex disorders and to contribute to the improvement of clinical diagnosis, genetic testing and counseling for affected individuals and families in Saudi Arabia.

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## RESEARCH ACHIEVEMENTS

- Grant with RAC# 2110035/ (NCPST KACST Project 11-BIO1440-20), Dr. Nada Al-Tassan as PI.
- Dr. Bashayer Mubarak was granted 1 year post-doctoral/ fellowship Oxford University.
- Dr.Mubarak was awarded a 3 month grant from KACST for a joint project in oxford (2015).
- KACST Grant 324-م.ص 37 (KACST Grant Fund (324-37)- RAC#2160018, "Development of Primary Neuronal and Glial Cultures for In Vitro Genetic and Pharmacological Studies of Neurological Disorders", Dr. Bashayer Mubarak, as PI.
- Funding from KACST stem cell program (project 20-0115)/ collaborator, Dr. Bashayer Mubarak.

### 5 Significant Publications

- Mustafa, A. E., T. Faquih, B. Baz, R. Kattan, A. Al-Issa, A. I. Tahir, F. Imtiaz, K. Ramzan, M. Al-Sayed, M. Alowain, Z. Al-Hassnan, H. Al-Zaidan, M. Abouelhoda, B. R. Al-Mubarak and N. A. Al Tassan (2018). "Validation of Ion Torrent(TM) Inherited Disease Panel with the PGM(TM) Sequencing Platform for Rapid and Comprehensive Mutation Detection." *Genes* (Basel) 9(5).
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- Khan, A. O., J. M. Shinwari and N. A. Al-Tassan (2016). "Exotropic Duane syndrome with synergistic divergence and no mutations in COL25A1." *J AAPOS* 20(6): 542-544 e542.

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- Maddirevula, S., S. Alsahli, L. Alhabeeb, N. Patel, F. Alzahrani, H. E. Shamseldin, S. Anazi, N. Ewida, H. S. Alsaif, J. Y. Mohamed, A. M. Alazami, N. Ibrahim, F. Abdulwahab, M. Hashem, M. Abouelhoda, D. Monies, N. Al Tassan, M. Alshammari, A. Alsagheir, M. Z. Seidahmed, S. Sogati, M. S. Aglan, M. H. Hamad, M. A. Salih, A. A. Hamed, N. Alhashmi, A. Nabil, F. Alfadli, G. M. H. Abdel-Salam, H. Alkuraya, W. O. Peitee, W. T. Keng, A. Qasem, A. M. Mushiba, M. S. Zaki, M. R. Fassad, M. Alfadhel, S. Alexander, Y. Sabr, S. Temtamy, A. V. Ekbote, S. Ismail, G. A. Hosny, G. A. Otaify, K. Amr, S. Al Tala, A. O. Khan, T. Rizk, A. Alaqeel, A. Alsiddiky, A. Singh, S. Kapoor, A. Alhashem, E. Faqeih, R. Shaheen and F. S. Alkuraya (2018). "Expanding the phenome and variome of skeletal dysplasia." *Genet Med* 20(12): 1609-1616.
- Mustafa, A. E., T. Faquih, B. Baz, R. Kattan, A. Al-Issa, A. I. Tahir, F. Imtiaz, K. Ramzan, M. Al-Sayed, M. Alowain, Z. Al-Hassnan, H. Al-Zaidan, M. Abouelhoda, B. R. Al-Mubarak and N. A. Al Tassan (2018). "Validation of Ion Torrent(TM) Inherited Disease Panel with the PGM(TM) Sequencing Platform for Rapid and Comprehensive Mutation Detection." *Genes (Basel)* 9(5).
- Tanskanen, T., L. van den Berg, N. Valimaki, M. Aavikko, E. Ness-Jensen, K. Hveem, Y. Wettergren, E. Bexé Lindskog, N. Tonisson, A. Metspalu, K. Silander, G. Orlando, P. J. Law, S. Tuupainen, A. E. Gylfe, U. A. Hanninen, T. Cajuso, J. Kondelin, A. P. Sarin, E. Pukkala, P. Jousilahti, V. Salomaa, S. Ripatti, A. Palotie, H. Jarvinen, L. Renkonen-Sinisalo, A. Lepisto, J. Bohm, J. P. Mecklin, N. A. Al-Tassan, C. Palles, L. Martin, E. Barclay, A. Tenesa, S. M. Farrington, M. N. Timofeeva, B. F. Meyer, S. M. Wakil, H. Campbell, C. G. Smith, S. Idziaszczyk, T. S. Maughan, R. Kaplan, R. Kerr, D. Kerr, D. D. Buchanan, A. K. Win, J. Hopper, M. A. Jenkins, P. A. Newcomb, S. Gallinger, D. Conti, F. R. Schumacher, G. Casey, J. P. Cheadle, M. G. Dunlop, I. P. Tomlinson, R. S. Houlston, K. Palin and L. A. Aaltonen (2018). "Genome-wide association study and meta-analysis in Northern European populations replicate multiple colorectal cancer risk loci." *Int J Cancer* 142(3): 540-546.

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## COGNITIVE GENETICS RESEARCH UNIT

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HEAD

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NAMIK KAYA MSc, PhD

Recent progress in molecular biology particularly in genetics is reshaping the perception and practice of neurology, psychiatry, and behavioral sciences. The application of the new molecular biology techniques such as high-density microarrays and next-generation sequencing to the field of genetic diseases of nervous system and related fields has greatly accelerated our understanding of the mechanisms and pathophysiology of such diseases affecting human body and perception. The elucidation the fundamental causes of these genetic diseases and disorders has proved to be more intricate; but striking progress has been made recently.

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## RESEARCH ACHIEVEMENTS

- Dr. Kaya wrote/participated/received three grants as PI (~6 million SAR), two as Co-PI (~4million SAR), and three as Co-I (~6 million SAR).
- Dr. Kaya is a member of Plos-One Journal's Editorial Board and Ad-Hoc reviewer of 13 prestigious journals such as Neurology, AJMG, and Genomics.
- Dr. Kaya submitted/got approval four new projects as PI, one as Co-PI; maintained nine active projects as PI and Co-PI, and two as Co-I (ORA).
- Students/trainees in the section received one 1<sup>st</sup> place, one 2<sup>nd</sup> place award (AlFaisal University/Research Day) three 1<sup>st</sup> place (KSU/Research Day), two 1<sup>st</sup> places in international conferences.
- The section mentored 3 PhD, 9 MSc, 6 BSc students (graduation thesis), 13 MDs, medical students/fellows, 14 Genetics Counseling Students (AlFaisal-MSc Program) during 2014-2018.
- Trained 3 international students and 47 local students under Training and Education Office and 10 students under AlRazi, Mawheeba, and Future Scientist Programs.
- Produced/signed hundreds of research-based genetic-testing/mutation reports, designed/tested clinically important assays especially for mitochondrial and metabolic analyses. His results have been frequently used for IVF-PGD.

## PUBLICATIONS

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- Kaya N, Alsagob M, D'Adamo MC, Al-Bakheet A, Hasan S, Muccioli M, Almutairi FB, Almass R, Aldosary M, Monies D, Mustafa OM, Alyounes B, Kenana R, Al-Zahrani J, Naim E, Binhumaid FS, Qari A, Almutairi F, Meyer B, Plageman TF, Pessia M, Colak D, Al-Owain M. KCNA4 deficiency leads to a syndrome of abnormal striatum, congenital cataract and intellectual disability. *J Med Genet*. 2016 Aug 31. pii: jmedgenet-2015-103637. doi: 10.1136/jmedgenet-2015-103637. [Epub ahead of print] PMID:27582084 (Received KFSH&RC Best Publication Award).
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## DEVELOPMENTAL GENETICS

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HEAD

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FOWZAN S ALKURAYA

The Developmental Genetics is mainly focused on understanding the molecular genetic control of human development by studying the genetics of human malformation syndromes. Specifically, we are involved in the identification of single gene defects that lead to developmental anomalies by exploiting cutting edge techniques and the special nature of our study population. This work is extremely important academically as it represents important contribution to the functional annotation of the human genome, a daunting but necessary task if we are to unlock the mysteries of the human genome and how it controls normal human embryogenesis. In addition, our research helps families afflicted with these Mendelian forms of developmental anomalies by facilitating the molecular diagnosis, a pre-requisite to the implementation of preventive genetic services, which represents a direct translational benefit of our work.

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## RESEARCH ACHIEVEMENTS

- Development of the clinical next-generation sequencing platform at MDL, which transformed this lab's annual revenues from <7million to >70million.
- Development of expanded premarital screening program for the thousands of established Saudi mutations.

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## FIRST ARABIAN HEREDITARY DEAFNESS UNIT

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HEAD

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FAIQA IMTIAZ AHMAD

The main research aspect of the FAHD unit in the Department of Genetics, is to try and identify known and novel genes causing hereditary non-syndromic and syndromic hearing loss in the Saudi Arabian population (RAC# 2100 001, KSCDR & KACST). We have further our focal research aspect to study inherited kidney diseases (RAC#2160 022) and inherited bleeding disorders (RAC#2160 026). We are also co-investigators in a number of RAC approved projects, e.g. investigating the molecular basis of familial pulmonary fibrosis, congenital glucose-galactose malabsorption, phenylketonuria and thalassemia in Saudi Arabian patients. We have active collaborations with various departments (Medical Genetics, Pediatrics, Medicine, OB/GYN, Hematology, Pathology DPLM and Gastroenterology) and as a direct result we are significantly involved in providing a primary platform for the design, validation and implementation of molecular diagnostic testing for a large number of inherited diseases of clinically diagnosed patients at KFSH&RC. To date, we have initiated, performed and reported in excess of 1500 patients and their families with over 160 different genetic diseases now available at KFSH&RC. In particular, 65 of these genetic tests are designed to molecularly characterize inherited errors of metabolism. In 2017, under the supervision of Dr. Faiqa Imtiaz, the Molecular Diagnostic Laboratory (MDL) successfully performed and reported over 850 prenatal molecular diagnostic tests for over 170 different genetic diseases. Our ultimate goal is to help lay the foundation for preventative measures including carrier testing, counseling, prenatal diagnosis, pre-implantation genetic diagnosis and pre-marital screening.

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## RESEARCH ACHIEVEMENTS

- From 2014–2018, Dr. Ahmad signed out on approximately 2,400 prenatal genetic testing reports as part of a diagnostic service originating from the Department of Genetics.
- From 2014–2018, Dr. Ahmad signed out on approximately 500 molecular genetic research reports that have arisen due to the results of basic research in my laboratory.
- From May 2017 to December Dr. Ahmad analyzed and signed out approximately 1,800 Gene Panel Reports.
- From 2014 to 2018 the unit/laboratory has hosted a very large number of summer/trainees/Al-Razi, etc. students.

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HEAD

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YUFEI SHI

## GENE THERAPY

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Gene Therapy Unit is currently conducting experimental gene therapy research on thyroid cancer, elucidating molecular defects leading to thyroid tumorigenesis, and molecular genetic analysis of genes involved in endocrine disorders. Significant progress has been made on each front. We have established a mouse model of spontaneous thyroid papillary cancer and demonstrated that IL-12 immunotherapy is effective against papillary thyroid cancer (PTC). We have also demonstrated that thyroid stimulation hormone (TSH) has played a significant oncogenic role in promoting thyroid tumorigenesis and preventing oncogene-induced senescence (OIS). Finally, we have demonstrated that the vitamin D metabolizing enzyme Cyp24a1 functions as an oncogene to promote malignant progression of BRAF<sup>V600E</sup>-induced thyroid cancer and resistance to BRAF inhibitor 2 treatment, offering a mechanistic rationale for targeting Cyp24a1 to improve cancer treatment.

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## RESEARCH ACHIEVEMENTS

- Obtained 3 major grants from KACST with total funding of SR 5,327,000.00.
- Identification of SLC26A7 as a novel gene in thyroid hormone synthesis, 7 months earlier than a larger group from Oxford university and University of Chicago.
- Cyp24a1 is an oncogene whose overexpression promote thyroid cancer progression.



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- TSH overcomes BrafV600E -induced senescence to promote tumor progression via down-regulation of p53 expression in papillary thyroid cancer. Zou M, Baitei EY, Parhar RS, Al-Mohanna FA, Kimura S, Pritchard C, BinEssa HA, Alanazi AA, Al-zahrani AS, AlKhalaf, H, Hawwari A, Akhtar M, Assiri AM, Meyer BF, and Shi Y. *Oncogene* 35:1909-18, 2016
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- Phenotype Heterogeneity of Congenital Adrenal Hyperplasia due to Genetic Mosaicism and Concomitant Nephrogenic Diabetes Insipidus in a Sibling. Kor Y, Zou M, Al-Rijjal RA, Monies M, Meyer BF, and Shi Y. *BMC Med Genet.* 2018 Jul 11; 19 (1):115. doi:10.1186/s12881-018-0629-2. PMID: 29996815



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HEAD

ANAS M ALAZAMI, PHD

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## IMMUNOGENETICS

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Our section concentrates on the genetic causes of immunodeficiency in Saudi Arabia. Dysregulation of a wide array of immune system genes can lead to many debilitating outcomes such as immunodeficiency, cancer and autoimmunity. Through the use of high throughput genotyping, and targeted next generation sequencing (gene panels and exome analysis) we aim to identify deleterious mutations that are segregating in the population. Our cases range from severe combined and combined variable immunodeficiency to the hyper-immunoglobulinopathies to autoimmune disease, as well as disorders with sizeable overlap across disciplines. This extensive collection is exciting as it provides us with the opportunity, not only of offering service to patients and their families, but also to focus on novel findings for immune genes which have not yet been linked to a specific disorder, for the wider benefit of the clinical and scientific communities.

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## RESEARCH ACHIEVEMENTS

- Four prizes, 2015 Publication of the Year Award, KFSH&RC, 14 April 2016.
- One prize, 2014 Publication of the Year Award, KFSH&RC, 15 April 2015.

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## NEWBORN SCREENING & BIOCHEMICAL GENETICS LAB (NSBGL)

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MAJED DASOUKI, MD

NSBGL is a clinical biochemical diagnostic & screening lab which performs a variety of clinically oriented biochemical genetic assays as well as newborn screening for many inborn errors of intermediary metabolism. In 2017, we screened 94205 Saudi newborns compared with 88896 newborns in 2016! We also conduct research in biochemical genetic disorders & develop new assays to be implemented in expanded newborn screening. We educate our clients (referring hospitals, labs & physicians) on the process of newborn screening & biochemical genetic testing. We also provide training rotations for young Saudi laboratory technicians as well as clinical genetics fellows who typically rotate in the lab for 2 weeks which enables them to become familiar with spectrum of biochemical genetic assays & how they relate to clinical care.

## RESEARCH ACHIEVEMENTS

- Performed newborn screening on 94205 babies and identified 47 new babies with 1 of 17 metabolic disorders the program screens for.
- Performed 8479 diagnostic biochemical studies on patients known or suspected of having various inborn errors of metabolism.
- Developed the first LC-MS/MS based comprehensive targeted metabolomics panel.
- Development of Population-Based Newborn Screening for primary Immunodeficiency Diseases in Saudi Arabia. Hamoud Al-Mousa, Abbas Hawwari, Majed Dasouki. KACST funded project [#13-BIO755-20]. Completed.
- The Genetics of Aplastic Anemia in Saudi Arabia. Majed Dasouki, Fahd Almohareb, Hazza Alzahrani, Syed Osman Ahmed, Mahmoud Aljurf. KACST funded project [#13-BIO1978-20] project. Completed.

## OTHER RESEARCH ACHIEVEMENTS

- Immunological and Molecular Newborn Screening for Cystic Fibrosis Disease Enforced with Metabolomics. Amal Saadallah. Majed Dasouki. KACST Funded project [#15-MED5443-20]. Ongoing.
- Development of Novel Biosensor Microarray for the Rapid Screening for CF, DMD, SMA. Mohammed Mahmoud Zourob, Anas AbdelRahman, Majed Dasouki. KACST funding (pending).
- Biomarker and Therapeutic Target Discovery in patients with Hyper IgE Conditions. Anas Mahmoud Abdel Rahman, Majed J. Dasouki, Hamoud Abdulkareem Almousa. KACST funding (pending).

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## SEQUENCING CORE FACILITY

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HEAD

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DOROTA MONIES, PHD

The DNA Sequencing Facility uses state-of-the-art technology and methodology to produce high quality DNA sequences in a time span of 2-3 business days. DNA samples are sequenced using BigDye Terminator chemistry and resolved on the ABI 3730xl DNA Analyzer. BigDye Terminator chemistry utilizes ddNTPs that are labeled with a fluorescent dye specific for each nucleotide, allowing sequencing in one reaction tube. All sequencing reactions are set up robotically using Beckman Automated Workstation (Biomek NX) and cycled on a high capacity thermal cyclers (ABI 2720 ). The sequences are then run on the ABI 3730xl DNA Analyzers (5 instruments). The ABI 3730xl uses a capillary electrophoresis system that creates a sensitive detection system, long sequence reads (up to a 1000 bases for high quality DNA), short run times, and low operating/reagent costs. The ABI 3730xl DNA Analyzer is an automated system (sample loading, separation matrix preparation, and sequence analysis) which coupled with the facility's liquid handling robot, dramatically reduces the introduction of human error. The Unit is involved in a broad range of medical scientific and diagnostic work, contributing to most of the research projects carried out in the Department of Genetics. Core cooperates with 85 researches within the Research Center.

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## RESEARCH ACHIEVEMENTS

- Sequencing Core Facility (SCF): the Unit is involved in a broad range of medical scientific and diagnostic work, contributing to most of the research projects carried out in the Department of Genetics. In addition, the Core provides the service to ~100 researches within the Research Center. In 2014-2018 we generated approximately 20,000 genotyping results and more than 2 000 000 sequencing reads with an average time span of 2-3 days.
- Equine DNA fingerprinting as a part of the Saudi Diagnostic Lab: provides genetic molecular testing for parentage verification of Arabian horses to the King Abdulaziz Arabian Horse Center which is the sole authority in the KSA for registration of all Arabian horses in the country. In 2014-2018 the lab performed more than 10 000 fingerprinting and parentage tests.
- Saudi Human Genome Program (SHGP): I took a central role in this national program. The SHGP has facilitated enormous amount of research, building a database of variants in the Saudi population which is a crucial component to research, diagnostic and other clinical activities at KFSHRC and beyond.
- Molecular Diagnostic Laboratory (MDL): I am responsible for clinical sequencing of Gene Panels and whole exome sequencing. My responsibility extends beyond wet lab procedures and involves the analysis and reporting of patient samples.
- Flash Exome: I have recently introduced this procedure for critically ill babies from NICU and other urgent medical situations. The whole procedure including lab work, analysis and reporting is undertaken in 36 hours. I am the PI of a project approved by ORA (RAC#2170 028).
- Training for junior staff: over 5 years, through the SCF and SHGP I have overseen the technical training of over 100 students and graduates in the many different components of sequencing technologies.

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# ENVIRONMENTAL HEALTH PROGRAM

The Environmental Health Program (EHP) continues its mission and focus on monitoring and assessing environmental pollutants that have a potential impact on the general population with a particular emphasis on children and women. The EHP research activities concentrate on three interactive areas: Biomonitoring Studies; Exposure Risk Assessment and Biochemical Toxicology. The program continues collaborating productively with our clinical colleagues to promote public awareness of the implications of our research findings for improved clinical management. We also continue to offer opportunities for both in-house and postgraduate training and collaborations with local academic institutions. This report describes the progress of our ongoing projects, identifying 2017-2018 significant accomplishments.

DIRECTOR

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IMAN AL-SALEH

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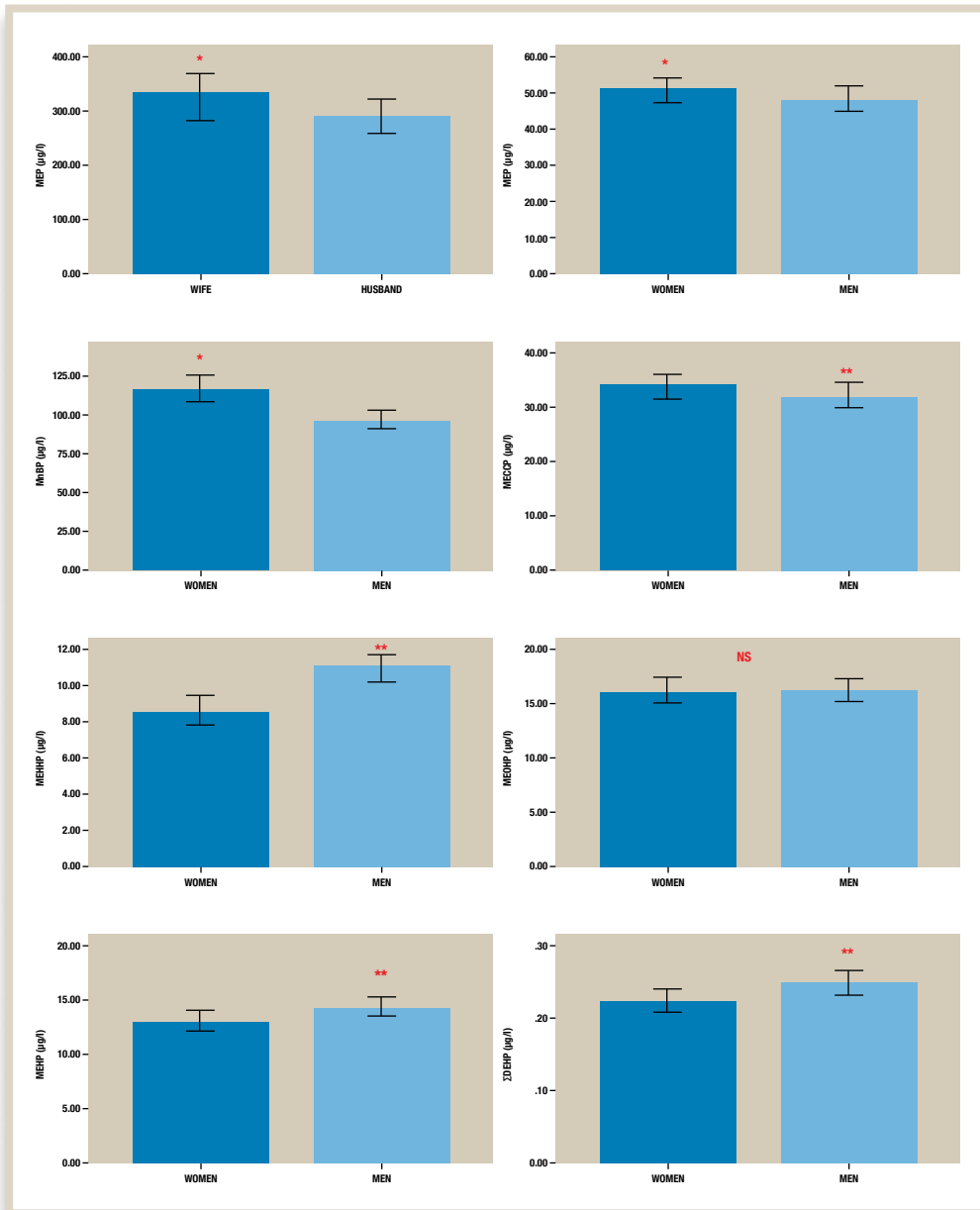
## RESEARCH ACTIVITIES

- The completion of the KACST funded project: Consequences of oxidative DNA damage induced by phthalates exposure on the outcome of *in vitro* fertilization treatment (RAC # 2131024: KACST # ARP-34-27). Investigators: Iman Al-Saleh, Coskan Serdar, Saad Alhassan.
- We found couples seeking *in vitro* fertilization at KF&RC were exposed to a broad range of phthalate compounds (Figure 1). Oxidative stress and DNA damage in follicular fluid and seminal plasma were also elevated. Associations between specific urinary phthalate metabolites and the risk of certain IVF outcomes were noted with specific oxidative stress/DNA damage biomarkers played a mediator role in the relationship between phthalate exposure and IVF outcomes.
- We also observed that higher urinary levels of phthalate metabolites in men seeking infertility treatment than values reported in other countries. Sperm concentration was associated positively with DEHP metabolites, but negatively with %MEHP. We also observed inverse associations between certain metabolites and reproductive hormones such as testosterone (TEST) and follicle stimulating hormone (FSH), whereas %MEHP was associated positively with FSH and luteinizing hormone (LH). FSH mediated significantly up to 60% of the positive relationship between sperm concentration and MEHP, while FSH and LH mediated respectively 15 and 12% of the inverse association between sperm concentration and %MEHP (Figure 2).
- Our *in vitro* experiments tested 33 different brands of e-liquids and found the majority induced substantial DNA damage and chromosome breakage in the human-derived TK6 cells measured respectively by the comet assay and the MN assay. Though the presence of nicotine in e-liquids did not play a major role in inducing DNA damage and chromosome breakage, we noted that genotoxicity was linked to different flavors, suggesting that the presence of certain ingredients with mutagenic/genotoxic properties that need to be identified.
- The approval of the following project: “Maternal exposure to plasticizers (phthalates & bisphenol A) and its link to autism spectrum disorders: A prospective cohort by King Salman Center for Disability Research and approved with a total fund of SR600,000. RAC# 2180 005. Investigators: Iman Al-Saleh, Maha Alnemr Abdullah Alkhenizan Hesham Aldhalaan and Mohamed Shoukri.

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## OTHER ACHIEVEMENTS

- Alqudaihi G, Al-Rajudi T, Elkhtaib R, Pulicat M, Almugbel S, Bin MummerA, Al-Saleh I., Al-Saleh I. Genotoxicity induced by different brands of e-cigarette liquids presented at the World Congress on Toxicology held in Dubai, UAE, December 3-4, 2018. Best Poster Awardee\_Toxicology\_Dubai\_2018.pdf.
- Three rounds of Hands-on course on BASIC CELL CULTURE TECHNIQUES: total number of participants = 10
- Two articles received Best Publication Award during the 2017 Research Annual Report.



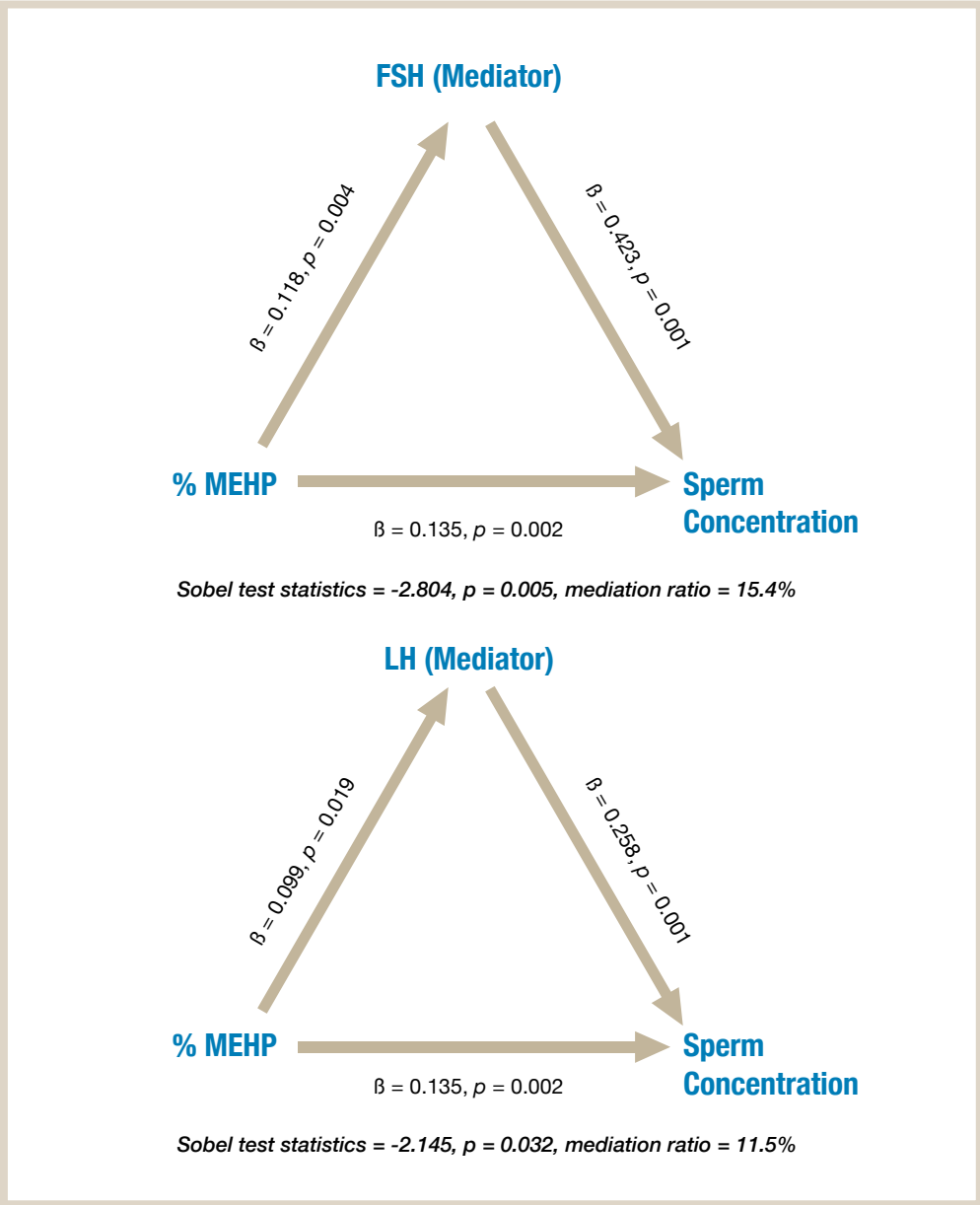


Figure 2

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- Al-Saleh I, Elkhatib R, Al-Rouqi R, Abduljabbar M, Eltabache C, Al-Rajudi T, Nester M. Alterations in biochemical markers due to mercury (Hg) exposure and its influence on infant's neurodevelopment. *International Journal Hygiene Environmental Health*. 2016;219(8):898-914.
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- Al-Saleh I, Coskun S, Al-Doush I, Al-Rajudi T, Abduljabbar M, Al-Rouqi R, Palawan H, Al-Hassan S. The relationships between urinary phthalate metabolites, reproductive hormones and semen parameters in men attending *in vitro* fertilization clinic(ScienceofTotalEnvironment<https://www.sciencedirect.com/science/article/pii/S0048969718351349?via%3Dihub>).

# DEPARTMENT OF INFECTION AND IMMUNITY

The Department of Infection and Immunity (DII) constitutes four research sections, namely Immunocompromised Host (IH), Microbial Pathogenesis (MP), Molecular Virology (MV), and Mycobacteriology (MB). In the IH Section, we define the molecular pathways of HIV-1/2. In the MP Section, research is ensuing on the search for drugs and/or vaccine targets and on the genetic response of *Plasmodium falciparum* to drug treatment. DNA fingerprinting of bacteria causing nosocomial infections is offered as a service to the hospital. In the MV Section, our research activities focus on blood-borne hepatitis viruses (HBV and HCV), human papillomaviruses (HPV), and seasonal respiratory viruses. HPV association with cervical cancer will at the molecular level is being investigated. The immunobiology and genomics of blood-borne hepatitis viruses are intensely studied. In the MB Section, molecular studies on *Mycobacterium tuberculosis* and non-tuberculous mycobacterial infections are conducted to elucidate the strains found in the community and in various populations, as well as investigating the anti-tuberculosis drug resistance.

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## CHAIRMAN

AHMED A. ALQAHTANI, PHD

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## MEMBERS

MOHAMMED N. AL-AHDAL  
SAHAL A. AL-HAJJOJ ALNAKHLI  
MAHA A. AL-MOZAINI  
FATIMAH S. AL-HAMLAN  
ALWALEED A. ALAIDAN  
SUHAIR M. ABOZAIID  
DAMIAN DELA CRUZ  
MARIE FE BOHOL  
IBTEHAG ALSHARIF  
BRIGHT VARGHESE  
MASHAEL AL-ANAZI  
MAUREENE DELOS-REYES  
HADEEL KHAYAT (GRANT)  
HUDA ALHOWAIL (GRANT)  
ALI ABDULGADIR ALI (CONTRACT)

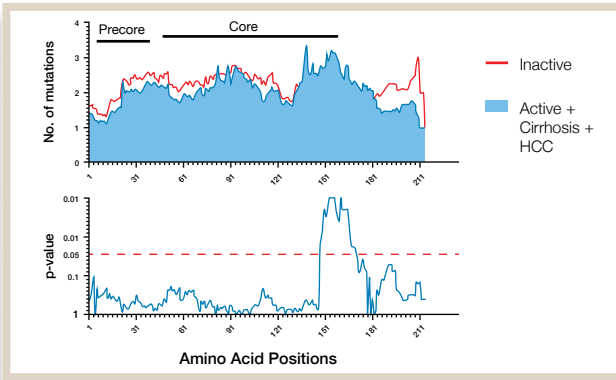
## RESEARCH ACHIEVEMENTS

- Specific preC/C mutations of HBV were determined and will be useful for predicting clinical outcomes and identifying the HBV-infected patients within the Saudi population at high risk of developing hepatocellular carcinoma.
- Based on our recent results on Human Papillomavirus (HPV), our group was granted a national fund from KACST to conduct a National Screening of HPV Prevalence and Genotype distribution in Saudi Arabia: A Multi-Center Based study.
- Assay for HIV-2 viral load was ordered by physician for their patients. This method was developed in DII and will serve as a diagnostic tool for physicians for better patient care and treatment. The work was submitted to Journal of Virological Methods for publication.
- A recombinant fragment of human SP-D protein can down-regulate pro-inflammatory milieu encouraged by influenza A virus that otherwise causes aberrant inflammatory cell recruitment leading to cell death and lung damage.
- Over 1, 241 cervical specimens were screened to uncover HPV prevalence and its association with cervical cancer. The results showed high prevalence of HPV, urging scientists to conduct large scale studies to cover all 13 health provinces in Saudi Arabia.
- A project focusing on HIV pathogenesis was finalized. The role of SAMHD1 in HIV-2 (Vpx) gene expression and its relation to HIV-2 pathogenesis was established and submitted for publication.
- *Mycobacterium riyadhense* was identified as a newly emerging non-tuberculous mycobacterial species, which is highly confined to the Saudi nationals and caused several pulmonary and extrapulmonary cases.

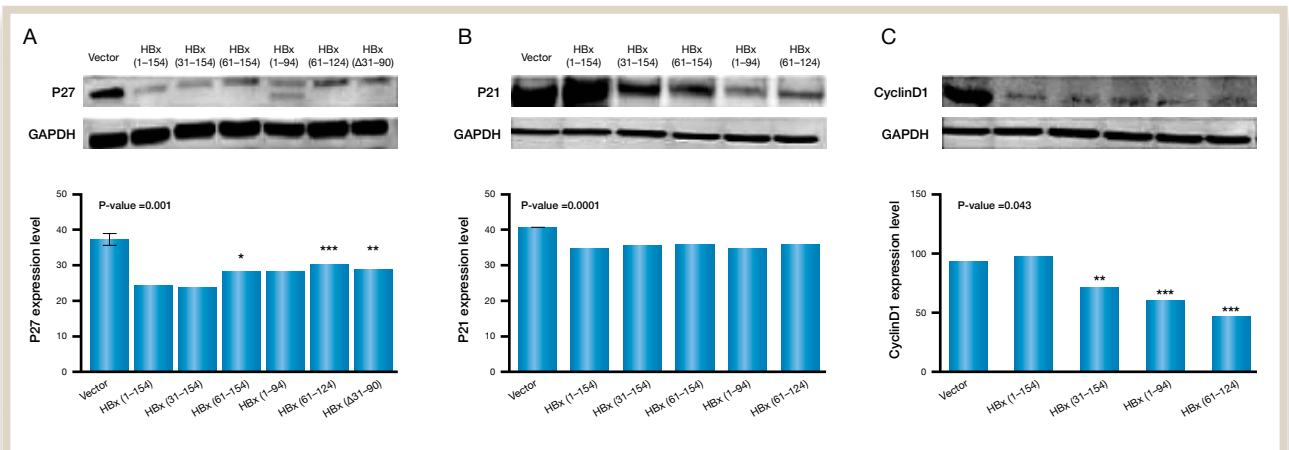
## OTHER ACHIEVEMENTS

- Ultrasensitive digital droplet PCR assay for the quantification of HIV-2 plasma RNA. GCC Patent application number 4401931009.
- Performing molecular diagnostic techniques for virus identification and quantification.
- Presentations in various national and regional meetings by scientific staff members of DII.
- Eisenhower Fellowship Award 2018 in Women's Health Research, USA.
- Organizer and Moderator, Second Combined Gulf Cancer Conference. Riyadh, Saudi Arabia. 27–29 March 2018.

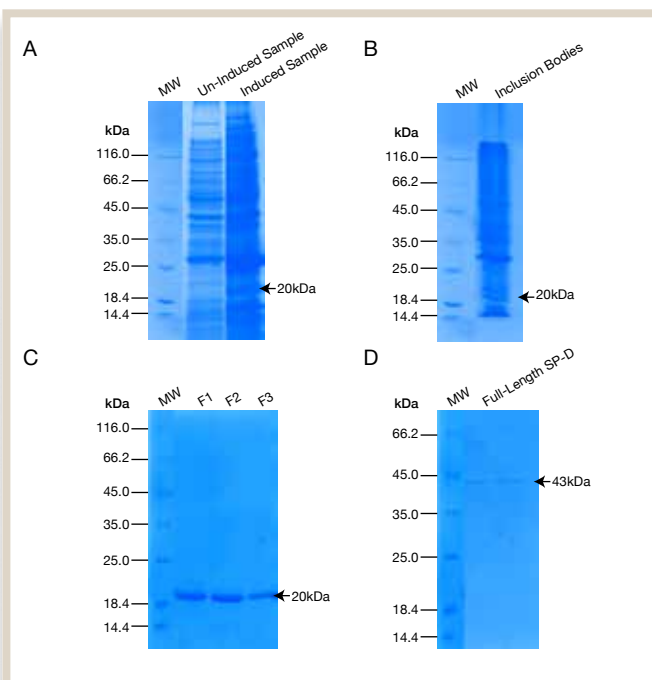




Sliding-window analysis for the differences in amino acid changes between the inactive and active+ cirrhosis+ hepatocellular carcinoma groups in HBV infected patients. The first panel shows the mean number of amino acid mutations of inactive (red line) and active+ cirrhosis+HCC (shaded in blue) in each sliding window of 30 amino acids.



Effect of X gene product of HBV on cell cycle regulators as examined by Western blot analysis. (A) Expression of p27, (B) Expression of p21, and (C) Expression of cyclin D1. Huh7 cell cultures were transfected with empty PEGFP-C1 vector, GFP-tagged HBx wild-type, and GFP-tagged HBx mutants.



SDS-PAGE under reducing conditions (12% v/v) showing expression and purification of recombinant surfactant protein D (rhSP-D). Homotrimeric neck and CRD regions from recombinant fragment of human SP-D was expressed using Escherichia coli BL21 (λDE3) pLysS. (A) Followed by induction with 0.5mM IPTG, (B) the bacterial cells were lysed and sonicated. The insoluble rhSP-D from inclusion bodies was refolded and (C) the peak fraction was further purified using maltose agarose column and rhSP-D is evident at 20kDa; (D) Full length human SP-D molecule expressed in HEK cell is evident at 43kDa as a monomer.

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# HUMAN CANCER GENOMIC RESEARCH

Human Cancer Genomic Research (HCGR) focuses on the dysregulation in various genes and signaling pathways in those cancers that are most prevalent in the Kingdom of Saudi Arabia, including papillary thyroid carcinoma, CRC, breast cancer, ovarian cancer, endometrial cancer etc. The scientists and other researchers of HCGR perform high-quality translational research utilizing state-of-the-art technologies, including next-generation sequencing technology, to identify molecular and genetic characteristics that may be playing a role in the pathogenesis of these cancers and to investigate the function of genes that have been implicated in the pathogenesis of various malignancies.

The researchers at HCGR continue to pursue these challenges by performing translational studies to identify molecular and genetic variations that may play a role in pathogenesis of these cancers. As a part of the ICGC-ARGO project, we continue to identify new genomic drivers in thyroid cancer, to help improve understanding and clinical management of this disease in Saudi Arabia. The Consortium is dedicated to generate high-quality genomic data on more than 25, 000 tumors for up to 50 types of cancer that are of clinical and societal importance across the globe. HCGR leads the initiative to analyze papillary thyroid cancer, which is the second most common cancer among women in Saudi Arabia.

DIRECTOR

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KHAWLA AL-KURAYA, MD FCAP

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## RESEARCH ACHIEVEMENTS

- In 2018, as part of the ICGC-ARGO project, we collected 23 PTC fresh tissues which will be subjected to sequencing analysis to better understand the molecular pathogenesis of these tumors.
- In 2018, we performed Sanger sequencing analysis on more than 60, 000 amplicons from various tumor types to generate important genetic information.
- In 2018, we performed functional validation of therapeutic targets in breast, colorectal and papillary thyroid cancer cell lines for our various projects. We also studied the role of PARP and XIAP over-expression in breast cancer tumorigenesis using xenograft model.
- In 2018, tissue microarray construction was done for 637 samples consisting of tumor tissues from various organ sites. 4500 tissue punches from formalin fixed paraffin embedded (FFPE) tissues were used for DNA extraction.
- Identification prevalence, spectrum and novel founder mutations of BRCA1 gene and BRCA2 gene in epithelial ovarian cancer from Middle East was estimated. These identifications might facilitate genetic counseling, risk assessment and development of cost effective screening strategy epithelial ovarian cancer patients and their relatives in Middle East region.
- Identified that TERT promoter mutation was an independent predictor of disease-free survival and might drive the metastasis, and downregulation of TERT could potentiate antitumor and anti-metastatic activities in PTC.
- Investigated TERT promoter mutation analysis among 2100 samples from 13 different types of cancers and demonstrated that TERT promoter mutations were frequent events in several types of cancers in Middle Eastern population and could be utilized as useful biomarker in cancer diagnosis and outcome prediction.

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## OTHER ACHIEVEMENTS

- International Patent Application No.: PCT/EP2017/070242. Gene Panel For Identifying A Predisposition For Inherited Cancer .
- GCC Patent Application No.: 2018/35820. Gene Panel For Identifying A Predisposition For Inherited Cancer.
- Saudi Arabia Patent Application No.: 118390778. Gene Panel For Identifying A Predisposition For Inherited Cancer.

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- FoxM1 is an independent poor prognostic marker and therapeutic target for advanced Middle Eastern breast cancer. Siraj AK, Pratheeshkumar P, Parvathareddy S, Qadri Z, Thangavel S, Ahmed S, Al-Dayel F, Tulbah A, Ajarim D, Al-Kuraya K. *Oncotarget*. 2018 Apr 3;9(25):17466-17482.
- Downregulation of SKP2 in papillary thyroid cancer acts synergistically with TRAIL on inducing apoptosis via ROS. J Clin Pratheeshkumar P, Siraj AK, Divya S, Parvathareddy S, Begum R, Melosantos R, Al-Sobhi S, Al-Dawish M, Al-Dayel F, Al-Kuraya KS. *Endocrinol Metab*. 2018 Apr 1;103(4):1530-1544. doi: 10.1210/jc.2017-02178.
- Telomerase Reverse Transcriptase Mutations are Independent Predictor of Disease-Free Survival in Middle Eastern Papillary Thyroid Cancer. Bu R, Siraj AK, Divya SP, Yan K, Parvathareddy S Alrasheed M, Alobaisi K, Victoria I, Alsobhi SS, Al-Dawish M, Al-Dayel F, Al-Kuraya K. *Int J Cancer*. 2018 May 15;142(10):2028-2039. doi: 10.1002/ijc.31225. Epub 2017 Dec 29.
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- FoxM1 and  $\beta$ -catenin predicts aggressiveness in Middle Eastern Ovarian cancer and their co-targeting impairs the growth of ovarian cancer cells. Pratheeshkumar P, Divya SP, Parvathareddy S, Al-Badawi I, Tulbah A, Al-Dayel F, Siraj AK, Al-Kuraya K. *Oncotarget*. 2017 Dec 16;9(3):3590-3604. doi: 10.18632/oncotarget.23338.
- Expanding the spectrum of germline variants in cancer. Siraj AK, Masoodi T, Bu R, Parvathareddy SK, Al-Badawi IA, Al-Sanea N, Ashari LH, Abduljabbar A, Alhomoud S, Al-Sobhi SS, Tulbah A, Ajarim D, Alzoman K, Aljuboury M, Yousef HB, Al-Dawish M, Al-Dayel F, Alkuraya FS, Al-Kuraya KS. *Hum Genet*. 2017 Nov;136(11-12):1431-1444. doi: 10.1007/s00439-017-1845-0. Epub 2017 Oct 3.
- XIAP over-expression is an independent poor prognostic marker in Middle Eastern breast cancer and can be targeted to induce efficient apoptosis. Hussain AR, Siraj AK, Ahmed M, Bu R, Pratheeshkumar P, Alrashed AM, Qadri Z, Ajarim D, Al-Dayel F, Beg S, Al-Kuraya KS. *BMC Cancer*. 2017 Sep 11;17(1):640. doi: 10.1186/s12885-017-3627-4.
- The role of HER2 overexpression in Middle Eastern papillary thyroid cancer. Siraj AK, Beg S, Jehan Z, Prabhakaran S, Al Sobhi S, Al-Dawish M, Al-Nuaim A, Al-Dayel F, Sauter G, Al-Kuraya K. *Transl Cancer Res* 2017;6(2):366-373.
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- Identification of Novel BRCA Founder Mutations in Middle Eastern Breast Cancer Patients Using Capture and Sanger Sequencing Analysis. Bu R, Siraj AK, Al-Obaisi KA, Beg S, Al Hazmi M, Ajarim D, Tulbah A, Al-Dayel F, Al-Kuraya KS. *Int J Cancer*. 2016 Sep 1;139(5):1091-7. doi: 10.1002/ijc.30143. Epub 2016 May 3.
  - Reply to specific gene patterns and molecular pathways related to human carcinogenesis in different populations among various geographic locations. Siraj AK, Beg S, Al-Kuraya KS. *Cancer*. 2016 Apr 1;122(7):1135-7. doi: 10.1002/cncr.29904. Epub 2016 Feb 5.



# MOLECULAR BIOMEDICINE PROGRAM

The Molecular BioMedicine Program objective is to investigate molecular mechanisms of diseases and develop necessary tools with potential translational outcome in therapy or in medical biotechnology. The program currently focuses on a medically important family of genes associated with regulating mRNA stability and translation which are perturbed as a result of disease. The program has a unique and internationally well-known research platform which is applicable to several chronic disease conditions that impact the health care in Saudi Arabia including inflammatory, infectious, and cardiovascular diseases, and cancer.

DIRECTOR

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KHALID S. ABU KHABAR, PHD

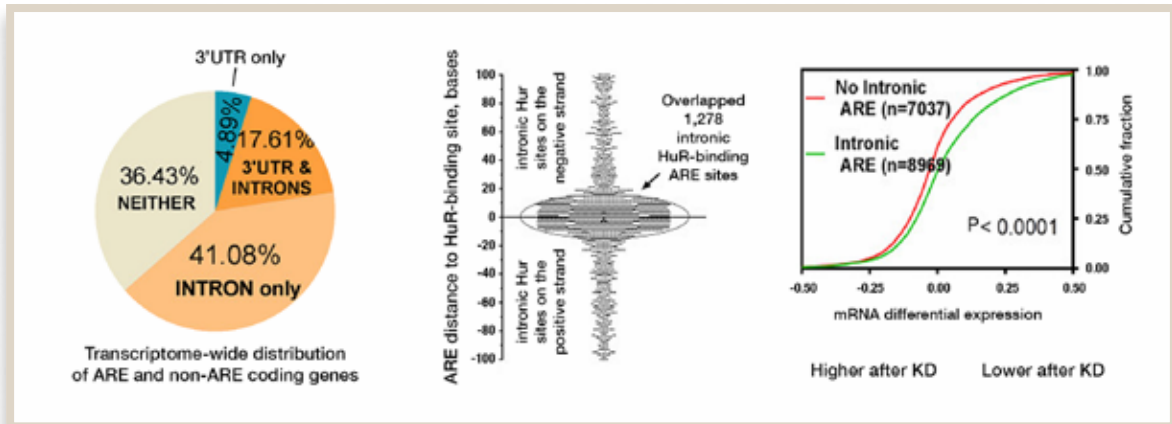
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## RESEARCH ACHIEVEMENTS

- AU-rich elements (AREs) in the 3'UTR of many genes are critical for normal cellular functions and aberrations in their activity are found in diseases conditions such as cancer and chronic inflammatory diseases. Our investigators conducted a comprehensive genome-wide analyses to discover that AREs are most common and bind key stabilizing protein (HuR) in the RNA introns. The results can broaden the role of AREs in health and disease, and were published in "BBA Gene Expression" journal.
- Pro-inflammatory cytokines such as tumor necrosis factor (TNF) and interleukin-8 (IL-8), are important for immune responses; however, feedback mechanisms that inhibit the production of such factors are needed to prevent chronic conditions and tissue damage. Specifically, we have discovered that intracellular pyrimidine 5'-nucleotidase NT5C3A is a negative epigenetic factor in interferon and cytokine signaling. This discovery can lead to novel therapeutic approaches against cchrnoThis study was published recently in Science Signaling.

## OTHER ACHIEVEMENTS

- US Patent Application 16/007, 146 Filed on June 13, 2018 entitled: "A method of treatment of cancer". The invention comprises protein kinase inhibitors of polo-like 1 kinase to a cancer patient. It also relates to a method of post-transcriptional control of cancer-related genes comprising administering an effective amount of a protein kinase inhibitor to cancer subject.



AU-rich elements are important stability sequence determinants that very common in introns, they strongly overlap with HuR binding sites and respond to HuR knock down. *Biochim Biophys Acta*. 2018 Feb.

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# DEPARTMENT OF MOLECULAR ONCOLOGY

The major goals of the Molecular Oncology Department are to enhance the understanding of the molecular basis of cancer, to act as a catalyst for translational cancer research, and to promote the movement of that knowledge into the prevention and management of cancer. The Department is composed of 5 different sections: Breast Cancer, Cancer Biology & Experimental Therapeutics, Cancer Epigenetics, Molecular Endocrinology and Translational Cancer Research. These sections study different cancer-related pathways and genes in various types of neoplasms, including breast and thyroid cancers. Our main objectives are to participate in understanding the molecular and cellular basis of cancer onset and spread, to identify novel and potent anti-cancer agents, and to search for genetic and epigenetic biomarkers relevant for diagnostic, prognostic as well as preventive purposes. Our ultimate goal is to translate our findings into knowledge-based awareness programs and preventive measures, as well as more effective personalized/precision cancer therapeutic approaches.

CHAIRMAN

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ABDELILAH ABOUSSEKHRA





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## BREAST CANCER RESEARCH

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HEAD

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SUAD M.BIN AMER, PHD

Breast cancer is a major cause of morbidity and mortality among females in Saudi Arabia. It accounts for 23% of all cancers. Given that histologically similar breast cancers may have completely different prognoses and consequently respond differently to therapy, the two main challenges in breast cancer today are 1) the lack of sensitive, specific, and non-invasive early detection biomarkers; and 2) the development of drug resistance to systemic and targeted drug therapies. The current clinical approach is to diagnose breast cancer as early as possible, since the disease can be readily treated at an early stage and positive clinical outcomes are maximized. Thus, better understanding of the early stages of cancer pathogenesis is a prerequisite for improving future therapies. Furthermore, studies have shown that alterations in expression during the early stages of cancer are directly involved in deciding the degree of invasiveness in each case. Hence, much research is still required to elucidate the linear mechanisms underlying the progression of breast cancer. Of particular interest are the insights to be gained into the events that take cells from normality to malignancy, which will surely speed the advent of novel therapies to treat this disease. This has created the pressing need to develop robust diagnostic circulating biomarkers that can detect the disease at a much earlier stage. Such biomarkers would result in the more efficient implementation of effective, life-saving treatment protocols. This approach would lead to better prognosis for patients, greatly reducing the cost of treatment. We plan to conduct a multidisciplinary research aimed at understanding breast cancer and the early detection of the disease by developing non-invasive liquid biopsy assays for monitoring its presence and in turn investigating novel therapeutic approaches, offering novel insights into tumorigenesis and therapy management.

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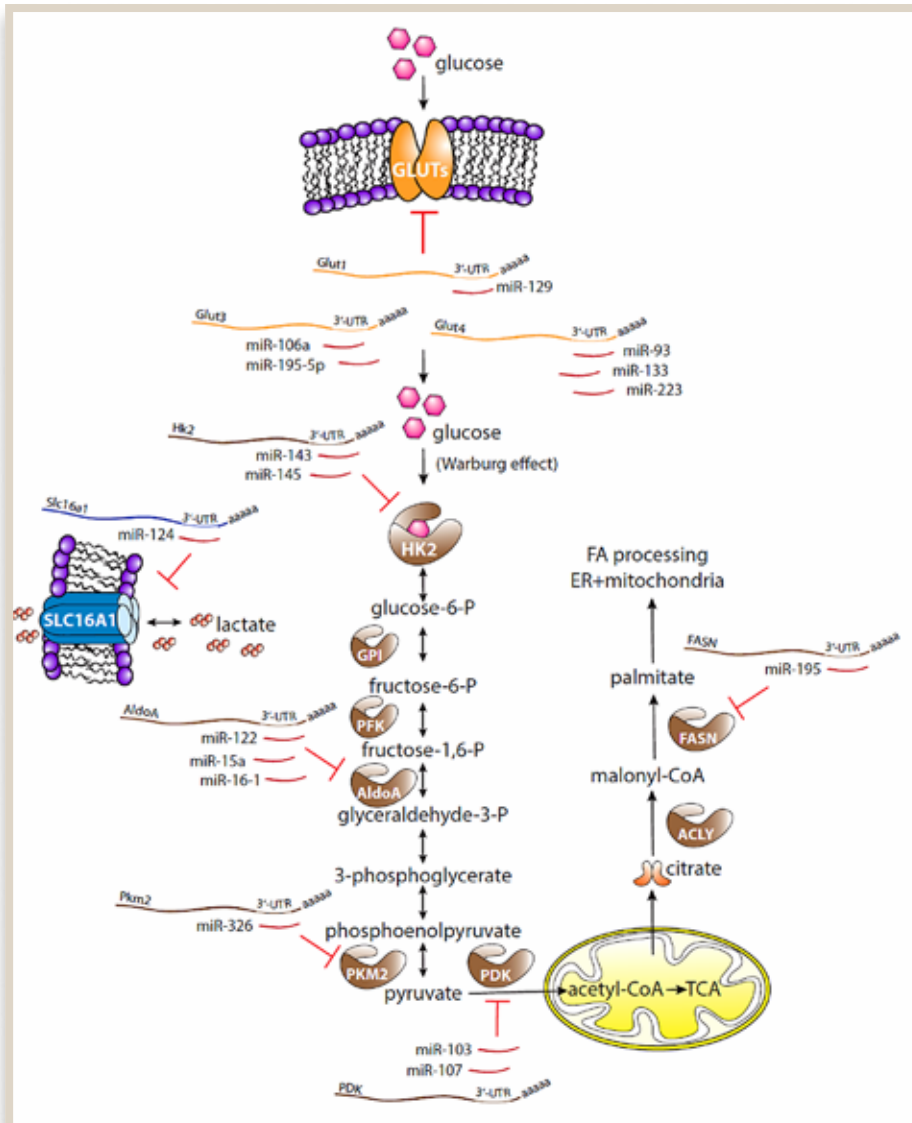
## RESEARCH ACHIEVEMENTS

- 2017 Award: L'OREAL UNESCO Award “For Women in Science (FWIS)” to Dr.Amal Qattan, PhD. The award ceremony was held in the Jumeirah Beach Hotel, Meyana Auditorium, Dubai, on 13<sup>th</sup> November 2017.
- 2016 Award: CTRC-AACR -2016, Best of San-Antonio Breast Cancer to Dr.Amal Qattan, PhD, 10<sup>th</sup> Middle East Best of San-Antonio Breast Cancer. This award was announced by the Ministry of National Guard Health Affairs, in Jeddah-SA, on 6<sup>th</sup> – 7<sup>th</sup> February 2016.
- 2016 Award: College of Medicine-Alfaisal University to Dr.Amal Qattan, PhD, in Riyadh-SA on 24<sup>th</sup> October 2016.

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## OTHER ACHIEVEMENTS

- 2019 Invited Speaker: Dr.AmalQattan, PhD, Oral presentation (Talk): Circulating microRNAs: Novel targets and specific therapy in Breast Cancer Personalized Medicine. 4<sup>th</sup>-9<sup>th</sup> March, 2019. International Conference on PharmScience Research & Development” (Pharma R&D-2019), Paris, France.
- 2018 Speaker: Dr.AmalQattan, PhD, Oral presentation (Talk): microRNAs: Puzzling molecules in Cancer Therapy... Are we ready? Advances in Breast Cancer Research Towards Precision Therapy Symposium”. 7<sup>th</sup>-8<sup>th</sup> .November.2018. King Faisal Specialist Hospital and Research Centre (KFSHRC), Riyadh-SA.
- 2017 Speaker: Dr.AmalQattan, PhD, Oral presentation (Talk): Developing of non-invasive liquid biopsy clinical assays for monitoring breast cancer and the role of cf-microRNAs. L'OREAL UNESCO “For Women in Science (FWIS)”. L'OREAL UNESCO Award-Middle East Fellowship 13<sup>th</sup>.November 2017. Jumeirah Beach Hotel, Meyana Auditorium, Dubai, UAE.
- 2017 Invited Speaker: Dr.AmalQattan, PhD, Oral presentation (Talk): Circulating MicroRNAs: Novel Biomarkers in Personalized Medicine against Breast Cancer (Breakthrough in cancer). 6<sup>th</sup> European conference on Predictive, Preventive and Personalized Medicine Molecular and Diagnostic. Edinburgh, Scotland.
- 2016 Invited Speaker: A.Qattan, Award and Oral presentation (Talk): Circulating MicroRNA: Therapeutic tools in breast cancer. (A.Qattan, PhD Winning the best Abstract and talk in CTRC-AACR -2016, Best of San-Antonio Breast Cancer: 10<sup>th</sup> Middle East Best of San-Antonio Breast Cancer 6<sup>th</sup>- 7<sup>th</sup> February 2016). 10<sup>th</sup> Middle East Best of San Antonio Breast Cancer Symposium. 6<sup>th</sup>- 7<sup>th</sup> February 2016. Ministry of National Guard Health Affairs, King Abdulaziz Medical City, Jeddah-SA.



miRNAs regulating cell metabolism in breast cancer. The change to aerobic glycolysis in cancer cells is facilitated by miRNAs, which also regulate the expression of GLUT transporters and the hexokinase 2 (HK2) enzyme involved in glycolysis. (A.Qattan, Metabolic Reprogramming of Triple Negative Breast Cancer: The Role of miRNAs. *microRNA Diagn. Ther.*; 3:1-8. DOI: <https://doi.org/10.1515/micrnat-2017-0001>).

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- (2017): Amal Qattan, Haya Intabli, Wafa Alkhayal, Chafica Eltabache, Taher Al-Tweigieri, Suad Bin Amer. (2017) "Robust expression of tumor suppressor miRNA's let-7 and miR-195 detected in plasma of Saudi female breast cancer patients". *BMC Cancer*. 2017 Nov 28;17(1):799. doi: 10.1186/s12885-017-3776-5.
- (2017): Amal Qattan. (2017). "Metabolic Reprogramming of Triple Negative Breast Cancer: The Role of miRNAs". MicroRNA Diagnostic and Therapeutic (MicroRNA Dx/Rx). *microRNA Diagn Ther*. 2017; 3: 1–8.
- (2017): S. Almozyan, D. Colak, F.h Mansour, A. Alaiya, O. Al-Harazi, Amal Qattan, F. Al-Mohanna, M.r Al-Alwan and H. Ghebeh. (2017). "PD-L1 promotes OCT4 and Nanog expression in breast cancer stem cells by sustaining PI3K/AKT pathway activation". *International Journal of Cancer*. 2017 June 14. doi:10.1002/ijc.30834.



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## CANCER BIOLOGY & EXPERIMENTAL THERAPEUTICS

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HEAD

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ABDELILAH  
ABOUSSEKHRA, PHD

Cancer is a complex and heterogeneous genetic disease that results from the accumulation over age of a plethora of genetic and epigenetic alterations in various genes, which leads to uncontrolled cell proliferation and resistance to cell death. In addition, a higher order cell-cell interaction between cancer cells and their microenvironment is capital for tumor formation and spread. The major goals of this research section are to participate in understanding the fundamental processes of carcinogenesis, to elucidate the role of stromal and stem cells in breast cancer onset and spread, and also the identification of novel natural molecules with potent anti-cancer effects. We are also interested in decorticating the role of obesity in breast carcinogenesis, through investigating the implication of adipocytes in breast cancer onset and spread. In addition, we assess the anti-carcinogenic effects of various natural molecules such as PAC (a curcumin analogue) and eugenol, on cancer cells and cancer stem cells. We are also aiming at targeting tumors through neutralizing the procarcinogenic effects of stromal cells using various approaches. Our major aim is to translate our findings into clinical practice in order to improve patient care.

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## RESEARCH ACHIEVEMENTS

- Dr. Aboussekhra and collaborators have discovered a new approach to target breast cancer stem cells through combining cisplatin with eugenol as potential therapeutic approach for triple-negative breast cancer patients.
- Dr. Aboussekhra and colleagues have shown that the tumor suppressor protein kinase ATR and the miRNA Let-7b play important roles in suppressing the pro-carcinogenic effects of breast cancer-associated fibroblasts and constitute important potential prognostic factors.
- Dr. Al-Khalaf and Dr. Aboussekhra provided the first indication that the tumor suppressor p16 controls the expression of the p53 protein through miR-dependent destabilization of MDM2.

## OTHER ACHIEVEMENTS

- Dr. Aboussekhra and collaborators have discovered a novel method for the generation of mammary stem cells from luminal cells. This technique can be used for cell therapy through injection of autologous stem cells. The patent number US 10, 100, 275 B2 from the USA patent office has been published in October 2018.
- We organized an international symposium entitled: "Advances in Breast Cancer Research: Towards Precision Therapy" Riyadh, 7–8 November 2018.
- Graduation of Laila Al-Kharashi as PhD student from KSU, College of Pharmacy, after finishing her practical work under the supervision of Dr. Aboussekhra.





US 20180265841A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2018/0265841 A1**  
**ABOUSSEKHRA et al.** (43) **Pub. Date: Sep. 20, 2018**

(54) **METHOD FOR GENERATING HUMAN  
MULTIPOTENT MAMMARY STEM CELLS  
FROM NORMAL PRIMARY BREAST  
LUMINAL CELLS**

(52) **U.S. CL**  
CPC ... *C12N 5/0602* (2013.01); *C12N 2501/2308*  
(2013.01); *A61K 35/12* (2013.01)

(71) Applicant: **KING FAISAL SPECIALIST  
HOSPITAL & RESEARCH  
CENTRE, Riyadh (SA)**

(57) **ABSTRACT**

(72) Inventors: **Abdellilah ABOUSSEKHRA, Riyadh  
(SA); Huda H. AL-KHILAF, Riyadh  
(SA); Hazem GHEBEH, Riyadh (SA)**

(21) Appl. No.: **15/461,043**

(22) Filed: **Mar. 16, 2017**

**Publication Classification**

(51) **Int. CL**  
*C12N 5/071* (2006.01)  
*A61K 35/12* (2006.01)

The invention relates to methods for generating multipotent mammary stem cells from isolated and cultured human breast luminal cells. The method comprises the steps: 1. isolating and growing normal differentiated cells in vitro; 2. treating the differentiated cells with either a conditioned medium from active fibroblasts or cytokine. The invention also relates to multipotent mammary stem cells, cultures of the multipotent stem cells, differentiated cells, tissues, organs derived from the culture multipotent stem cells isolated by the methods disclosed and therapeutic and other uses for those cells thereof.

**Specification includes a Sequence Listing.**

Published patent.

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## CANCER EPIGENETICS

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HEAD

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NISREEN AL MOGHRABI, PHD

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## RESEARCH ACHIEVEMENTS

- We demonstrated that BRCA1 and MGMT epimutations are present from the early life of the carriers and that they are transmitted from mother to daughter. Our data also pointed at the possible demethylation of BRCA1 and MGMT during pregnancy.

## PUBLICATIONS

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- Al-Moghrabi N, Al-Showimi M, Al-Yousef N, Al-Shahrani B, Karakas B, Alghofaili L, et al. Methylation of BRCA1 and MGMT genes in white blood cells are transmitted from mothers to daughters. *Clin Epigenetics*. 2018; 10:99.
- Al-Moghrabi N, Al-Yousef N, Al-Showimi M, et al. MicroRNA-126 is Dysregulated in Cancer-Free Females Harboring Methylated BRCA1 Promoter through Up-Regulation of DNMTs. *J Clin Epigenet*. 2017, 3:1.
- Al-Moghrabi N. BRCA1 promoter methylation in peripheral blood cells and predisposition to breast cancer. *J Taibah Univ Med Sc* 2017;12(3):189-193.
- Allam A, Alhindi H, Al-Otaibi F, Al-Hebshi A, Khalil E and Al-Moghrabi N. The Response to Chemo Radiation Therapy in Unresectable Glioblastoma Multiforme Patients in Relation to MGMT Promoter Methylation Status: A Study from a Single Saudi Center. *J Clin Epigenet*. 2017, Vol 3: 2.





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## MOLECULAR ENDOCRINOLOGY

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HEAD

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ALI S. ALZHRANI, MD, FACP

Molecular Endocrinology Section focuses on two main aspects. The first is translational research on endocrine neoplasms, exploring the role of certain oncogenes and tumor suppressor genes in the pathogenesis of endocrine cancer and studying genetic mechanisms of endocrine tumors. Further, relate the molecular findings in these tumors relating the phenotypes with genotypes. Our aim is to define the molecular basis of the clinical variations that these tumors show in their presentations, response to therapy and prognosis. The second aspect of our work is to study genetic abnormalities in a number of genetic endocrine diseases such as hormone resistance syndromes, congenital hypothyroidism, disorders of sex developments, etc.

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## RESEARCH ACHIEVEMENTS

- Analyzed a large number of thyroid cancer samples for detecting EIF1AX, PPM1D, and CHEK2 mutations reported in Thyroid Cancer Genome Atlas (TCGA) and found that the Genetic factors involved in Western cases were completely different from Saudi population as we did not find any of those common mutations in our Saudi cases.
- Profiled most comprehensively the genetic mutations in thyroid cancer in children for the first time in Saudi Arabia and showed the somatic mutation pattern is completely different from adults which paves important role in management of pediatric thyroid cancer.
- Reviewed, profiled and published the tumor suppressive and oncogenic lncRNAs associated with carcinogenesis, diagnosis and prognosis in thyroid cancer for the first time.
- Analyzed for the first time various genes associated with rare subtypes of congenital adrenal hyperplasia (CAH) in Saudi Arabian population and found many heterogeneous phenotypic and various genetic features of these subtypes that includes unique novel mutations in highly inbred population.
- Characterized genetic alterations in 11 B hydroxylase deficiency and found several novel mutations in CYP11B1 which causes 11  $\beta$ -hydroxylase deficiencies (11 $\beta$ -OHD), the second most common subtype of congenital adrenal hyperplasia in patients from Saudi Arabia. *In vitro* study on novel mutations revealed complete loss of the 11 hydroxylase activity and we concluded that 11  $\beta$ -OHD in Saudi Arabian cases have a unique genotype with a high rate of novel mutations. We also identified the R448P novel mutation as the most common mutation in Saudi cases.
- Described a large number of thyroid cancers (n=600) and their salient clinical and pathological characteristics with outcome from Saudi Arabia. This is the first comprehensive data from the Middle-East while most data on differentiated thyroid cancer (DTC) came from the Western world
- Described a unique case with the longest ever survival of adrenocortical cancer extending to the inferior vena cava and reviewed the literature of this situation.

## PUBLICATIONS

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- Alzahrani AS, Murugan AK, Qasem E, Alswailem MM, AlGhamdi B, Moria Y, Al-Hindi H. Absence of EIF1AX, PPM1D, and CHEK2 mutations reported in Thyroid Cancer Genome Atlas (TCGA) in a large series of thyroid cancer. *Endocrine*. doi: 10.1007/s12020-018-1762-6. Epub 2018 Sep 29.
- Zou M, Alzahrani AS, Al-Odaib A, Alqahtani MA, Babiker O, Al-Rijjal RA, BinEssa HA, Kattan WE, Al-Enezi AF, Al Qarni A, Al-Faham MSA, Baitei EY, Alsagheir A, Meyer BF, Shi Y. Molecular Analysis of Congenital Hypothyroidism in Saudi Arabia: SLC26A7 Mutation Is a Novel Defect in Thyroid Dysmorphogenesis. *J Clin Endocrinol Metab*. 2018 May 1;103(5):1889-1898.
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- Alzahrani AS, Alsaadi R, Murugan AK, Sadiq BB. TERT Promoter Mutations in Thyroid Cancer. *Horm Cancer*. 2016 Jun;7(3):165-77.
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- Murugan AK, Munirajan AK, Alzahrani AS. MicroRNAs: Modulators of the Ras Oncogenes in Oral Cancer. *J Cell Physiol*. 2016 Jul;231(7):1424-31.
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  - Alzahrani AS, Alkhafaji D, Tuli M, Al-Hindi H, Sadiq BB. Comparison of differentiated thyroid cancer in children and adolescents ( $\leq 20$  years) with young adults. *Clin Endocrinol (Oxf)*. 2016 Apr;84(4):571-7.

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## TRANSLATIONAL CANCER RESEARCH

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HEAD

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BEDRI KARAKAS, PHD

Our section is focused on bridging the gap between basic cancer research and clinical cancer care that is relevant to the local patient population. We have been working to bring promising molecular diagnostic technologies to the clinical use. We are particularly interested in non-invasive methods to follow up cancer treatment response and early detection of relapses using blood circulating tumor DNA as a biomarker. We are also involved in identifying the mutational frequencies of important oncogenes and tumor suppressor genes in Saudi breast cancer population. Noninvasive cancer detection “liquid biopsies” is another major focus of the laboratory. The laboratory is highly equipped however there is no technical personal support.

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## RESEARCH ACHIEVEMENTS

- We have recently identified germ line mutations and their frequencies in Saudi Breast and Ovarian Cancer Patients.

## PUBLICATIONS

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- Alhuqail A-J, Alzahrani A, Almubarak H, Al-Qadheeb S, Alghofaili L, Almoghrabi N, et al. High prevalence of deleterious BRCA1 and BRCA2 germline mutations in arab breast and ovarian cancer patients. *Breast Cancer Res Treat.* 2018;136:E359–8.
- Al-Moghrabi N, Al-Showimi M, Al-Yousef N, Al-Shahrani B, Karakas B, Alghofaili L, et al. Methylation of BRCA1 and MGMT genes in white blood cells are transmitted from mothers to daughters. *Clin Epigenet.* 2018;10:1861–10.
- Noman AS, Uddin M, Chowdhury AA, Nayeem MJ, Raihan Z, Rashid MI, et al. Serum sonic hedgehog (SHH) and interleukin-(IL-6) as dual prognostic biomarkers in progressive metastatic breast cancer. *Sci Rep.* Nature Publishing Group; 2017;7:1796.





# STEM CELL & TISSUE RE-ENGINEERING PROGRAM

The Stem Cell and Tissue Re-Engineering Program, Research Centre, focuses on investigating the molecular and cellular mechanisms of stem cell biology, their application for therapeutic use in a number of clinical areas including, cancer, hematopoietic stem cell transplantations, kidney-regeneration, orthopedics injuries, cardiovascular, neurodegenerative, urologic and autoimmune diseases. The department is working towards achieving the goal of excellence in stem cell research in the Middle East and worldwide. The program's members actively conduct a range of translational and tissue re-engineering research activities in collaboration with KFSHRC laboratories and clinical departments, while equally pursue basic and pre-clinical research. We are currently in dynamic collaboration with international institutions including but not limited to Cancer Center, Karolinska University Hospital, Stockholm, Sweden. In addition to research and development, the program is committed to education and training, and advancement of Saudi scientists, physicians, technicians and students.

DIRECTOR

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AYODELE A. ALAYA, MB.BS,  
MPH, PH.D, FRCPATH

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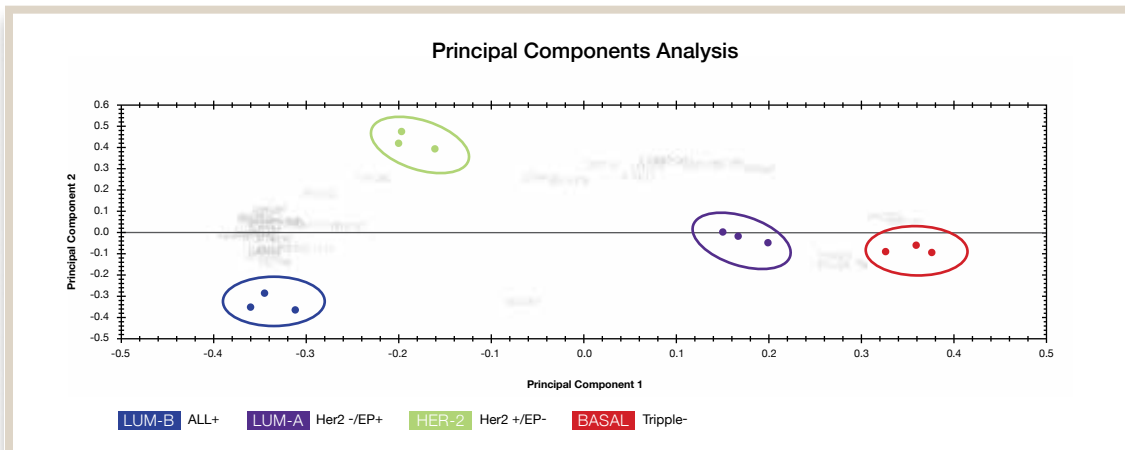
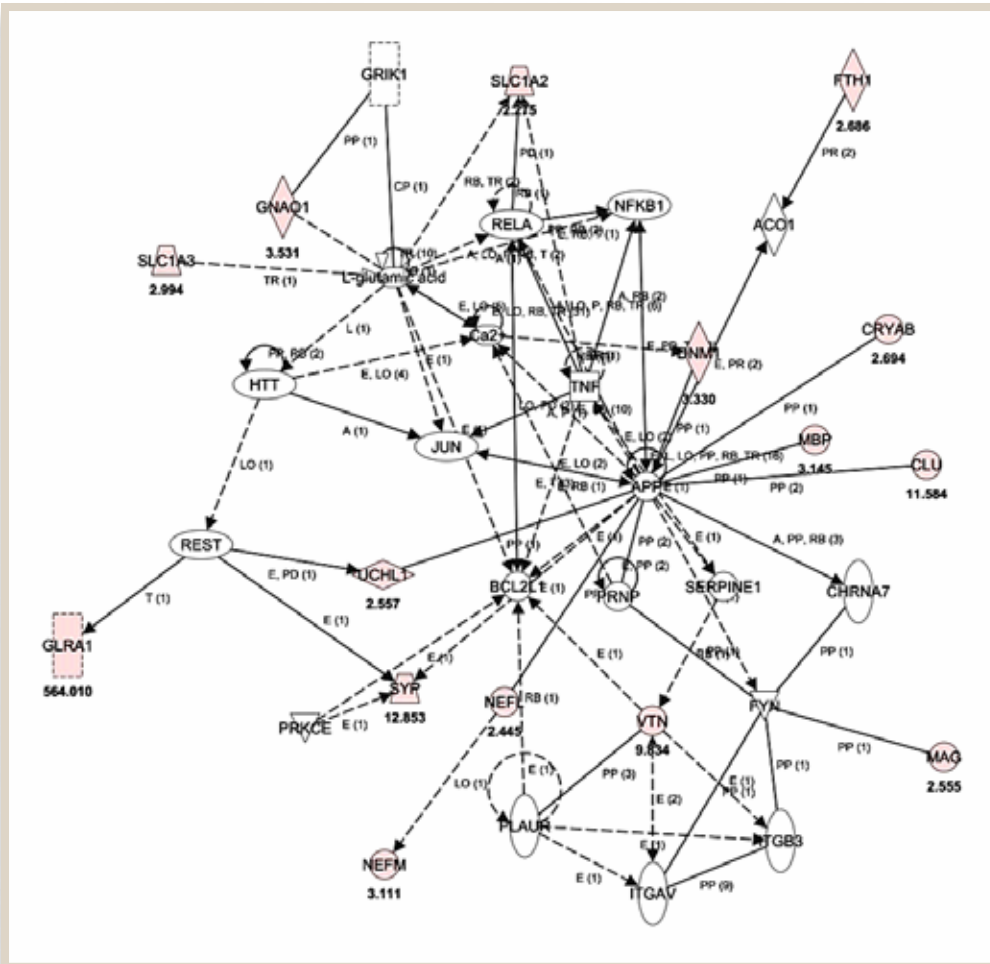
## RESEARCH ACHIEVEMENTS

- We initiated 8 major translational research projects that upon completion have the potential to improve patient care as well as to have significant cost saving implications to KFSH&RC.
- Three (3) of our breakthrough results were published in prestigious journals (International Journal of Cancer, Bone Marrow Transplantation Journal and Molecular Carcinogenesis Journal) demonstrating: (1) Relationship between cancer stem cells and the expression of an immune suppressive molecule PD-L1. (2) Role of the KIR-B and HLA-C molecules in the selection of the appropriate bone marrow donors (3) Eugenol, kills breast cancer cells and fortify the cytotoxic effect of cisplatin.
- Inaugurated a clinical trial titled “Phase I/II Study for safety and efficacy of a combination of the investigational anti-B7-H1 (PD-L1) monoclonal antibody MEDI4736 (AZ) with Paclitaxel for The Treatment for Metastatic Breast Cancer” and recruited 20 patients. Patient recruitment is still ongoing.
- Development of autologous stem cell implantation (transplantation) for treatment of avascular osteonecrosis in the hip joints and to assess the efficacy, and feasibility of a treatment protocol. This project has resulted in the opening of a new outpatient orthopedics clinic dedicated for this project to facilitate patient recruitment.
- Established a major project to tackle Glomerular Nephritis in Saudi Arabia. Our goals in this project are to study “Genomics”, “Biomarkers”, “Epidemiology” and “Patient Reported Outcomes (PRO).
- Initiated a project on Cellular and Molecular Profiling of Primitive HSC Subsets in Umbilical Cord Blood & Bone Marrow Samples: Implications for Cell Therapy.
- Development of Acute graft-versus-host-disease (GVHD) mice model.
- Reconstitution of cleared mammary fat pad with a single stem cell in mice model.

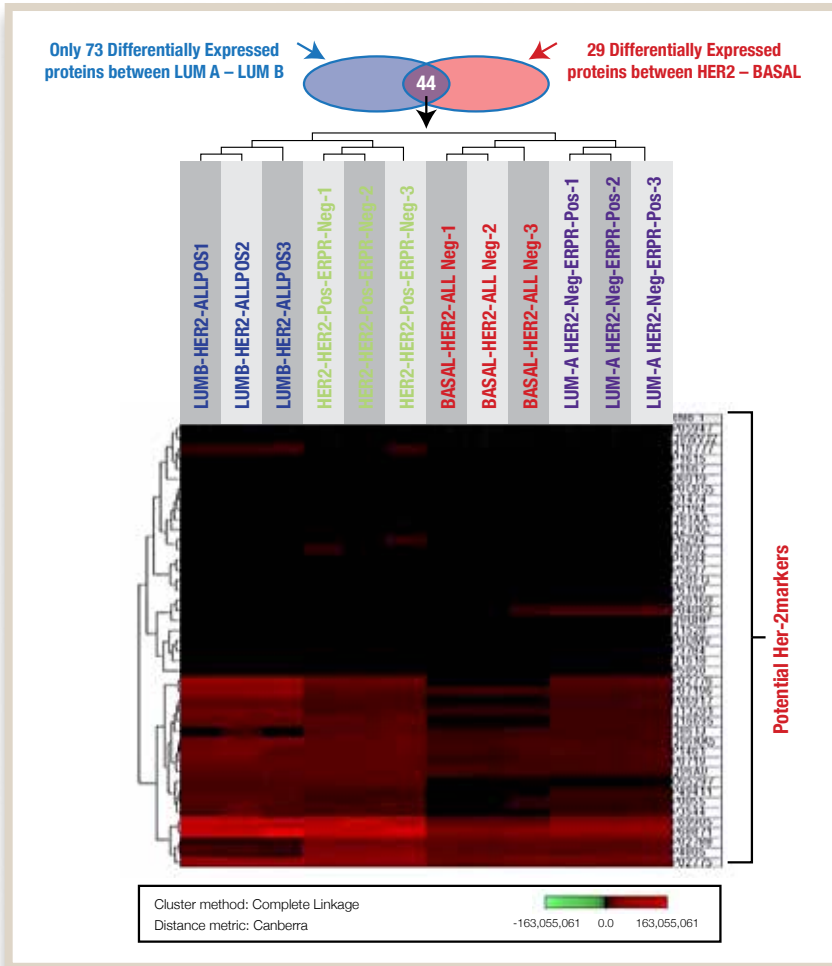
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## OTHER ACHIEVEMENTS

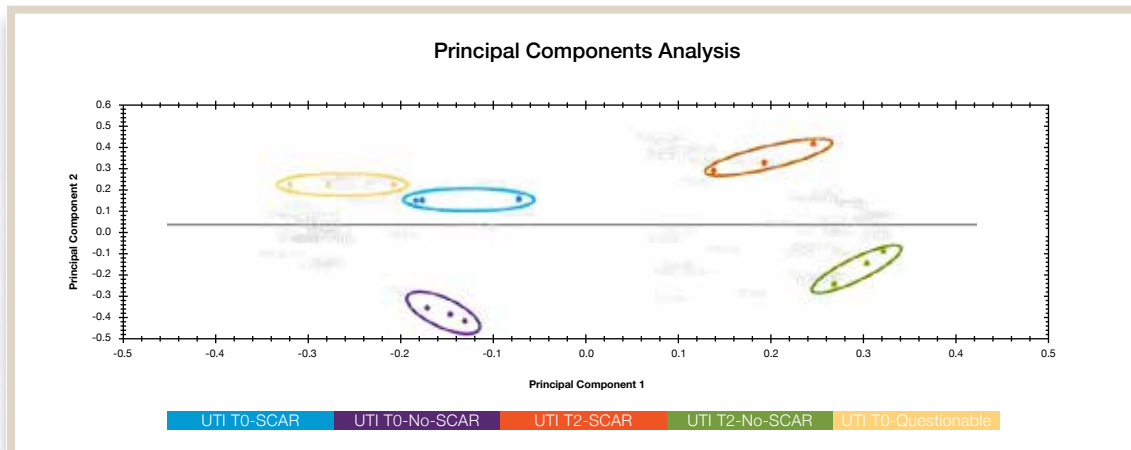
- Dr. Hazem Ghebeh [co-investigator] awarded US Patent 2018/0265841 A1 Pub date Sept 20, 2018 titled "Method for generating human multipotent mammary stem cells from normal primary breast luminal cells"
- Dr. Hazem Ghebeh [co-investigator] awarded world patent WO 2018/192641 Pub date Oct 25, 2018 titled "A method for generating induced pluripotent stem cells from fibroblast cells"
- US Patent 20160272652A1 Pub date 22 September 2016 title "Targeting Cancer Stem Cells by Benzo [d] thiazolo [3, 2-a] imidazole and its Derivatives for Cancer Treatment".
- US Patent US9119856B1 A1 Pub date 1 September 2015 title "Method for treating cancer using a dihydropyrimidine derivative"



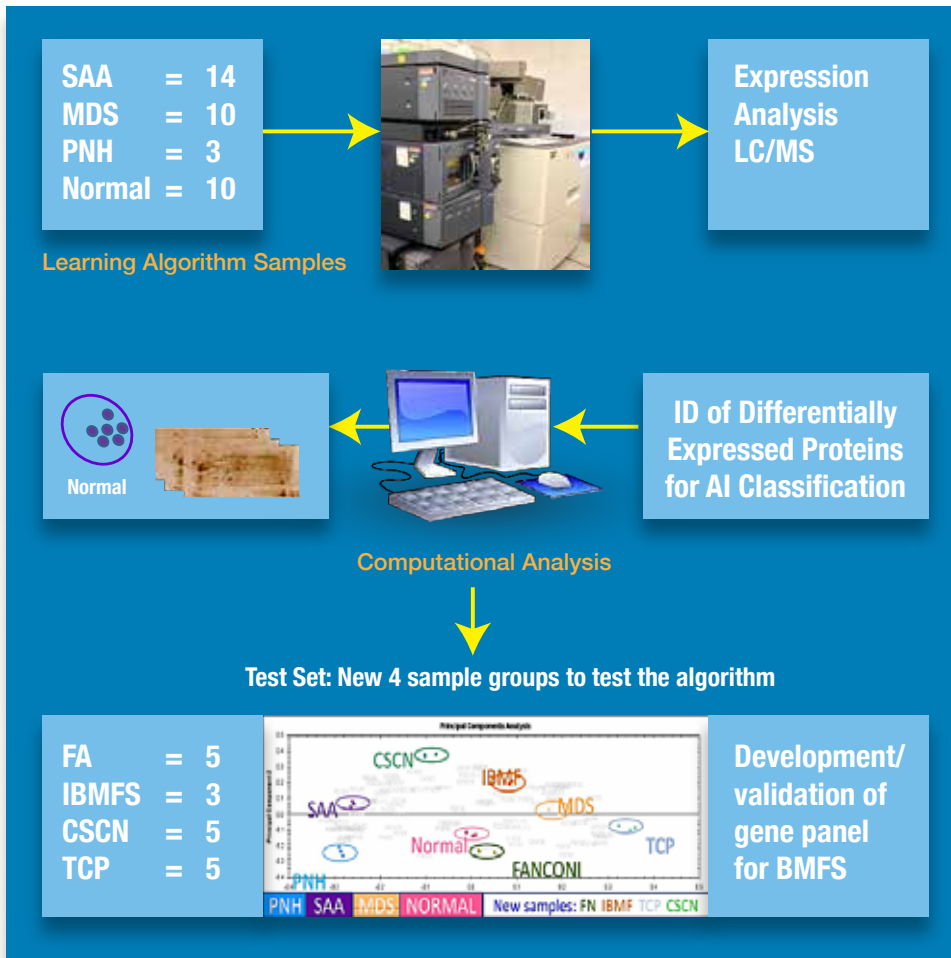
Principal component analysis of HER2 status using the expression dataset of 44 potential Her-2 proteins biomarkers.



Objective classification of Her2 status using the expression profiles of 44 potential Her2 identified proteins biomarkers using principal component analysis (PCA) and Hierarchical Cluster Analysis.



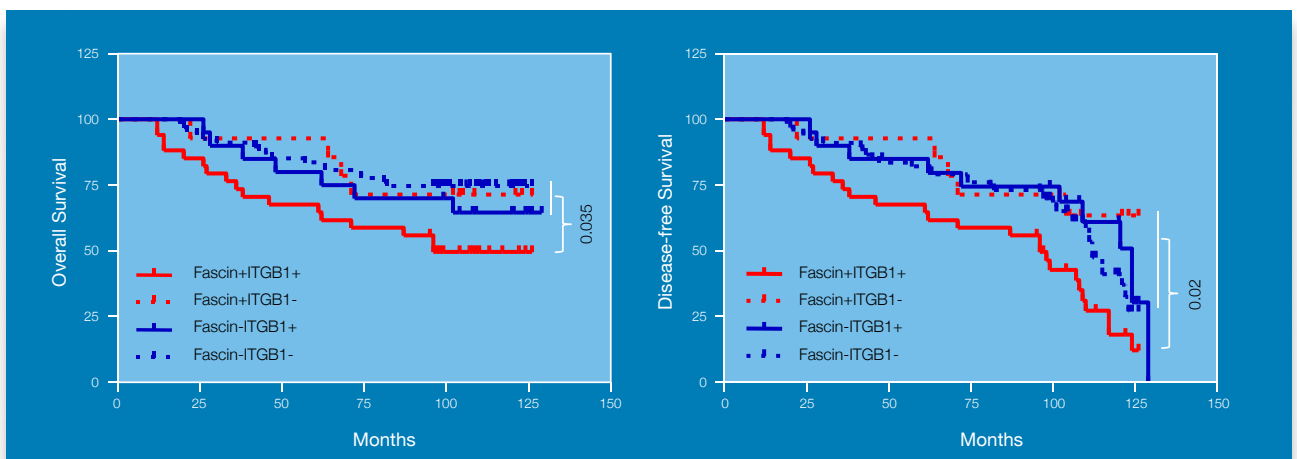
Principal Component Analysis using dataset of 113 differentially expressed PBP proteins separated the samples into 4 main groups of time 0 scar/no-scar, time 2 scar/no-scar/ equivocal. [Image was generated using Progenesis Qlfp (Nonlinear Dynamics/Waters)].



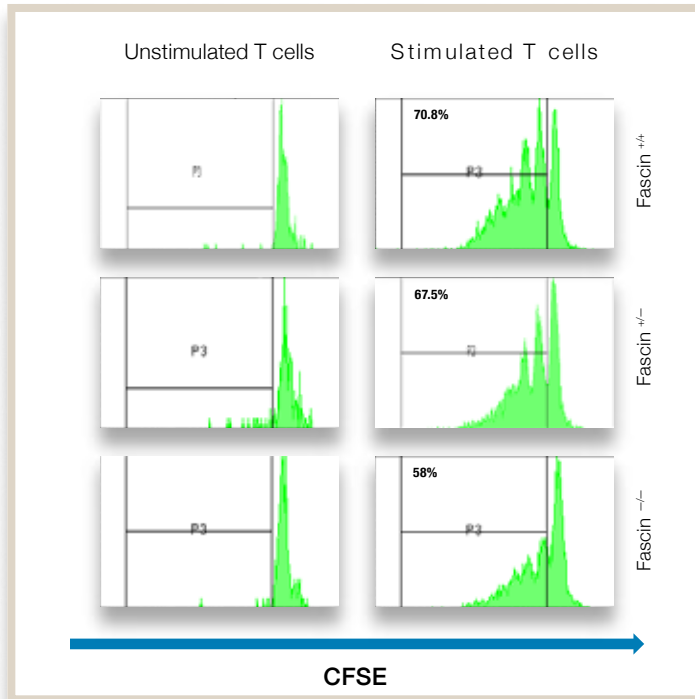
Overview of our biomarker discovery proteomics approach: Peripheral blood samples were analyzed by LC/MS. Identified proteins were subjected to statistical analysis and evaluated for objective disease classification.

#### ABBREVIATIONS

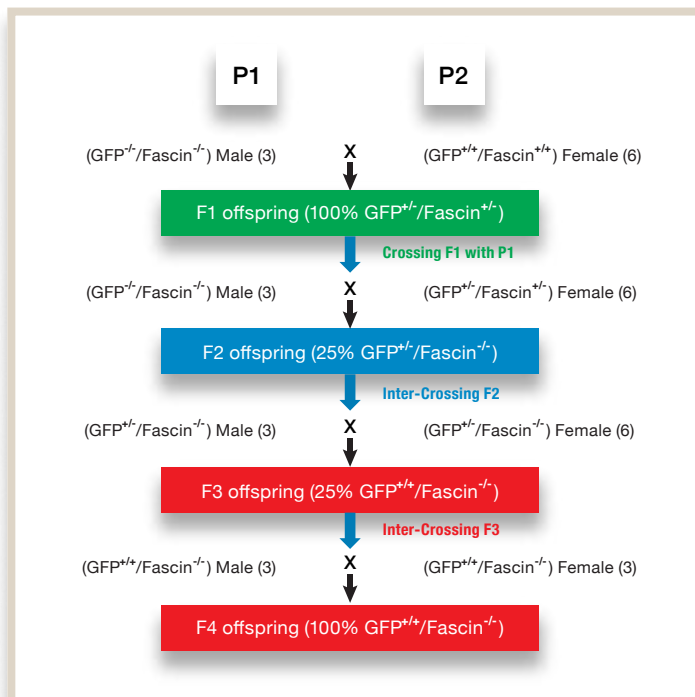
<b>SAA</b>	Sever Aplastic Anemia
<b>MDS</b>	Hypoplastic Myelodysplastic Syndrome
<b>IBMFS</b>	Inherited BM Failure Syndromes
<b>PNH</b>	Paroxysmal Nocturnal Hemoglobinuria
<b>FA</b>	Fanconi Anemia
<b>CSCN</b>	Cytopenia-Severe Congenital Neutropenia
<b>TCP</b>	Thrombocytopenia
<b>Normal</b>	Control Normal Subjects
<b>PCA</b>	Principal Component Analysis



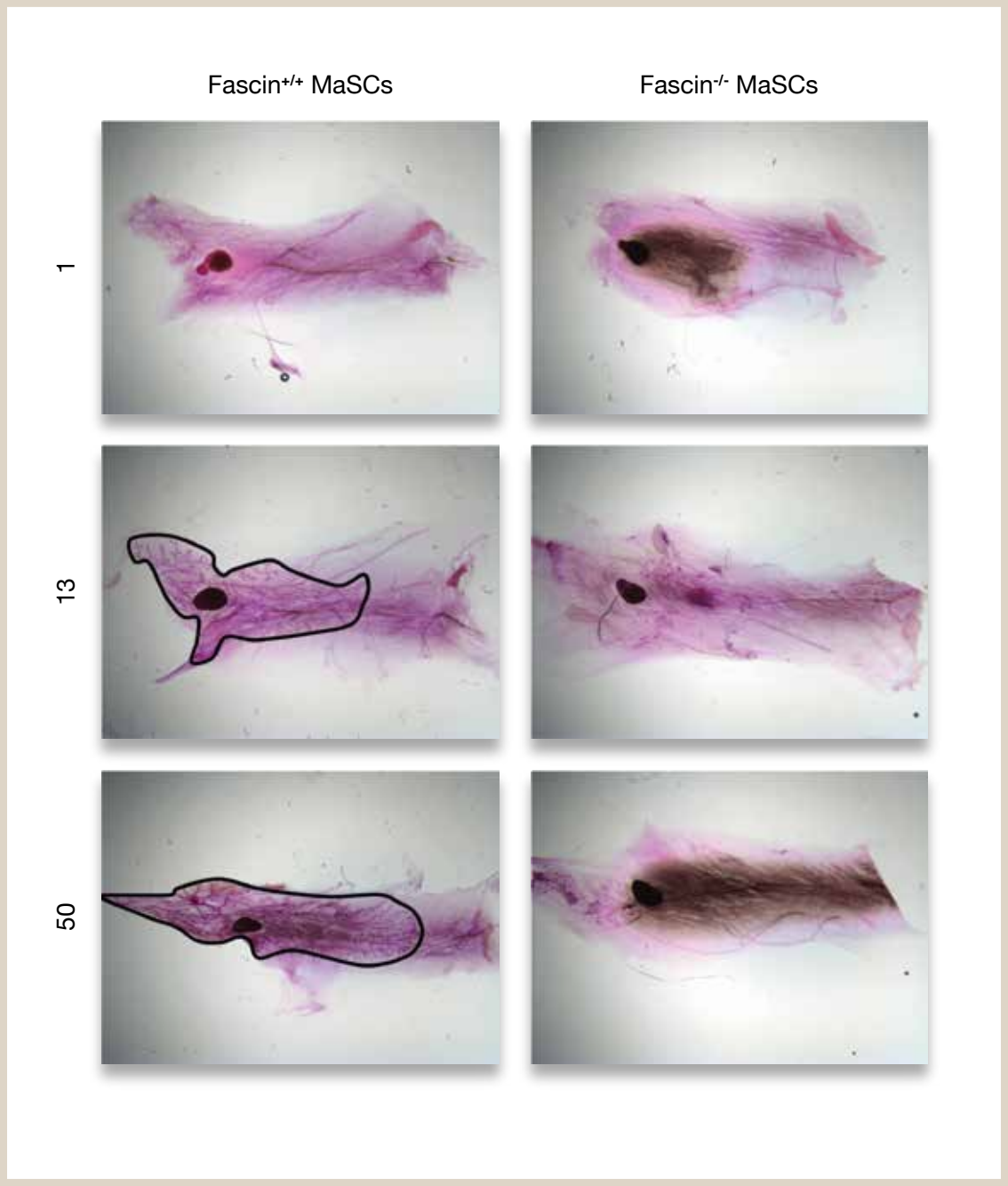
Kaplan Meier survival in the presence or absence of fascin and or TGFB1.



Representative histograms showing T cell responsiveness to stimulation with anti-CD3 and CD28 coated beads (right) as quantified according to the reduction in fluorescence intensity compared to unstimulated T cells (left).

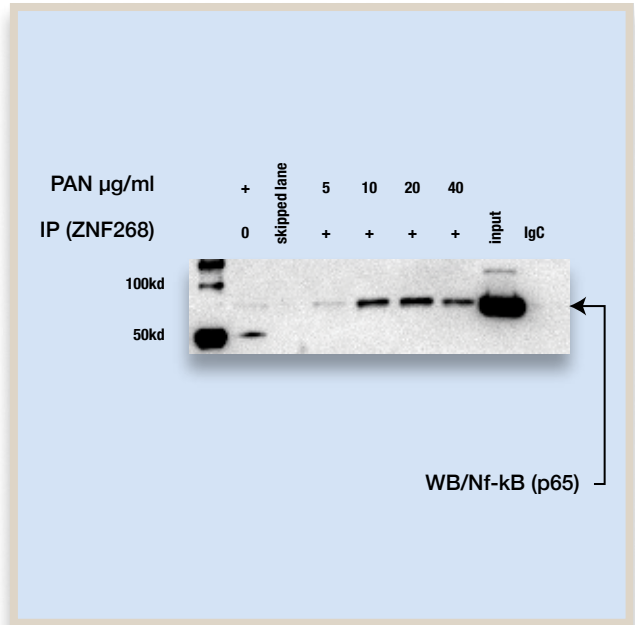
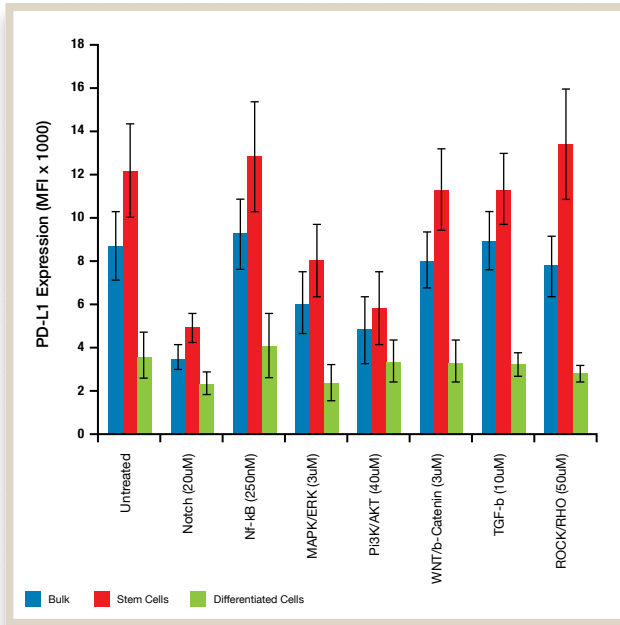


Flow chart showing the step of fascin<sup>-/-</sup> generation on GFP<sup>+/+</sup> background.



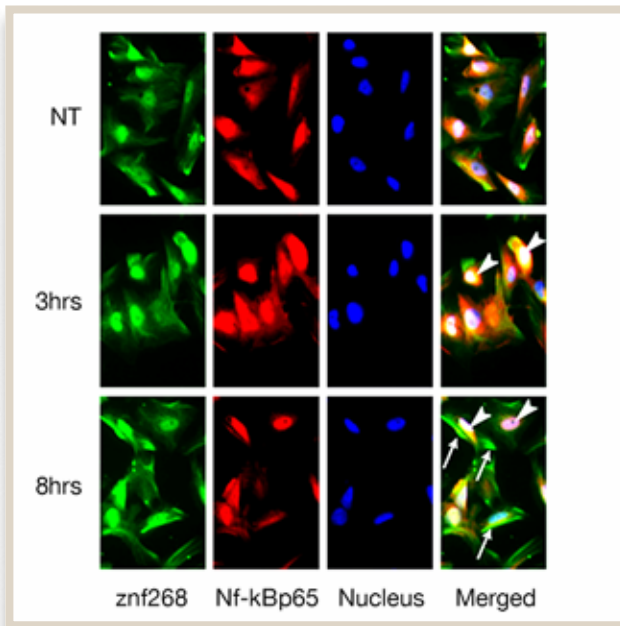
Images showing cleared mammary fat pad 10 weeks post reconstitution with various number of MaSCs (CD49<sup>hi</sup>/CD326<sup>lo</sup>/CD201<sup>+</sup>) sorted from fascin<sup>+/+</sup> (left) or fascin<sup>-/-</sup> (right) mammary glands.



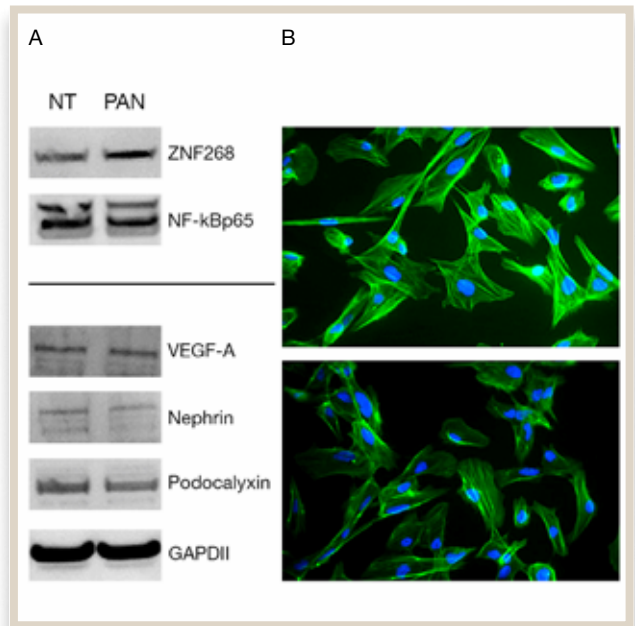


The effect of different stem cell related pathway inhibitors on PD-L1 expression on cancer stem-like cells (CSCs). PD-L1 expression in different cancer cell subpopulations as measured by flow cytometry after treatment with different pathway inhibitors for 24 hours. Results are average of 5 independent experiments ± SEM.

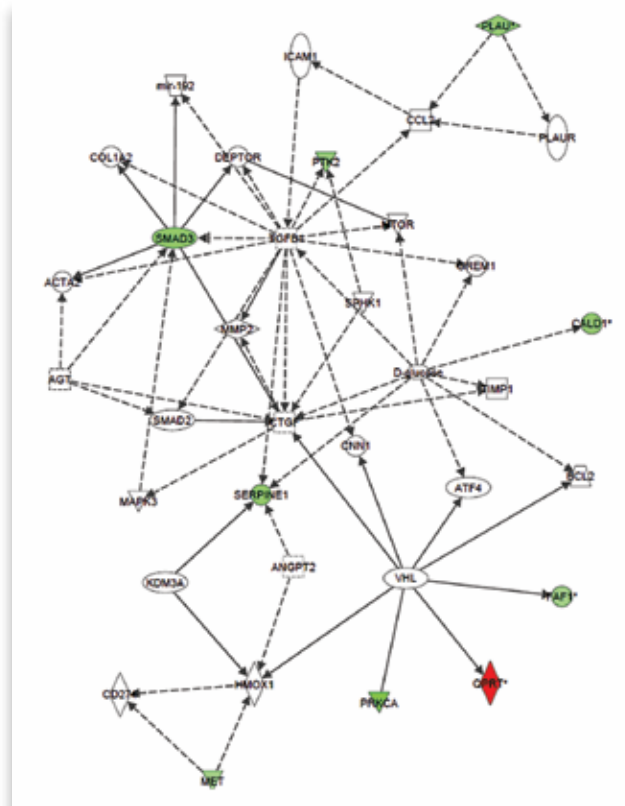
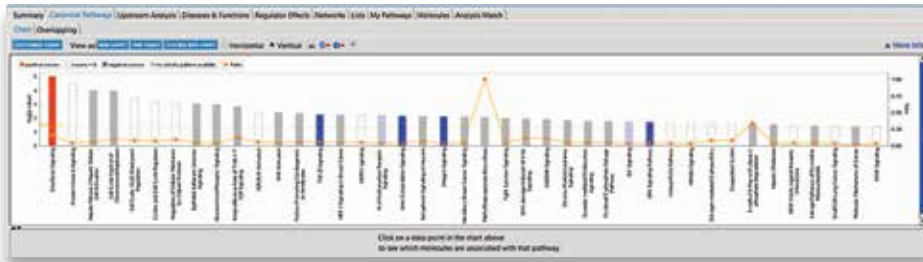
Co-immunoprecipitation of ZNF268 and NF-κB-p65 in differentiated human podocytes: PAN treatment at 0, 5, 10, 20, and 40 μg/ml of differentiated human podocytes for 3 hours followed by immunoprecipitation of cell lysates with mouse anti-ZNF268 and immunoblotting with rabbit anti-NF-κB-p65. Skipped lane = no sample loading. Input = 30 μg of protein from the no treatment cell lysates (positive control). IgG = mouse IgG immunoprecipitation (negative control).



Immunofluorescent stain of ZNF268 and NF-κB-p65 in human podocytes: PAN treatment 10 μg/ml of differentiated human podocytes followed by immuno-fluorescent stain of fixed cells with mouse anti-ZNF268 and rabbit anti-NF-κB-p65. Green = ZNF268, Red = NF-κB. Arrow heads point to nuclear protein localization.



PAN effect on podocyte related proteins expression and actin cytoskeleton: Immunoblotting of podocyte function related proteins (A) and fluorescent microscopy of the actin cytoskeleton stain (phalloidin488).



Expression profiling followed by Pathway Ingenuity Analysis of PAN treated differentiated podocytes: The expression profiling implicates signaling pathways closely related to podocyte function and injury including TGF- $\beta$  signaling and actin cytoskeleton signaling

# **MEDICAL AND CLINICAL AFFAIRS**



# DEPARTMENT OF ANESTHESIOLOGY

Submitted Research Proposal to ORA on 31<sup>st</sup> July 2018 - Proposal # 2181 166 - A New and Innovative Method for CO<sub>2</sub> Removal In Anesthesia Circuits: Replacing Chemical Granulate Absorbers. Proposal accepted by RAC, application submitted to Saudi FDA to get approval for importing the device. We shall start recruiting patients when the device is imported after customs clearance.

It is a simple device resembling in shape with the currently available granulate carbon dioxide absorbers. Its performance will be evaluated against the standard absorbers through analysis of gas samples, and computerized patient monitoring data.

CHAIRMAN

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HESHAM ALBABTAIN

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## RESEARCH ACHIEVEMENTS

- RAC # 2180134 approved on 28<sup>th</sup> March 2018 – Presented as oral presentation and poster on 13<sup>th</sup> September 2018 at Society for Airway Management meeting in Chicago, USA  
- Awake iGel insertion in a patient with challenging airway

## OTHER ACHIEVEMENTS

- Invited speaker to talk at the Society for Technology in Anesthesia meeting in Miami, Florida, USA, on 17<sup>th</sup> January 2018. Topic: Technology and future of anesthesiology.
- Represented KFSHRC and the Kingdom of Saudi Arabia at the inaugural meeting of International Society for Liver Transplant Anesthesia in Chicago, USA, on 1<sup>st</sup> May 2018.

## PUBLICATIONS

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- RAC # 20180123 approved on 3<sup>rd</sup> August 2018 - Editorial published in *APICARE (Anesthesia, Pain, and Intensive Care) Journal - Technology and Future of anesthesia*.
- RAC # 2180413 approved on 13<sup>th</sup> November 2018 - Cost drain of emergency anesthesia drugs – Article accepted for publication by *Saudi Journal of Anesthesia*.



مستشفى الملك فيصل التخصصي ومركز الأبحاث  
King Faisal Specialist Hospital & Research Centre  
ج.م.س. الرياض - المملكة العربية السعودية

## CASE REPORT AWAKE SUPRAGLOTTIC AIRWAY DEVICE (IGEL) INSERTION WITHOUT SEDATION FOR AIRWAY MANAGEMENT OF A CHILD WITH SEVERE CONGENITAL CRANIO-FACIAL ABNORMALITIES AND A HISTORY OF FAILED INTUBATION IN THE PAST

Dr Amer Majeed FCARCSI<sup>1\*</sup>, Dr Syed Shahid Mahmood AFA<sup>1</sup>, Dr Maab Mohammed Ahmed Altayeb MBBS<sup>2</sup>  
1. Consultant Anesthesiologist 2. Resident in anesthesiology  
King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia

\*Correspondence: amer.majeed@gmail.com

### BACKGROUND

A 2 years old female weighing 12 Kg, scheduled for MRI of brain under general anesthesia, presented with large congenital frontal meningo-myelocele, bilateral cleft lip and palate, rotated fixed neck deformity to the right [Figures 1,2,3], severe developmental delays, gastro-oesophageal reflux disease, and an indwelling oro-gastric tube. Over a year ago, while attempting to anesthetize her for a feeding gastrostomy, significant difficulty was faced during tracheal intubation, sharing multiple attempts amongst 3 experienced anesthesiologists, over an hour, using a range of airway adjuncts including fibre-optic scope and UE-Scopel®. Intubation failed and the procedure was aborted.



Fig. 1 Severe craniofacial abnormalities

### CASE REPORT

After obtaining informed parental consent, and with appropriate preparations for management of an anticipated difficult airway, 24 mg of topical lignocaine 5% ointment diluted to 2.5% was applied on her oropharynx manually and smeared over iGel (size 1.5) which was introduced repeatedly for further topicalization [Figures 4,5,6]. Placement of iGel was easy [Figure 7]; anesthesia was induced and maintained with inhaled Sevoflurane. Spontaneous ventilation was preserved throughout. MRI completed uneventfully over 45 minutes. The iGel slipped out when she was fully awake. She was discharged home the same day.

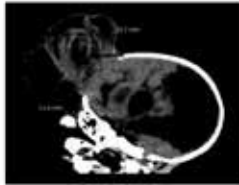


Fig.2 CT scan showing brain herniation through cranial defect.



Fig.3 Scout X-ray depicting cranio-facial abnormalities



Fig.4 Application of topical lignocaine directly



Fig.5 Application of topical lignocaine with finger



Fig.6 Application of topical lignocaine over iGel

### DISCUSSION

Use of topical anesthesia for Supraglottic Airway Device (SAD) insertion in awake patients has been described to facilitate intubation. High success rate was reported for elective use of SAD for primary airway management in anticipated difficult pediatric airway in asleep patients.

### CONCLUSION

We recommend SAD insertion under topical anesthesia alone, without sedation, for management of anticipated difficult airway.

### REFERENCES

- 1. Mahmood, S. B. Topical Anesthesia is enough for the placement of laryngeal mask airways in awake patients without sedation. *W. J. Med. Res. Rep.* 2020; 9(3): 4251
- 2. Wende, A. J. Gokhale, Awake insertion of the Biocompatible LMA, CTrack™ in three morbidly obese patients with potentially difficult airways. *Anaesthesia*, 2007; 62: 948-951
- 3. Matkoc Zabralo, Maria Dolores Gimel, Maira Portas, Maria Barrio, Ana Maria Lopez, Awake insertion of a Laryngeal Mask Airway-Proseal™ as alternative to awake fiberoptic intubation in management of anticipated difficult airway in ambulatory surgery. *Rev Bras Anestesiol*, 2016; 66(5): 539-542
- 4. Jagannathan N, Sequera-Ramos L, Suho L, Walle B, Shertzer A, Schuldenbrand K. Elective use of supraglottic airway devices for primary airway management in children with difficult airways. *Br J Anaesth* 2014; 112: 742-3



Fig. 7 Awake insertion of iGel, tolerated very well by the patient

https://doi.org/10.1007/s12012-021-00100-0



# DEPARTMENT OF DENTISTRY

Research plays significant role to the development of best practice in patient care.

The Department of Dentistry fully supports all research activities and all consultant staff are encouraged to actively participate and submit new research proposals and publications.

The Department's ongoing research projects tackle different concepts and all doctors are highly involved to complete the projects in order to provide us with essential input.

CHAIRMAN

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DR. ABDULLAH AL BARKHEEL

## RESEARCH ACHIEVEMENTS

- Registry of Cleft Lip/Palate and Craniofacial Anomalies (Ongoing research).  
*Investigators:* Dr. Aziza Al-Johar, Dr. Ali Al Mutlaq, Ms. Shazia Subhani
  - We are proud that this research project served its purpose to develop a Craniofacial Anomalies Registry at KFSH&RC. This registry is the only source of data regarding congenital defect in the Kingdom.
- Genetics of Craniofacial Birth Defects in Saudi Arabia (Ongoing research).  
*Investigators:* Dr Fouzan Al Kuraya, Dr. Aziza Al-Johar
  - Birth defects are important cause of disability worldwide with tremendous impact on the public health system. In this study, we aim to identify the genetic lesions (mutations) that underline the various genetic forms of craniofacial birth defects in the Saudi population and to study the role of the identified genes in the model organism.
- Stem Cells from Human Exfoliated Deciduous Teeth (SHED): A stem cell source for bone regeneration (Ongoing research).  
*Investigators:* Dr. Zikra Alkhayal, Dr. Saleh Al Bazie, Dr. Rajaa Alsanea, Dr Bjorn Olsen, Dr. Paul Sharpe
  - Our protein expression signatures indicates that different mesenchymal stem/ progenitor cells from human exfoliated deciduous teeth (SHED) obtained from osteopetrosis and healthy subjects exhibits highly similar multi-lineage capability for differentiation.
  - We have identified protein panel that might be specific as novel dental pulp mesenchymal stem cell markers once validated.
  - Some of them confirmed the previously reported proteins characterized from SHED and many of them have been implicated as putative stem cell markers.
- Rare Dental Disorder Registry (Ongoing research).  
*Investigators:* Dr Adeeb Al Omrani, Dr Mohammed Al Helal, Dr Richard Hakansson, Dr. Nomahn Humayun, Ms Shazia Naz Subhani
  - This ongoing project created an impact to the Kingdom, now we can get accurate information, diagnosis and treatment at KFSH&RC. Also, a web page has been initiated and demographic data has been captured and registered in the system.
- Gene Expression & Immuno Histological Findings in Patients With Papillon Lefèvre Syndrome (Ongoing research).  
*Clinical Investigators:* Adeeb Al Omrani BDS, DMSc (PI), Saleh Al-Muhsen, MD, Hamad Al Zaidan, MD, Mohammed Al Owain, MD, Richard Hakansson, DDS, PhD, Christer Ullbro, DDS, PhD  
*Research Investigators:* Namik Kaya, PhD (Co-PI), Dilek Colak, PhD, Said Dermime, PhD, Hazem Ghebeh, PhD
  - Papillon Lefèvre syndrome is relatively prevalent in a small village north of Riyadh. In this ongoing study, we established a preventative program among this high-risk group through carrier testing and genetic counselling.
- Health Related Quality of Life in Papillon Lefèvre Syndrome (Ongoing research).  
*Investigators:* Adeeb Al Omrani BDS, DMSc (PI), Yasmin Altwaijri, Aljoharah Aabed Al Abdullah, Maram Altuwaijri, Tahani Hamdan Alanzi, Noura Ali Alsanie, Hessah Al Suwaidan, Rehab Almubrick
  - Papillon Lefèvre syndrome (PLS) is a rare autosomal recessive disorder that can affect the quality of life. We develop a quality of life tools and administer them to PLS patients, initial findings is that patients with this case live less than the normal quality of life.

- Serum Levels of Leptin, C-reactive Protein and Pro Inflammatory Cytokines: Their Relationship to Periodontal Health and Disease in Saudi Periodontitis Patients. (Ongoing research).  
*Investigators:* Dr. Khalid Al Zoman, Dr. Fatwan Ak Muhanna, Dr. Ali Al Ghamdi
  - It has involved 77 subject. Samples were determined using an enzyme-linked immunosorbent assay kit. Results will be analyzed by the end of the study but investigators started doing the statistical analysis of the clinical laboratory data.
- A Prospective Observational Multicenter Cohort Study to Assess the Incidence of Osteonecrosis of the Jaw (ONJ) in Cancer Patients with Bone Metastases Starting Zoledronic Acid Treatment (Completed research).  
*Investigators:* Dr. Waled Rasheed, Dr. Kausar Suleman, Dr. Khalid Al Zoman
  - The study enrolled 3,491 evaluable pts. Overall, 87 pts had confirmed ONJ. Fewer total number of teeth, the presence of dentures and any oral surgery at baseline were all associated with a higher rate of ONJ. Conclusions: About 1 in 40 patients receiving Zoledronic Acid for metastatic bone disease (MBD) developed ONJ.
- Oral Lesions and Dentition Status Among Saudi HIV Infected Patients (Ongoing research).  
*Investigators:* Dr. Khalid Al Zoman, Dr. Muteb Al Mutairi, Dr. Dr Ranna Al-Musallam, Dr. Maha Al-Mozaini, Dr. Sadeq Ali Al-Maweri, Dr. Abdulrahman AlRajhi
  - This is on-going study; 98 patients were recruited statistical analysis will be carried out after completion of patients enrolled.
- A Randomized Phase II study of Adjuvant Concurrent Radiation and Chemotherapy versus Radiation alone in Resected High-Risk Malignant Salivary Gland Tumors (Completed research).  
*Investigators:* Nasir Al Rajhi, MD (PI), Mohammed AlGhazi, BDS, Zeyad Mahasin, MD
  - Important comparison of the effective treatment of high risk malignant salivary gland tumors with concurrent radiation and chemotherapy versus radiation alone.
- Randomized Phase II Trial of Docetaxal and Cisplatin vs Low Dose Fractionalized Radiation Plus Decetaxal and Cisplatin as Induction Therapy in Locally Advanced Nasopharyngeal Cancer (Ongoing research).  
*Investigators:* Nasir Al Rajhi, MD (PI), Mohammed AlGhazi, BDS, Zeyad Mahasin, MD
  - Exploring a new chemotherapy protocol alone in treatment of locally advanced nasopharyngeal cancer versus the traditional chemotherapy/radio therapy.
- Challenges of Autism Spectrum Disorders (ASDs) in affected Families towards Oral Health care in the Kingdom of Saudi Arabia (Ongoing research).  
*Investigators:* AlHammad Kholood, Zakria Moneer, Aldhalaan Hesham, Mosadomi Hezekiah, Al Dhalaan Reem, Alghazi Mohammed, Jobeir Aman, Al Muhanna Abdulaziz
  - The knowledge toward oral health was found to be inadequate among the majority of the parents of ASD children. The parents of ASD children, ASD Centers, Physicians and School teachers need to be educated about the consequences of oral health neglect and the importance of regular dental check-ups.

## RESEARCH ACHIEVEMENTS

- Challenges for Dental Health Professionals in the treatment of Autistic Patients in the Kingdom of Saudi Arabia: A Cross Sectional Study (Ongoing research).  
*Investigators:* AlHammad Kholood, Zakria Moneer, Aldhalaan Hesham, Mosadomi Hezekiah, Al Dhalaan Reem, Alghazi Mohammed, Jobeir Aman, Al Muhanna Abdulaziz
  - Knowledge about dental management of Autism Spectrum Disorders (ASD) seemed to be inadequate among dentists practicing in the Kingdom. Collaboration between Dental and Autism Society is important to regularly conduct oral health education programs.
- The Effect of Intravenous Biphosphonate Medication on the Outcome of Non-Surgical Endodontics Therapy: A Retrospective Study (Ongoing research).  
*Investigators:* Dr. Badar Al Shammari, Dr. Dr.Lama Alnasser, Dr. Lamyia Alballaa
  - We were able to communicate with the R4 software company, through which we manage to know all the patients who have received IV bisphosphonate and endodontic treatments. This be will be very helpful for any future research in the department.
  - We were able to collect all the patients MRN who meet the research criteria from the house ware through ICIS.
  - We gathered all the sample pre and post radiograph for analysis.

## OTHER ACHIEVEMENTS

- Registry of Cleft Lip/Palate and Craniofacial Anomalies  
*Investigators:* Dr. Aziza Al-Johar, Dr. Ali Al Mutlaq, Ms. Shazia Subhani
  - Development of Clefty mobile application is the 1<sup>st</sup> and only interactive application in the Kingdom. This is the resource for anyone affected by Cleft Lip and Palate to connect, share stories, learn, and support each other.
- Rare Dental Disorder Registry  
*Investigators:* Dr Adeeb Al Omrani, Dr Mohammed Al Helal, Dr Richard Hakansson, Dr. Nomahn Humayun, Ms Shazia Naz Subhani
  - A web page has been initiated related to this project. This will be the resource for anyone affected by Rare Dental Disorder.

## PUBLICATIONS

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- Effect of Er, Cr, YSGG on Bond Strength and Microleakage of Dentin Bonded to Resin Composite with Different Distance and Irradiation Time. Saud Al Mojaly. *Photodiagnosis and Photodynamic Therapy*.
- Effect of Diode Laser and Topical Fluoride Application on Masking White Spot Lesions of Enamel. Mohammed Al Qahtani. *General Dentistry*.
- Hidden Caries: A Case Report of A 17 Years Old Male with Two Affected Mandibular Premolars. Haifa Al Khodier. *Journal of Clinical Pediatric Dentistry*.
- Oral Mucositis in Saudi Leukemic Children Following Chemotherapy. Almoshed E., Azizrahman T., Al Johar A. *Saudi Dental Research* Feb 2018.
- The Difference in Cervical Vertebral Skeletal Maturation between Cleft Lip/Palate and Non-Cleft Lip/Palate Orthodontic Patients. Batwa W. Almoamar K, Aljohar A. Almujel S, Zawawi K. Jan 2018. *Bio-Med Research International* Volume 2018, Article ID 5405376, 5 pages.
- The Effects of Presurgical Nasoalveolar Molding on the Midface Symmetry of Children with Unilateral Cleft Lip and Palate: A Long-term Follow-up Study. Alhayan W. Sharat P. Aljohar A. *Plastic Reconstr Surg*. 2018 Jul; 6(7): e1764. Published online 2018 Jul 9.
- Multidisciplinary Approach for Improving Aesthetics in A Cleft Lip and Palate Patient. Khalid Al Zoman. *Saudi Medical Journal*.
- Cerebrospinal Fluid Leaks: Considerations for the Oral & Maxillofacial Surgeon. Ahmad Al Shadwi. *Craniofacial Trauma & Reconstruction*.
- Classification of Sagittal Root in Relation to the Anterior Maxillary Alveolus for Immediate Implant Placement: A Cone Beam Computed Tomography. Ahmad Al Shadwi. *Journal of Implantology*.
- Classification of Sagittal Root Position in Relation to the Anterior Maxillary Alveolus for Immediate Implant Placement: A Cone Beam Computed Tomography Study. Ahmad Al Shadwi. *Journal of Implantology*.



# DEPARTMENT OF EMERGENCY MEDICINE

The Research conducted by the Emergency Department (ED) encompassed a lot of interesting areas including Toxicology, patient flow during the busy month of Ramadan, impact of culture values impacting on patient care etc. The interesting case report also highlighted areas where ED should be focusing on patient education in using auto-injector devices.

The research was carefully conducted and directed towards providing safe and high quality patient care. The impact and validity of the Rapid assessment model (RAT) model was studied which clearly showed the impact of this intervention on ED's sickest group of patients. Our study proved that this model had significantly reduced our patients' morbidity and mortality.

ED research also focused on the preventative practices around the Middle eastern respiratory distress syndrome which had an impact on tailoring national safety measures for MERS-CoV, preventing infections in health care workers and hospital acquired infections.

CHAIRMAN

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TAIMUR S. BUTT, MD

## RESEARCH ACHIEVEMENTS

- Raised safety awareness among the patients and clinicians, around the use of auto-injector devices. The ability to deal with the accidents caused by these devices due to human errors. Emphasis on an immediate ED intervention to save the digit (finger).
- Our research highlighted the impact of patient gender segregation as important part of Saudi Arabia society. This was studied in relation to the clinical encounters carried out by different gender clinicians. This study concluded that no stringent barriers exist in DEM patients for clinicians gender preference
- The importance of using carefully measured quantities of contrast for patients undergoing contrast enhanced studies. There was a safety margin defined for the amount of contrast to be delivered for the patients by measuring the contrast levels in the urine.
- The change of patient pattern walking through the ED doors varies during different days of the week and also different months. The patient pattern in the month of Ramadan was studied and that helped tailor the resources according to patients' needs.
- The pattern of working in ED was modified by using Rapid assessment and treatment model (RAT). The high acuity patients in ED were seen by the most senior clinicians in a a very short space of time. The team working was achieved between the physicians and the nursing staff. This led to reduction in sentinel events, improved patient care and experience.
- We studied the infection patterns in our ED with the help of our infection teams. Preventative strategies were devised to stop transmission of the deadly respiratory illness in our patients and staff. This led to enhanced patient safety.

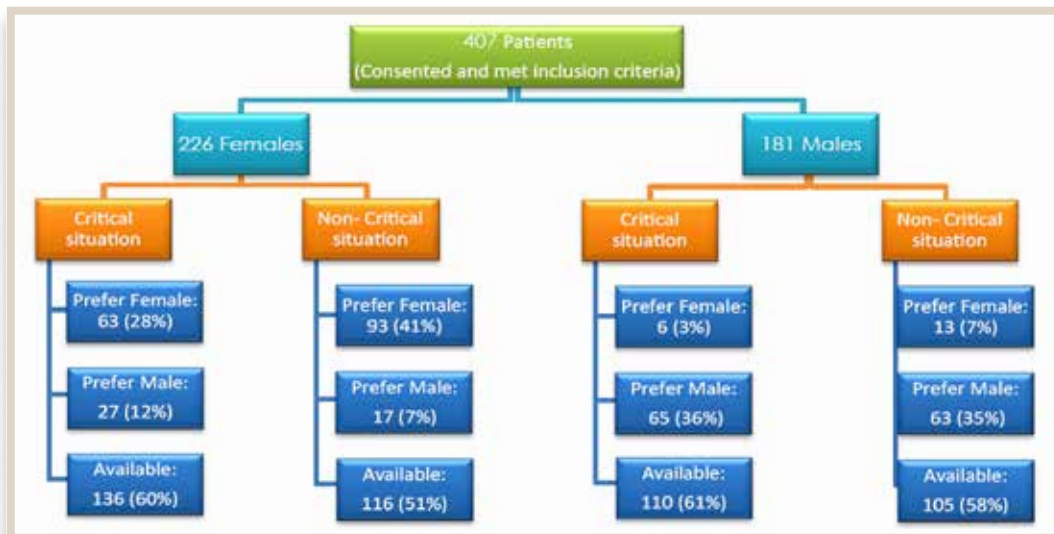
## OTHER ACHIEVEMENTS

- 6<sup>th</sup> Emergency and Critical Care Ultrasound Course, 21–22 November 2018, King Faisal Specialist Hospital & Research Centre. Teaching POCUS in Emergency and Acute Care setting.
- 5<sup>th</sup> International Conference in Pediatric Emergency Medicine, 17–19 April 2018, Princess Bint Haya Auditorium, Al Faisal University. Attended by over 500 delegates from all over the region.

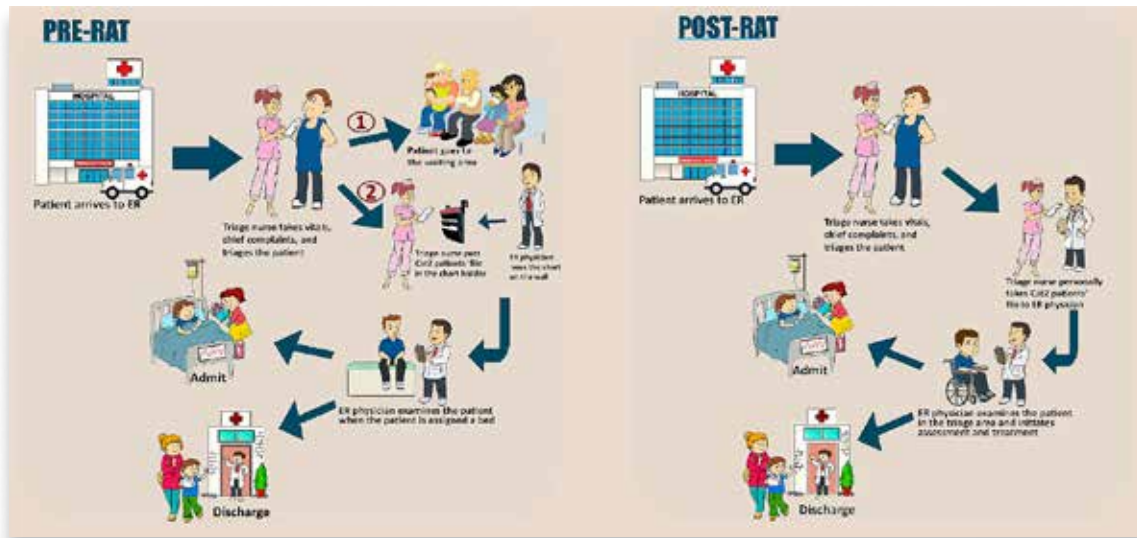




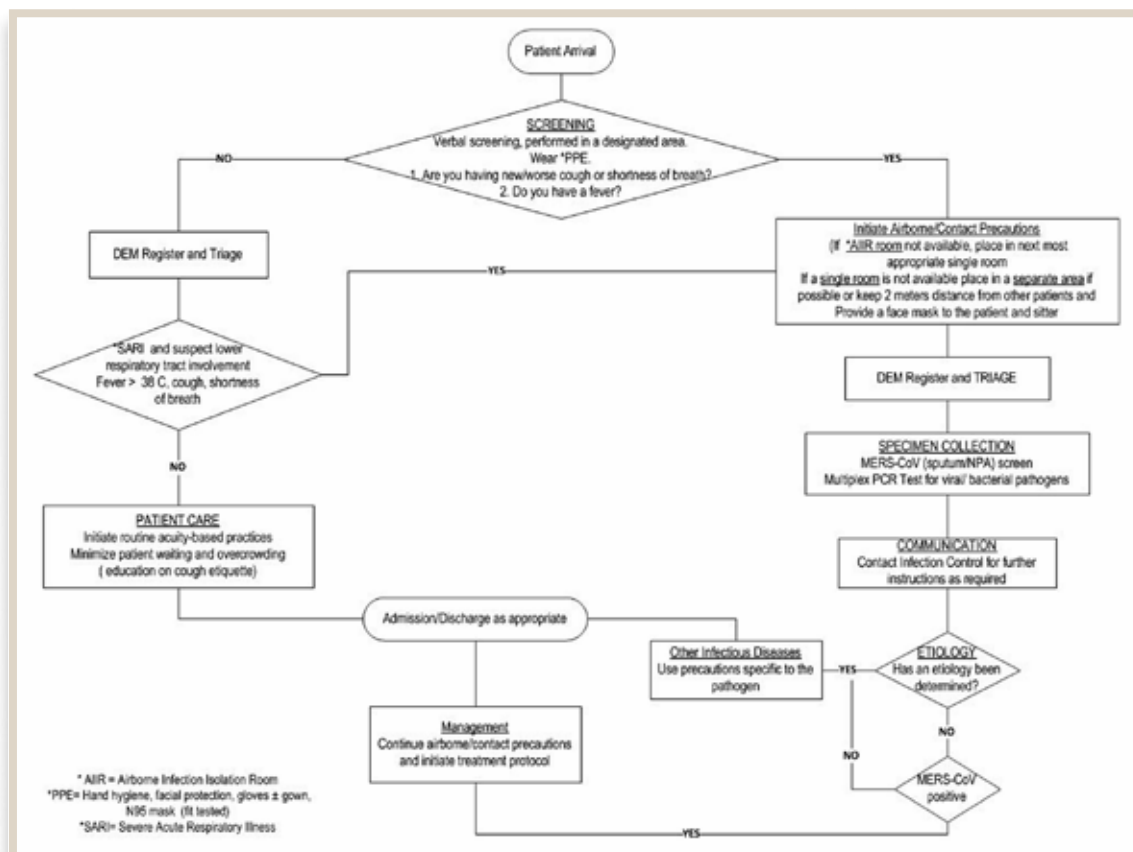
Epipen Needle embedded in the patient's thumb.



The Population of Participants Recruited for the Gender Study.



Pre-RAT and Post RAT Flowchart.



Department of Emergency (ED) MERS-COV Contingency Plan.

## PUBLICATIONS

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- Mujtaba SI, Alameel A, Hamad B, Butt TS. Digital Ischemia from Accidental Epinephrine Injection A 28-year-old woman presented to the ED after accidentally injecting the entire contents of an epinephrine autoinjector into her right thumb. *Emergency Medicine*. 2018 May;50(5):113-7.
- How Emergency Physicians' gender shaped by patients attending emergency departments in culturally conservative society? Mohammed Alomar\*, Fatima Alkandari, Muneera Al Asfoor, Ali Almajed, Sultan Alrobaian, Ranya Abo Shanb and Abdelmoneim Eldali. *Trauma Emerg Care*, 2018/Volume 3(2): 1-5.
- Urinary Gadolinium Levels After Contrast-Enhanced MRI in Individuals with Normal renal Function: A pilot study. Dalia Alwasayah, Christine Murphy, et al. *J Med Toxicol*. (2018) <https://doi.org/10.1007/s13181-018-0693-1>.
- S.H Rahmatullah, R. A Chamseddin, A. N Farfour, M. AlOmar, A.M Eldali, H.Alhabahbeh, T.S Butt; Rapid Assessment and Treatment (RAT) of Triage Category 2 patients in the emergency department. *Trauma Emerg Care*. 2017;2(2): 1-5. doi: 10.15761/TEC.1000128
- Butt T, Khan HU, Ahmed I, Eldali A. Emergency department attendance patterns during Ramadan. *Annals of Saudi Medicine*. 2016 Jul;36(4):258.
- Butt TS, Koutlakis-Barron I, AlJumaah S, AlThawadi S, AlMofada S. Infection control and prevention practices implemented to reduce transmission risk of Middle East respiratory syndrome-coronavirus in a tertiary care institution in Saudi Arabia. *American Journal of Infection Control*. 2016 May 1;44(5):605-11.



# DEPARTMENT OF FAMILY MEDICINE & POLYCLINICS

The report highlights research and scholarly activities by our department members. Although the department has a relative modest number of faculty members with protected time for research, the collaborative culture within the department has led a number of publications.

The Department of Family Medicine & Polyclinics is active in enriching the research activities of the department through its Department Research Committee. The function of this Committee is to provide academic and administrative support to physicians and residents in our department, and in the preparation and submission of their proposed research projects and to give assistance to investigators in a manner consistent with approved policies and procedures of KFSH&RC. As a result, the number of research projects, publications, abstracts and international presentations has increased compared to previous years. The Committee is comprised of four physicians and one research coordinator.

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#### CHAIRMAN

ABDULLAH ALKHENIZAN

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#### COMMITTEE MEMBERS

ANEELA HUSSAIN  
HUSSAM JNAID  
PATRICIA MCWALTER  
LOAY BASUDAN  
SUAD ALSOGHAYER

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## RESEARCH ACHIEVEMENTS

- Dr Muath Alammam, R4 Resident, won 1<sup>st</sup> Prize in Poster Presentation (Diagnostic Accuracy of BMI to Identify Obesity in Saudi Adult Population in a Hospital-Based Setting), at International Family Medicine Conference, Dubai, 26-28 Feb 2018.
- Dr Muath Alammam, R4 Resident, won 1<sup>st</sup> Prize in Oral Presentation for same research at Fifth WONCA East Mediterranean Region Family Medicine Congress, in Kuwait, 1-3 Mar 2018.
- Poster presentation of Dr Naif Almoneef, R3 Resident, of his research entitled, "The Yield of Fecal Occult Blood Testing as a Screening Tool for Colon Cancer in a Primary Care Setting" at the 3<sup>rd</sup> Health Professions Conference, KSAU-HS, Riyadh.
- Poster presentation of Dr Naif Almoneef, R3 Resident, of his research entitled, "The Yield of Fecal Occult Blood Testing as a Screening Tool for Colon Cancer in a Primary Care Setting", at WONCA 2018 in Seoul, Korea, 17-21 October 2018.
- Dr Muath Alkhunizan, R4 Resident, won 2<sup>nd</sup> Prize in Oral Presentation (Prevalence of Mild Cognitive Impairment and Dementia in Primary Care), at Iman Abdulrahman Bin Faisal University, Dammam, 13-14 Dec 2018.
- All R4, R3, and R2 residents in the department are doing individual research and participated in oral and poster presentation at "11<sup>th</sup> KFSH&RC Annual Residents Research Day", 22 Feb 2018.
- Six research projects have been submitted and approved by RAC in 2018 and four ORA approved research projects were published in 2018.

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## OTHER ACHIEVEMENTS

- Management of Chronic Diseases Series, entitled “Update in Outpatient Management of Chronic Diseases” in Al Baha, 28–29 October 2018.
- Management of Chronic Diseases Series, entitled “Respiratory Day”, KFSH&RC, Riyadh, 05 May 2018.
- Management of Chronic Diseases Series, entitled “Cardiovascular Day”, KFSH&RC, Riyadh, 17 February 2018.

## PUBLICATIONS

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- Al Sifri S, Al Shemmeri O, Al Jaser S, Alkhenizan A, Bin Shafi A, Morcos B, et al. Prevalence of lipid abnormalities and cholesterol target value attainment in patients with stable coronary heart disease or an acute coronary syndrome in Saudi Arabia. *SMJ*, 2018 Jul;39(7):697-704.
- Alkhunizan, M., Alkhenizan, A., & Basudan, L. (2018). Prevalence of Mild Cognitive Impairment and Dementia in Saudi Arabia: A Community-Based Study. *Dementia and Geriatric Cognitive Disorders Extra*, 2018 Mar 20;8(1), 98-103.
- Alkhenizan AH, Shafiq MR. The process of litigation for medical errors in Saudi Arabia and the United Kingdom. *SMJ*. 2018 Nov;39(11):1075-1081.
- Muhsen N, AlFreihi O, Abaalkhail F, Alkhenizan A, Khan M, Eldali A, Alsohaibani F. Bone Mineral Density Loss in Patients with Cirrhosis. *Saudi J Gastroenterol*, 2018 Nov-Dec;24(6):342-347.
- McWalter P, AlWahbi O. Interstitial Lung Disease. *J Clin Med Imag*. 2018 Aug;1(2):7
- Hussain F, Hussain A, et al. Gynecologic Tumor Markers. Obstetrics & Gynecology book. *Medscape*, Aug 2012; modified 25 Mar 2018.
- McWalter P. Love's Last Gift – A Journey Through Bereavement. *Mental Health Fam Med*, 2018;13:747.
- Hussain A. Overactive Bladder in the Neurogenic Bladder and Overactive Bladder Reference. *Medscape*. Dec 2017.
- Berhanu A, Alkhenizan A. Non-Therapeutic Infant Male Circumcision: Evidence, Ethics and Internal Law Perspective. *SMJ* 2017 Feb; 38(2)213-214.
- Alkhenizan A, Mahmoud A, Hussain A, Gabr A, Alsoghayer S, Eldali A. The Relationship Between 25 (OH) D Levels (Vitamin D) and Bone Mineral Density (BMD) in a Saudi Population in a Community-Based Setting. *PLoS One* 2017 Jan 3:12(1).
- Alhamlan FS, Khayat HH, Ramisetty-Mikler S, Al-Muammar TA, Tulbah AM, Al-Badawi IA, Kurdi WI, Tulbah MI, Alkhenizan AA, Hussain AN, Ahmed M, Al-Ahdal MN. Sociodemographic characteristics and sexual behavior as risk factors for human papillomavirus infection in Saudi Arabia. *Int J infect Dis*. 2016 May; 46:94-9.
- Hussain AN, Alkhenizan A, McWalter P, Qazi N, Alshmassi A, Farooqi S, Abdulkarim A. Attitudes and perception towards HPV vaccination among young women in Saudi Arabia. *J Family Community Med*, 2016 Sep-Dec;23(3):145-50.
- McWalter P, Muammar T, Hafez K. Chronic Pelvic Pain of Myofascial Origin in a 53-year-old Patient. *Iraqi J of Community Medicine*, July-Oct 2016;29(3&4).
- Alkhenizan A, El Abd K. Non-Therapeutic Infant Male Circumcision: Evidence, Ethics and International Law Perspectives. *SMJ* 2016 Sep;37(9):941-7.
- Al Hajjo S, Varghese B, Datijan A, Shoukri M, Alzahrani A, Alkhenizan A, Al Saif A, Althawadi S, Fernandez G, Alrajhi A. Interferon Gamma Release Assay versus Tuberculin Skin Testing among Healthcare Workers of Highly Diverse Origin in a Moderate Tuberculosis Burden Country. *PLoS One* 2016 May 5;11(5):11(5).



# HEART CENTRE

The Heart Centre is committed to excellence in patient care, teaching and research. Its mandate includes research on the challenges of cardiovascular diseases faced by the people of Saudi Arabia. Its objective is to increase scientific knowledge of cardiovascular diseases including their epidemiology, risk and risk factors, prevention, detection and diagnosis, treatment and prognosis, and to initiate cardiovascular evidence-based programs.

In 2018 the Heart Centre had 75 approved/ongoing research projects. These projects included prospective studies, retrospective records review and analysis, registries, interventional, diagnostic research, and basic research. The Heart Centre has 64 Retrospective and 11 Prospective studies, out of these 7 are sponsored. The sections of the Heart Centre have research proposals as follows: Adult Cardiology = 28, Adult Cardiovascular Surgery = 30, Pediatric Cardiology = 16, Pediatric Cardiovascular Surgery = 11, and Adult and Pediatric Cardiovascular Surgery (combined) = 06. Also for 2018, the Heart Centre submitted 20 Publications and 56 Abstract and Oral presentations.

The Heart Centre continues to develop its Strategic Research Plan (SRP) which is designed to develop and sustain significant internationally acknowledged research in several thematic areas relevant to the high incidence of cardiovascular diseases in the Kingdom. The Heart Centre plans to significantly increase its research capacity in each of these areas and to become recognized internationally for its high caliber research.

Our sponsored studies were assessed several times by the Saudi Food and Drug Authority and they are happy with our data management and compliance.

CHAIRMAN

JEHAD AL BURAIKI, MD

## RESEARCH ACHIEVEMENTS

- In Ross patients who require re intervention on the PV homograft, both tPVR and sPVR provide low procedural mortality and comparable midterm outcome with no significant difference in mortality or PV re intervention. However IE is more common following tPVR. A larger randomized study is required to determine the role of each procedure in patient management. This study was published in a key society journal “Journal of Thoracic and Cardiovascular Surgery”
- Increases in Heart Rate Variability Signal Improved Outcomes in Rapid Response Team Consultations: A Cohort Study: HRV analysis appears to have powerful associations with ICU admission and poorer survival in patients referred for RRT evaluation. Based on our results, prognostication using real time HRV assessment at the bedside is a promising next step. This study was published in a key society journal “Cardiology Research and Practice.”
- Appropriate and Inappropriate Implantable Cardioverter Defibrillators Therapies in Arrhythmogenic Right Ventricular Cardiomyopathy/ Dysplasia Patients. ARVC/D patients are at risk of VT/VF arrhythmias. ICD therapy is the only proven life-saving therapy in those patients. Most of ICD therapies in our patient’s population are appropriate, and ATP therapy is effective in terminating most of VT episodes. Although we do not have any patient with subcutaneous ICD, the high success rate of ATP suggests that transvenous ICD would be more appropriate in ARVC/D patients. This study was published in a key society journal “Cardiology Research Journal.”
- Bioprosthetic Tricuspid Valve Dysfunction in Patients with Transvalvular or Epicardial Pacing Leads. Development of BTV dysfunction is similar in patients with trans valvular ventricular leads and epicardial leads. The incidence of BTV dysfunction was higher in patients with sinus rhythm compared to atrial fibrillation. This study was published in a key society journal “Pacing and clinical Electrophysiology(PACE).”
- In the present study we evaluated the LV function adaptation to aging. We can summarize the present results as follows 1) LVM value increased due to increase in wall thickness. A progressive diastolic impairment with an increase in diastolic filling pressure and left atrial volume according to age was observed; 2) The EF did not change among the 3 age-groups but there was an increase in SV, CO, LVET and SW. On the other hand, Sm, an index of longitudinal contractility, was inversely related to age. 3) LV arterial-coupling did not change among the groups because the vascular stiffness increased in tandem with LV contractility. Moreover, neither Ea nor EES changed significantly with age. This study was published in a key society journal “American Journal of Cardiology.”
- The Right Heart-Pulmonary Circulation Unit in Systemic Hypertension. Hypertension is associated with changes in the pulmonary circulation and the right heart. PVR may be increased and RV function may be altered at early stage of hypertension when LV hypertrophy is still inconspicuous and in relation to increased pulmonary vaso reactivity. With progress of LV remodeling and sustained increase in PAP, the RV undergoes a hypertrophic remodeling that parallels that of the LV. Further LV remodeling may transiently correct or prevent alteration of RV function by positive systolic interaction. This study was published in a key society journal “Book Chapter: Heart Failure Clinic-Clinic Review Article.”
- One-Point Carotid Arterial Stiffness Is An Independent Determinant Of Left Ventricular Remodeling In Never-Treated Hypertensive Patients; In the present study of never-treated hypertensive subjects with a low cardiovascular risk burden, one-point carotid arterial stiffness measured by echo-tracking method was independently associated with LV remodeling and provided additive effect over BP, and regardless to cfPWV. Age and mean night-time ambulatory BP were found to be constantly and independently related with arterial stiffness, but the weight of both variables was higher in local carotid stiffness than regional arterial stiffness (cfPWV). This study was published in a key society journal “Blood Pressure.”

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## OTHER ACHIEVEMENTS

- Heart Centre Research team arranged a “Cardiovascular awareness day” on 18<sup>th</sup> September. The theme was “Your Heart Comes First”. It was a successful event and nearly 500 attendees during the event.
- Heart Centre research team conducted a successful Women’s Heart Health Day which was held on the 27 February. There were approximately 300 attendees during the event.

## PUBLICATIONS

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- Khadija Alassas, MD, Dania Mohty, MD, PhD, Marie Annick Clavel, DVM, PhD, Aysha Husain, MD, Talal Hijji, MD, Mansour Aljoufan, MD, Zohair Alhalees, MD, Bahaa M. Fadel, MD; Transcatheter versus Surgical Valve Replacement for the Failed Pulmonary Homograft in the Ross Population; *Journal of Thoracic and Cardiovascular Surgery*; March, 2018.
- Nawal Salahuddin, Azam Shafquat, Qussay Marashly, Khaled Juan Zaza, Moh'd Sharshir, Moazzum Khurshid, Zeeshan Ali, Melissa Malgapo, Mouhamad Ghyath Jamil, Mohamed Shoukri, Mohammed Hijazi, and Bandar Al-Ghamdi ; Increases in Heart Rate Variability Signal Improved Outcomes in Rapid Response Team Consultations: A Cohort Study; *Cardiology Research and Practice March*, 2018.
- Nicole Bertin, Gabriele Brosolo, Francesco Antonini-Canterin, Rodolfo Citro, Rosalba Minisini, Khadija Alassas, Eduardo Bossone, Olga Vriz; Takotsubo In Young Fertile Women; *European Journal of Internal Medicine* 2018; August, 2018.
- Olga Vriz, MD, PhD, Yoshiki Motoji, MD, Francesco Ferrara, MD, PhD, Eduardo Bossone, MD, PhD, Robert Naeije, MD, PhD; The right heart-pulmonary circulation unit in systemic hypertension; *Heart Failure Clinic* 2018; April, 2018.
- Antonello D'Andrea, Olga Vriz<sup>1</sup>, Francesco Ferrara<sup>2</sup>, Rosangela Cocchia, Marianna Conte, Marco Di Maio, Caterina Driussi<sup>1</sup>, Raffaella Scarafille, Francesca Martone, Simona Sperlongano, Giampaolo Tocci, Rodolfo Citro<sup>2</sup>, Pio Caso, Eduardo Bossone<sup>2</sup>, Paolo Golino; Reference Ranges and Physiologic Variations of Left E/e' Ratio in Healthy Adults: Clinical and Echocardiographic Correlates; *Journal of Cardiology Echo*; 2018.
- Zainab Al Awadhi, Abdullah Al Wadai, Zohair Al Halees; A Rare Case of Total Anomalous Systemic Venous Return; *World Journal for Pediatric and Congenital Heart Surgery*; March 2018.
- Abdullah Al Sehly; Right superior vena cava draining into left atrium with partial anomalous pulmonary venous return: case report and literature review; *JACC*; May, 2018.
- Bandar Al-Ghamdi, Yaseen Mallawi, Azam Shafquat, Nadiyah AlRuwaiti,, Ayman Alhazaymeh, Waleed Al-Manea, Majid Al-Fayyadh; Appropriate and Inappropriate Implantable Cardioverter Defibrillators Therapies in Arrhythmogenic Right Ventricular Cardiomyopathy/ Dysplasia Patients; *Cardiology Research Journal*; June, 2018.
- Shafquat, Azam, Salahuddin, Nawal, Dawood, Wafa, Assas, Khadija, Al Ghamdi, Bander, Fadel, Bahaa; Bioprosthetic Tricuspid Valve Dysfunction in Patients with Transvalvular or Epicardial Pacing Leads; *Pacing and clinical Electrophysiology (PACE)* June, 2018.
- Domenico Galzerano, Naji Al Kholaif; Horseshoe Shaped Clot; *New England Journal Of Medicine*; July 2018.
- Al Ghamdi, Bander, Subcutaneous implantable cardioverter defibrillators: an overview of implantation techniques and clinical outcomes; *Current Cardiology Reviews*; August, 2018.

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- O. Vriz, N. Bertin, L. Mos, D. Galzerano, E. Bossone, P. Palatini; Aortic diameters and mild functional aortic regurgitation in hypertensive and normal subjects; *European Heart Journal*; 2018
  - O. Vriz, N.B. Bertin, A. Ius, E. Bizarrini, L. Mos, D. Galzerano, E. Bossone; Carotid artery stiffness and development of hypertension in chronic spinal cord injury subjects with no overt cardiovascular disease: a 7-year follow-up study; *European Heart Journal*; 2018.
  - Olga Vriz, Julien Magne, Joanna Jarosh, Eduardo Bossone, Victor Aboyans, Paolo Palatini ; One-Point Carotid Arterial Stiffness Is An Independent Determinant Of Left Ventricular Remodeling In Never-Treated Hypertensive Patients; *Blood Pressure*; 2018.
  - Domenico Galzerano, Khadija Assas, Naji Al Kholaf, Giovanni Di Salvo, Dania Mohty, Baha M Fadel, Abd-Kareem Allaf, Ziad Dahdouh, Jihad Al Buraiki, Hani Al Sergani ; Gerbode Defect After Trans Catheter Aortic Valve Replacement: Three Dimensional Transesophageal Echocardiographic Imaging Of A Rare Complication; *European Heart Journal Cardiovascular Imaging*; October, 2018.



# DEPARTMENT OF NEUROSCIENCES

The Department of Neurosciences' mission and vision are state of the art tertiary neuroscience clinical care, research and education. Department of Neurosciences research endeavors encompass several clinical registries, basic, clinical translational research and technical innovations. These are conducted in collaboration among its four sections, multi-disciplinary clinical programs, King Faisal Specialist Hospital & Research Centre, national and international academic institutions.

Neuroscience research activities are supported by approved RAC projects and reflected in several publications in peer review journals.

The department is composed of four sections: The Section of Adult Neurology; the Section of Pediatric Neurology; the Section of Neurosurgery; and the Section of Clinical Neurophysiology.

Furthermore, the department hosts several Residency and fellowship training programs which contributes to publications, among which are the annual Neurosciences Clinical Case Presentations book (Vol3), Tumor Registry book (Vol1) and Epilepsy Cases Presentations book (Vol1).

CHAIRMAN

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PROF. IMADUDDIN KANAAN





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SECTION OF  
ADULT NEUROLOGY

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## RESEARCH ACHIEVEMENTS

- An Open-Label, Single-Arm 4-Year Study to Evaluate Effectiveness and Safety of Ocrelizumab Treatment in Patients with Progressive Multiple Sclerosis.  
RAC#2181075  
Principal Investigator: Mona Alkhawajah, MD  
Project Description: To evaluate the effectiveness and safety of ocrelizumab treatment in progressive multiple sclerosis patients.  
Progress: Ongoing
- Outcome and Safety of Disconnective Surgery in Patients with Refractory Epilepsy: a Retrospective Single Center Study.  
RAC#2181092  
Principal Investigator: Mashaal Alkhateeb, MD  
Project Description: To analyze surgical outcome and safety of disconnection surgery in drug-resistant epilepsy arising from one region either anterior or posterior head region in a tertiary care center, KFSHR&RC.  
Progress: Ongoing
- Comprehensive Outcomes Registry in Subjects with Epilepsy Treated with Vagus Nerve Stimulation Therapy.  
RAC#2181205  
Principal Investigator: Mashaal Alkhateeb, MD  
Project Description: To evaluate clinical outcome and safety data in subjects with drug resistant epilepsy treated with the VNS Therapy system.  
Progress: Ongoing
- The Effect of Early Disclosure of MS Diagnosis on Engagement/Marriage Outcome in Saudi Arabia.  
RAC#2161029  
Principal Investigator: Mona Alkhawajah, MD  
Project Description: A cross-sectional study, looking at a marriage/engagement outcome in MS patients as a factor of disclosing versus hiding the diagnosis prior to making the partnership commitment.  
Progress: Ongoing
- Seizure Outcomes after Hemispherectomy for Refractory Epilepsy in Childhood and Adolescence .  
RAC#2161142  
Principal Investigator: Mashaal Alkhateeb, MD  
Project Description: Retrospectively review patients who underwent a hemispherectomy (either anatomical or functional) at KFSHRC between 2000-2014, and to evaluate Seizure outcome during follow-up in 1, 3, 5, years post-surgery.  
Progress: Ongoing
- MSBase: An International Registry Dedicated to Evaluating Outcomes Data in Multiple Sclerosis (MS).  
RAC#2161180  
Principal Investigator: Mona Alkhawajah, MD  
Project Description: A longitudinal, strictly observational Multiple Sclerosis worldwide database. The Registry has established a web-based platform dedicated to sharing, tracking and evaluating outcomes data in MS and other Central Nervous System demyelinating diseases. Aims to advance multi-centre, multi-national epidemiological and outcomes research by providing a freely accessible resource to compile, combine, compare and analyse large datasets.  
Progress: Ongoing
- Epilepsy Registry.  
RAC#2011059  
Principal Investigator: Abdulaziz Alsemari, MD  
Project Description:
  - Better understanding of Epilepsy
  - Improvement of patient care and health planning
  - Provide a disease specific information network to enhance the management of research in Saudi Arabia
  - Provide an important source of data to enable health care workers to estimate the magnitude and impact of Epilepsy on society and to assess the result of the therapy.Progress: Ongoing

- Seasonal Variation in Optic Neuritis & Possible Association with Vitamin D Deficiency.  
RAC#2171078  
Principal Investigator: Mona Alkhawajah, MD  
Project Description: To quantify and analyze the seasonal pattern of Optic Neuritis onset, evaluate the causative meteorological factors and investigating the role of Vitamin D at onset in the seasonal fluctuation.  
Progress: Ongoing
- The Effect of Fasting on the Brain of Multiple Sclerosis Patients (MS): Pilot Advance Magnetic Resonance Images (MRI) Study.  
RAC#2171075  
Principal Investigator: Mona Alkhawajah, MD  
Project Description: To study the effect of fasting on several magnetic resonance imaging parameters in patients with Multiple Sclerosis.  
Progress: Ongoing
- Specificity predictor of surgical outcome in pharmaco-resistant bitemporal lobe epilepsy.  
RAC#2171189  
Principal Investigator: Salah Baz, MD  
Project Description: Retrospective cohort study compares outcome in term of seizures control primarily and other variables, impact of life and depression screening between patients with pharmaco-resistant bitemporal lobe epilepsy underwent unilateral temporal lobectomy or subjected to vagal nerve stimulator implantation.  
Progress: Ongoing
- Education and Refractory Epilepsy in Children and Adult: A Survey of Children and Adult Refractory Clinic.  
RAC#2171178  
Principal Investigator: Mashael Alkhateeb, MD  
Project Description: To estimate the amount of education refractory epilepsy patients are receiving at school. The reason and causes of difficulties confronted by the patients and shortage of attendance at school.  
Progress: Ongoing



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SECTION OF  
PEDIATRIC NEUROLOGY

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## RESEARCH ACHIEVEMENTS

- Normal Nerve Conduction Parameters in Saudi Children  
RAC#2181043.  
Principal Investigator: Mohamed Al Muhaizea, MD  
Project Description: To collect the normal nerve conduction data from children with focal or unilateral nerve injury who had nerve conduction studies performed on the contra lateral-normal-side as a reference control for the patient.  
Progress: Ongoing
- A Two Part Seamless, Open-Label, Multi-Center Study To Investigate the Safety, Tolerability, Pharmacokinetics, Pharmacodynamics and Efficacy of Ro7034067 in Infants with Type 1 Spinal Muscular Atrophy.  
RAC# 2181082  
Principal Investigator: Mohamed Al Muhaizea, MD  
Project Description: To assess the efficacy of RO7034067 measured as the proportion of infants sitting without support after 12 months of treatment, as assessed in the Gross Motor Scale of the Bayley Scales of Infant and Toddler development- (BSID-III)(defined as sitting without support for 5 seconds).  
Progress: Ongoing
- Phenotype and Genotype of NCL in Saudi Arabia.  
RAC# 2181203  
Principal Investigator: Suad Alyamani, MD  
Project Description: To provide an overview of the NCLs in Saudi Arabia in different genotype and phenotype and identify clinical type of NCL in our patient population.  
Progress: Ongoing
- Standardization of Neuropsychology Tests for Saudi Arabian Children.  
RAC# 2181032  
Principal Investigator: Haya Al Joudi, PhD  
Co-Principle Investigator: Najla Almarzouki  
Project Description: To improve lives of disabled children by proving fair measure that highlights their strengths and areas in for need help. This will enable disabled children to contribute and be a part of Saudi vision 2030 (2017). Also, aims to foster research on the area of neurocognitive impairments in general and enables Saudi Arabia and the Middle East be a part of international neuropsychological research, Additionally, producing information on standards and norms on a Saudi Population and the disabled will allow services to be created or amended according to the populations needs.  
Progress: Ongoing
- Clobazam Efficacy, Tolerability, and Adverse Effects in Saudi Children with Intractable Epilepsy.  
RAC# 2161171  
Principal Investigator: Suad Al Yamani, MD  
Project Description: To compare anticonvulsant effects, tolerance and pharmacokinetic interactions of Clobazam in Saudi patients with epilepsy against international findings.  
Progress: Ongoing
- Cognitive Performance and MRI Substrates in Patients with Neuromyelitis-Optica: Comparison with Multiple Sclerosis.  
RAC# 2171079  
Principal Investigator: Haya Al Joudi, PhD  
Project Description: To determine whether there is a significant difference in the cognitive performance of Neuromyelitis optica patients in comparison with Multiple sclerosis, considering the duration of the disease. Investigate the possibility to find a cognitive marker that would feature both diseases in their early stages. Our second objective is to examine the relationship between certain cognitive marker and Magnetic resonance imaging substrates including white matter lesion volume, gray matter, deep GM volume, and cortical thickness in NMO and MS patients  
Progress: Ongoing

- **Neuroradiological Findings in Infantile Spasm and Its Correlation with Seizure Outcome.**  
RAC# 2171188  
Principal Investigator: Sameena Khan, MD  
Co-Principle Investigator: Mohamed Al Muhaizea, MD  
Project Description: To review clinical and laboratory investigation of enrolled patients, review (MRI) findings in the enrolled patients, review clinical and seizure outcome of enrolled patients and its relation to outcome, and review etiology of IS in the enrolled patients.  
Progress: Ongoing
- **Efficacy of Clobazam in Dravet Syndrome.**  
RAC# 2181125  
Principal Investigator: Suad Alyamani, MD  
Project Description: To review the efficacy of Clobazam in Dravet syndrome (Severe Myoclonic Epilepsy in Infancy)  
Progress: Ongoing
- **Standardization of an Arabic-Language Neuropsychological Test Battery Surgical Evaluations.**  
RAC# 2141115  
Principal Investigator: Haya Aljoudi, MD

**Project Description:**

- Develop an Arabic language battery based on the neuropsychological test battery used at Johns Hopkins for the pre-surgical evaluation of patients undergoing temporal lobe resection,
- Compare the ability of an Arabic language neuropsychological test battery in distinguishing patients with left and right hemisphere epileptic foci who are candidates for surgery at KFSH to the ability of American English version of the tests.
- Provide preliminary clinical and normative data for the developed battery,
- Administer the battery to patients with left temporal epileptic foci, with right temporal epileptic foci, and neurologically and psychiatrically healthy adults,
- Compare the three groups through analyzing de-identified patient information collected from test administration and medical records,
- Derive descriptive statistics, and if applicable, analysis of variance.

Progress: Ongoing





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## SECTION OF NEUROSURGERY

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## RESEARCH ACHIEVEMENTS

- Peptide receptor radionuclide therapy (PRRT) in unresectable meningioma using <sup>177</sup>Lu-DOTATOC/DOTATATE.  
RAC# 2181183  
Principal Investigator: Homoud Aldahash, MD  
Project Description: To assess the efficacy and the toxicity of the theranostic approach of using <sup>68</sup>Ga-DOTATOC/DOTATATE for diagnosis and <sup>177</sup>Lu-DOTATOC/DOTATATE for therapy in progressive unrespectable meningioma patients.  
Progress: Ongoing
- Genomic Study of Radiation Induced Meningioma in Children.  
RAC# 2160020  
Principal Investigator: Essam Alshail, MD  
Project Description: To evaluate the genetic profile of radiation induced meningioma in children who received radiation for intracranial or spinal pathology. .  
Progress: Ongoing
- Hybrid Endoscopic approach for Microsurgical Resection of Intracranial Epidermoid and Predication of outcome using DWI flair MRI images.  
RAC# 2171131  
Principal Investigator: Imad Kanaan, MD  
Project Description: To estimate the value of DW images and the hybrid use of endoscope in Intracranial Epidermal Microsurgical Resection in our institution.  
Progress: Ongoing

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SECTION OF  
NEUROPHYSIOLOGY

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## RESEARCH ACHIEVEMENTS

- Comparison of Corkscrew Needle and EEG Cup Electrodes for Intraoperative Transcranial Electric Stimulation Motor Evoked Potential Monitoring.  
RAC# 2181002  
Principal Investigator: David MacDonald, MD  
Project Description: To compare TES electrode efficacy in a randomized sample of patients undergoing TES MEP monitoring and form recommendations based on the results.  
Progress: Ongoing

## OTHER ACHIEVEMENTS

- 1<sup>st</sup> Annual KFSH&RC Intensive Board Review of Neurology Course. 9–12 September 2018.
- KFSH&RC, Riyadh, KSA. (Dr. Fahad Alajlan & Dr. Amaal Aldakheel).
- 1<sup>st</sup> Annual KFSH&RC Neurology Crash Course. 26–29 September 2018. KFSH&RC, Riyadh, KSA. (Dr. Fahad Alajlan & Dr. Mashaal Khateeb).
- 2<sup>nd</sup> Intensive Epilepsy & EEG Review Course. 11–12 May 2018. KFSH&RC, Riyadh, KSA (Dr. Hesham Aldhalaan & Dr. Mashaal Khateeb).
- Organizing the 12<sup>th</sup> International Conference of the Asian Congress of Neurological Surgeons (ACNS) & 2<sup>nd</sup> Interim Meeting of World Federation of Skull Base Society (WFSBS), 14–18 March 2018. Dubai, United Arab Emirates.
  - President & Organizing Committee: Prof. Imad Kanaan
  - Members: Dr. Maher Hassounah, Dr. Essam Alshail, Dr. Faisal Alotaibi, Dr. Ibrahim Althubaiti, Dr. Peter Spangenberg. Dr. Homoud Aldahash, Dr. Faisal Farrash.
- Dr. Saeed Bohlega, Neurology, consultant, received King Salman Award for Disability Research in Clinical Health and Medical Sciences. 01–02 April 2018, Riyadh, KSA.
- Epilepsy & Status Epilepticus Awareness Day (Purple Day). 25 March 2018 KFSH&RC, Riyadh, KSA. (Dr. Ibrahim Althubaiti & Dr. Mashaal Khateeb).
- Parkinson's Awareness Day, 11 April 2018. KFSH&RC, Riyadh, KSA. (Dr. Amaal Aldakheel).
- Social and Economic problems facing women with MS. MS Support Group Meeting. 1 February 2018 KFSH&RC, Riyadh, KSA. (Dr. Mona Alkhawajah).
- "Ask the Experts". MS Support Group Meeting. 15 March 2018. KFSH&RC, Riyadh, KSA. (Dr. Mona Alkhawajah)
- "Physical Therapy and Exercises in MS". MS Support Group Meeting. 19 April 2018. KFSH&RC, Riyadh, KSA. (Dr. Mona Alkhawajah).

## PUBLICATIONS

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- PUB# 2180 082 – Danya Alsarheed, Mohammed Almuhaizea, “Joubert Syndrome Caused by Novel Mutation in ARMC9 with a Unique Ocular Finding Case Report & Literature Review”. *Case Report, International Journal of Medical Research Professionals*. 21 February 2018.
- PUB# 2180 160 – Mohamed Alkhaja, Abdulaziz Abanmy, Ahmed Alkhadiri, Sami Alrasheedi, Mona Alkhawajah, Hazzaa Alzahrani, “Alemtuzumab- Containing Reduced Intensity Conditioning Allogenic Hematopoietic Stem Cell Transplantation in a Case of Primary Progressive Multiple Sclerosis”. Case Report, *Multiple Sclerosis and Related Disorders Journal*. 25 October 2018.
- PUB# 2180 201 – Abdulaziz Alsemari, Mohannad Alsuhaibani, Rawabi Alhathloul, Bayan Ali. “Potential Oligogenic Disease of Mental Retardation, Short Stature, Spastic Paraparesis and Osteopetrosis”. Case Series, *The Application of Clinical Genetics Journal*- 8November 2018 Volume 2018:11 Pages 129–134.
- PUB# 2180 255 – Manal Nicolas-Jilwan, Ahmed Alahmari, Mohammed Alowain, Khalid Altuhani, Essam Alshail. “Tectocerebellar dysgraphia with occipital encephalocele: a phenotypic variant of the TMEM231 gene mutation induced Joubert syndrome”. Case Report, *Journal of Childs Nerv Syst* -. 07 January 2019.
- PUB# 2180 344 – Sulaiman Almobarak, Mohammad Almuhaizea, Musaad Abukhaled, Suad Alyamani, Omar Dabbagh, Aziza Chedrawi, Sameena Khan, Hesham Aldhalaan. “Tuberous Sclerosis Complex: Clinical Spectrum and Epilepsy”. A Retrospective Chart Review Study. Review, *Translational Neuroscience*. 12 October 2018.
- PUB# 2180 423– Ali Abusrair, Abdulaziz Alsemari, Fahad Alajlan, Khalid Alahmadi, Bader Mohamed, Amaal Aldakheel, Saeed Bohlega. “ Brain MRI Findings in Woodhouse-Sakati Syndrome”. Case Series, *Neurology Journal* -. 10 April 2018.
- PUB# 2160 174– Imad Kanaan. “Fronto Orbito Zygomatic (FOZ) Approach”. Book Chapter, *Neurovascular Surgery* pp 17-22, 28 September 2018.
- PUB# 2180 347– Imad Kanaan. “Spinal Intradural Extramedullary Tumors”. Book Chapter, *Nova Book Chapter*. October 2018
- Anna M M Boers, Ivo G H Jansen, Ludo F M Beenen, Thomas G Devlin, Luis San Roman, Ji Hoe Heo, Marc Ribó, Scott Brown, Mohammed A Almekhlafi, David S Liebeskind, Jeanne Teitelbaum, Hester F Lingsma, Wim H van Zwam, Patricia Cuadras, Richard du Mesnil de Rochemont, Marine Beaumont, Martin M Brown, Albert J Yoo, Robert J van Oostenbrugge, Bijoy K Menon, Geoffrey A Donnan, Jean Louis Mas, Yvo B W E M Roos, Catherine Oppenheim, Aad van der Lugt, Richard J Dowling, Michael D Hill, Antoni Davalos, Thierry Moulin, Nelly Agrinier, Andrew M Demchuk, Demetrius K Lopes, Lucia Aja Rodríguez, Diederik W J Dippel, Bruce C V Campbell, Peter J Mitchell, Fahad S Al-Ajlan, Tudor G Jovin, Jeremy Madigan, Gregory W Albers, Sebastien Soize, Francis Guillemin, Vivek K Reddy, Serge Bracard, Jordi Blasco, Keith W Muir, Raul G Nogueira, Phil M White, Mayank Goyal, Stephen M Davis, Henk A Marquering, Charles B L M Majoie, “Association of follow-up infarct volume with functional outcome in acute ischemic stroke: a pooled analysis of seven randomized trials”. *Journal of NeuroInterventional Surgery*, Vol 10, Issue 12. 7 April 2018.
- Muneerah Albugami, Najeeb Qadi, Fahed Almugbel, Alaa Mohammed, Alawi Alttas, Abdelazeim Elamin, Mumin Siddiquee, Usama El Alem, Yasmin Al Twajrim, “The Demographic Characteristics and the Risk Factors of Dementia in SAUDI Elderly”. *American Journal of Psychiatry and Neuroscience*, Volume 6, Issue 1. 10 January 2018.

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- Laila Alrakaf, Mohammed A. Al-Owain, Maryam Busehail, Maha A. Alotaibi, Dorota Monies, Hesham M. Aldhalaan, Amal Alhashem, Zuhair N. Al-Hassnan, Zuhair A. Rahbeeni, Fathiya Al Murshedi, Nadia Al Ani, Almundher Al-Maawali, Niema A. Ibrahim, Firdous M. Abdulwahab, Maysoon Alsagob, Mais O. Hashem, Wafaa Ramadan, Mohamed Abouelhoda, Brian F. Meyer, Namik Kaya, Sateesh Maddirevula, Fowzan S. Alkuray, "Further delineation of Temtamy syndrome of corpus callosum and ocular abnormalities". *American Journal of Medical Genetics*. Volume176, Issue3, Pages 715-721. 31 January 2018.
  - Lienekea van den Heuvel, Andrew S.b Lim, Naomi P.a Visanji, Janaa Huang, Mestre Ghate, A.c Tiago, Amaal AlDakheel, Barbara S.a Connolly, Carmena Gasca-Salas, Drew S.d Kern, Jennifera Jain, Elizabeth J.a Slow, Margaritaa Pondal, Achinoama Faust-Socher, Ekaterinae Rogaeva, Georgef Tomlinson, Anthony E.a Lang, Conniea Marras. "Actigraphy Detects Greater Intra-Individual Variability During Gait in Non-Manifesting LRRK2 Mutation Carriers" *Journal of Parkinson's Disease*. Volume8, Issue1, Pages 131-139. 17 February 2018.
  - Anne-Laure Bernat, Stefano Maria Priola, Ahmad Elsayy, Faisal Farrash, Shervin Taslimi & Fred Gentili. "Chronic subdural collection overlying an intra-axial hemorrhagic lesion in chronic myelomonocytic leukemia: special report and review of the literature". *Expert Review of Neurotherapeutics*. Volume18, Issue 5, Pages 371-377. 19 April 2018
  - Haya Almalag, Huda Alzahrani, Fawaz Al-hussain, Abdulaziz Alsemari, Edward B.De Vol,Manal Almarzouqi, Yazed S.AlRuthia. "The impact of old versus new antiepileptic drugs on costs and patient reported outcomes among older adults". *Geriatric Nursing Journal*.Volume39,Issue6, Pages669-675.04 May 2018.
  - Francesco Sala, Stanley A Skinner, Jeffrey E Arle, Shlomi Constantini, Vedran Deletis, Karl F Kothbauer, David B MacDonald, Jay Shils, Francisco Soto, Andrea Szelenyi. "Letter: Guidelines for the use of Electrophysiological Monitoring for Surgery of the Human Spinal Column and Spinal Cord". *Neurosurgery Journal*. Volume 83, Issue 2, Pages E82–E84. 11 June 2018.
  - Andrea Morotti , Dar Dowlatshahi , Gregoire Boulouis , Fahad Al-Ajlan , Andrew M. Demchuk , Richard I. Aviv , Liyang Yu , Kristin Schwab , Javier M. Romero , M. Edip Gurol , Anand Viswanathan , Christopher D. Anderson , Yuchiao Chang , Steven M. Greenberg , Adnan I. Qureshi , Jonathan Rosand , and Joshua N. Goldstein. "Predicting Intracerebral Hemorrhage Expansion With Noncontrast Computed Tomography". *Stroke Journal*. Volume 49, Issue 5. 18 April 2018.
  - Anne-LaureBernat, Stefano MariaPriola, AhmadElsawy, Faisal Farrash, Christopher R. Pasarikovski, Joao Paulo Almeida, Stéphanie Lenck, John De Almeida, Allan Vescan, Eric Monteiro, Gelareh Mohammed Zadeh, Fred Gentili. "Recurrence of Anterior Skull Base Meningiomas after Endoscopic Endonasal Resection: 10 Years' Experience in a Series of 52 Endoscopic and Transcranial Cases". *Journal of World Neurosurgery*. Volume 120, Pages e107-e113. December 2018.
  - Heba A Alqurashi, Ghada Al-Salmi, Mohammad A AlMuhaizea, Sulaiman M Al-Mayouf. "Biologic therapy-Related demyelinating peripheral neuropathy in a child with Juvenile Idiopathic Arthritis". *Journal of Clinical Case Reports and Reviews*. 19 July 2018.
  - Shimaa Eissaa, Nawal Alshehri, Mai Abduljabbar, Anas M. AbdelRahman, Majed Dasouki, Imran Y.Nizami, Mohammad A.Al-Muhaizea, Mohammed Zourob. "Carbon nanofiber-based multiplexed immunosensor for the detection of survival motor neuron 1, cystic fibrosis transmembrane conductance regulator and Duchenne Muscular Dystrophy proteins." *Biosensors and Bioelectronics*. Volume 17, pp 84-90. 15 October 2018.

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- Bijoy K. Menon, Fahad S. Al-Ajlan, Mohamed Najm, Josep Puig, Mar Castellanos, Dar Dowlatshahi, Ana Calleja, Sung-Il Sohn, Seong H. Ahn, Alex Poppe, Robert Mikulik, Negar Asdaghi, Thalia S. Field, Albert Jin, Talip Asil, Jean-Martin Boulanger, Eric E. Smith, Shelagh B. Coutts, Phil A. Barber, Simerpreet Bal, Suresh Subramanian, Sachin Mishra, Anurag Trivedi, Sadanand Dey, Muneer Eesa, Tolulope Sajobi, Mayank Goyal, Michael D. Hill, Andrew M. Demchuk. "Association of Clinical, Imaging, and Thrombus Characteristics with Recanalization of Visible Intracranial Occlusion in Patients with Acute Ischemic Stroke." *JAMA*. 11 September 2018.
  - Luis San Román, Bijoy K Menon, Jordi Blasco, María Hernández-Pérez, Antoni Dávalos, Charles B L M Majoie, Bruce C V Campbell, Francis Guillemin, Hester Lingsma, René Anxionnat, Jonathan Epstein, Jeffrey L Saver, Henk Marquering, John H Wong, Demetrius Lopes, Gernot Reimann, Hubert Desal, Diederik W J Dippel, Shelagh Coutts, Richard du Mesnil de Rochemont, Dileep Yavagal, Jean Christophe Ferre, Yvo B W E M Roos, David S Liebeskind, Robert Lenthall, Carlos Molina, Fahad S Al Ajlan, Vivek Reddy, et al. "Imaging features and safety and efficacy of endovascular stroke treatment: a meta-analysis of individual patient-level data." *The Lancet Neurology*. Volume 17, Issue 10, pp -895-904. 01 October 2018
  - Sateesh Maddirevula, Fatema Alzahrani, Mohammed Al-Owain, Mohammad A. Al Muhaizea, Husam R. Kayyali, Amal AlHashem, Zuhair Rahbeeni, Maha Al-Otaibi, Hamad I. Alzaidan, Ameera Balobaid, Heba Y. El Khashab, Dalal K. Bubshait, Maha Faden, Suad Al Yamani, Omar Dabbagh, et al. "Autozygome and high throughput confirmation of disease genes candidacy." *Genetics in Medicine*. Volume 21. pp 736-742. 21 September 2018.
  - Fadi M Jan, Hesham M Aldhalaan, Nadia H Dandachi, Doaa H AlAbbas, Ahmed M Elmardenly, Maher A Khalifa. "Chronic Functional Constipation causing Recurrent "Anal Spasms": An Epilepsy Mimicker." *ACTA Scientific Paediatrics*. 31 October 2018
  - M. Aljumah, S. Kojan, A. M. Alshehri, M. Al Balwi, I. Al Abdulkarim, E. M. Masuadi, Y. Alhaidan, A. Alabdulrahman, H. M. Fakhoury, A. H. Hajeer. "HLA class II polymorphism in Saudi patients with multiple sclerosis." *HLA*. Volume 91, Issue 1, pp 17-22. January 2018.



# OBSTETRICS & GYNECOLOGY

The Department of Obstetrics and Gynecology is a tertiary care center providing up-to-date evaluation and management in Maternal-Fetal Medicine, Reproductive Endocrinology and Infertility, and Gynecologic Oncology patients.

The Section of MFM handles all types of high risk pregnancies with fetal and maternal complications. The Infertility/IVF Unit performs the latest Assisted Reproductive Technologies (ART) from conventional IVF to all types of micromanipulation techniques. Pre-implantation Genetic Diagnosis (PGD) is one of the unique high tech services offered by IVF unit. The Section of Gynecologic Oncology delivers an up to date care to women with all types of gynecologic malignancies. The services include cancer screening, early diagnosis as well as surgical and medical management of all gynecologic cancer cases.

The Department supports the hospital campaign for active participation of physicians in research studies. Over the year of 2018, we have submitted 11 research proposals and numerous publications for the last three years. We aim to increase the department statistical performance with the continuous encouragement to department staff. However, we are faced with a challenge as the department do not have a dedicated research coordinator.

CHAIRMAN

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DR. ISMAIL AL-BADAWI

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## RESEARCH ACHIEVEMENTS

- Selected Winner in the 18<sup>th</sup> Research Centre Annual Research Day 2017 “Expanding the spectrum of germline variants in cancer” Awarded last 18-20 March 2018 King Salman Auditorium, KFSH&RC, Riyadh.
- Cover Page “World Journal of Obstetrics and Gynecology for the Middle East Ob/Gyn Research Contribution (World J Obstet Gynecol 2017 February 10; 6(1):1-7).

## OTHER ACHIEVEMENTS

- 1<sup>st</sup> Fetus Studio Awareness Day, 29 Nov. 2018, KFSH&RC.
- Enhanced Recovery After Surgery Awareness Day, 01 May 2018, KFSH&RC.
- Women’s Health Awareness Day: Women Aim Healthy, 26 April 2018, KFSH&RC.
- Fetal Care in Saudi Arabia Status and Future Workshop, 10-11 May 2017, KFSH&RC.
- 1<sup>st</sup> Advanced and Basic Obstetric Ultrasound Workshop, 09-10 Nov. 2016, KFSH&RC.

## PUBLICATIONS

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- FoxM1 and  $\beta$ -catenin predicts aggressiveness in middle eastern ovarian cancer and their co-targeting impairs the growth of ovarian cancer cells. Poyil Pratheeshkumar, Sasidharan Padmaja Divya, Sandeep Kumar Parvathareddy, Norah M. Alhoshani, Ismail A. Al-Badawi, Asma Tulbah, Fouad Al-Dayel, Abdul K. Siraj and Khawla S. Al-Kuraya. Received: July 14, 2017 Accepted: November 26, 2017 Published: December 16, 2017.
- Expanding the Spectrum of Germline Mutations in Cancer. Abdul K Siraj; Tariq Masoodi; Rong Bu; Sandeep Parvathareddy; Ismail Al-Badawi; Nasser Al-Sanea; Luai Ashari; Alaa Abduljabbar; Samar Alhomoud; Saif Al-Sobhi; Asma Tulbah; Dahish Ajarim; Khalid Alzoman; Muna Aljuboury; Hussam Bin Yousef; Mohammed Al-Dawish; Fouad Al-Dayel; Fowzan S. Alkuraya; Khawla Al Kuraya The submission id is: HUGE-D-17-00333.
- Preoperative Anemia as a Prognostic Factor in Endometrioid-Type Endometrial Carcinoma. Ahmed Abu-Zaid, Mohannad Alsabban, Mohammed Abuzaid, Osama Alomar, Hany Salem, Ismail A. Al-Badawi, NOVEMBER JOGC NOVEMBRE 2018.
- Preoperative elevated platelet count and thrombocytosis in gynecologic malignancies. Ahmed Abu-Zaid, Osama Alomar, Ismail A. Al-Badawi, Hany Salem. Received: 9 November 2017 / Accepted: 31 January 2018 / Published online: 5 February 2018 © Springer-Verlag GmbH Germany, part of Springer Nature 2018.
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# ONCOLOGY CENTRE

Oncology Centre, KFSH&RC enjoys the recognition of being the largest tertiary care facility in the MENA region where around 3000 cancer cases are seen annually. Established with a mission of providing excellent cancer treatment, education and research, the Oncology Centre evolved over the years towards its vision of becoming one of the best international centers for cancer research, prevention, and treatment. Patients are assessed in multidisciplinary clinics and provided with treatment in accordance with disease specific internationally accepted management guidelines. Our oncologists continue to actively address national oncology problems through their involvement in institutional, national, and international research protocols with the invaluable support of the Oncology Research Unit (ORU) which also serves as a hospital base for cancer and bone marrow transplantation registries.

DIRECTOR

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ALI ALSHANQEETI, MD

DEPUTY DIRECTOR

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MAHMOUD ALJURF, MD  
MOHAMMAD ALSHABANAH, MD

## ACHIEVEMENTS

- Continued institutional membership and collaborative studies with Southwest Oncology Group (SWOG), American College of Radiology Imaging Network (ACRIN), and Radiation Therapy Oncology Group (RTOG)/NRG Oncology.
- Continued membership of the CBMTG (Canadian Bone Marrow Transplantation Group) and the EBMT Clinical Trials Group (EBMTG); highest accruing institution on CBMTG protocol 0601.
- Eastern Mediterranean Blood & Marrow Transplantation Group (EMBMT) expanded. Myriads of Disease Specific Working Committees designed innovative trials. Several research protocols are currently, in progress. Several manuscripts published in major international Bone Marrow Transplantation Journals. Significantly increased research studies and publications; several on-going research projects and myriads of new study proposals under consideration.
- Advanced Radiotherapy techniques credentialing by Radiological Physics Centre (RPC) at MD Anderson Cancer Center, USA.
- 4<sup>th</sup> edition of the KFSH&RC Guidelines for Management of Hematological Malignancies were published.
- IAEA Collaborative Centre in Radiation Medicine, renewal for four (4) years.
- 5<sup>th</sup> International Conference on Radiation Medicine (ICRM 2016): Clinical Applications and Innovative Approaches, February 2018.
- 12<sup>th</sup> Oncology Academic and Research Day; 3 May 2018.
- Eastern Mediterranean Blood and Marrow Transplantation (EMBMT) Group held its educational activities throughout the year.
- Initiated a new research course: “Research Methodology in Contemporary Medicine” KFSHRCOC RU206100.
- Text Books:
  - Establishing a Hematopoietic Stem Cell Transplantation Unit; A Practical Guide; Editors: Gluckman, Éliane, Niederwieser, Dietger, Aljurf, Mahmoud (Eds.)
  - Congenital and Acquired Bone Marrow Failure. Endorsed by the European Group for Blood and Marrow Transplantation and the European School of Hematology. Edited by Dr Mahmoud Aljurf and others.

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# OPHTHALMOLOGY

The Ophthalmology Department at King Faisal Specialist Hospital & Research Center (KFSH&RC) continuously strives to enhance the quality of life for those we serve by improving sight and preventing blindness through competent and compassionate patient care, innovative research and continuing education. We also seek to advance the knowledge and skills of fellow Ophthalmologists, clinicians and trainees who will form the next generation of practitioners.

The Ophthalmology Department has a history of international clinical research in eye diseases and is involved in several ongoing departmental; inter-departmental and internal projects. These projects and studies will play a major role and contribute in understanding the natural course of eye diseases, the outcome of treatment and the epidemiology and genetics of eye diseases and vision loss in the Kingdom of Saudi Arabia.

CHAIRMAN

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SELWA AL-HAZZAA

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## RESEARCH ACHIEVEMENTS

- RAINBOW study extension study: a randomized, controlled study evaluating the efficacy and safety of RAnibizumab compared with laser therapy for the treatment of INfants BOrn prematurely With retinopathy of prematurity.
- AURIGA: An Observational Study Program to Investigate the Effectiveness of Intravitreal Aflibercept in Diabetic Macular Edema and/or Macular Edema Secondary to Retinal Vein Occlusion in a Real World Setting.
- Evaluating the Use of Adjustable Sutures in Surgical Correction of Strabismus.
- Idiopathic Intracranial Hypertension with Chronic Disc Edema in a Tertiary Care Centre.
- Pediatric Vision Impairment In Saudi Arabia.
- Rate of Posterior Capsular Opacification at KFSH&RC After Cataract Surgery.
- Precision Ophthalmic Genetic Disease Center at KFSH&RC, Riyadh, Saudi Arabia.

# ORGAN TRANSPLANT CENTER

The Organ Transplant Center (OTC) is an established division of KFSH&RC since 2010 which focuses on providing world leading transplantation healthcare. It is also one of the most active and experienced transplant centers in the Middle East.

Research within the Organ Transplant Center is a collaborative effort with the Research Centre of KFSH&RC and focuses on translational, epidemiological and clinical research in organ conditioning, tissue engineering, tolerance induction, medical and surgical innovations and stem cell research.

The advancement of excellent education and interdisciplinary research within the OTC and the Organ Transplant Registry will enable the translation of our findings and the increase of submitted research publications in high impact factor journals to clinical settings which could potentially have a significant clinical impact on the improvement of health, quality of life, life expectancy and by providing exceptional healthcare for kidney, liver, lung, pancreas and small bowel transplant patients and donors.

CHAIRMAN

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PROF. DIETER C. BROERING, MD

## RESEARCH ACHIEVEMENTS

- The Organ Transplant Registry serves as a tool in collecting post-transplant data such as morbidities and mortalities for both recipients and living donors for all organs such as liver, lung, kidney, pancreas and small bowel. Investigators will have easy access to the list of patients needed in their study.
- We reported that T regulatory cells and anti C5a mediated immunotherapy shortens the phase of hypoxia and ischemia, which favors microvascular allograft recovery and thus delayed the phase of acute rejection, and therefore may be a useful therapeutic tool in designing single/combined Treg therapy to prevent organ rejection in clinical settings.
- Left lateral sectionectomy for donor hepatectomy is a well-established alternative to deceased donor pediatric liver transplantation. However, very little is available on the laparoscopic approach (laparoscopic left lateral sectionectomy [L-LLS]). A retrospective, observational, single-center, PSM study was conducted and proves that L-LLS for donor hepatectomy is a safe and reproducible technique yielding better donor perioperative outcomes with respect to the conventional approach with similar recipient outcomes.
- Lung transplantation (LTx) has matured into an accepted therapeutic alternative for children with end-stage lung disease. Pediatric LTx is a viable treatment option for infants and children with end-stage pulmonary diseases. Overall survival after LTx in the pediatric population is similar to the expected survival in adults.

## OTHER ACHIEVEMENTS

- The Liver Transplant Department was successful in publication of 15 original studies in high impact factors Journals covering several areas of liver transplantation research. The highlight of these publications were, (1) the novel of Pure laparoscopic living donor left lateral sectionectomy in Pediatric Transplantation. (2) Utility of perioperative risk score to predict massive ascites development after living donor liver transplantation.
- We successfully established immunotherapies, which included use of T regulatory cells (RAC # 2140 036), Stem cells (RAC # 2160 003), and Anti-Complement C5a (RAC # 2150 017) in mouse models of airway transplantation.
- Awarded best oral presentation at KFSHRC Annual Surgery Day 2018.
- Minimally invasive / robotic surgery for liver living donor has been added in the Organ Transplant Registry. Collecting the list of patients who underwent this type of procedure with the mortalities and morbidities provides easy access of data to the physicians.

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# ORTHOPEDECS SURGERY DEPARTMENT

We have ongoing clinical research projects designed to improve the diagnosis of Orthopedic conditions and to improve the management of musculoskeletal disorders. Our clinical research studies involve the application of new healing and surgical techniques for our Orthopedic patients.

CHAIRMAN

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DR.ZAYED ALZAYED

- The objectives of the Orthopedics Surgery Department are:
- To perform quality clinical researches.
- To improve the quality of clinical care by developing new analytical methods for evaluating medical treatments and applying these methods to innovate approaches to patient care.
- To promote advancement of health outcomes research in patients.
- To educate all levels of health care providers in health sciences research.
- To investigate and disseminate the health policy implications of our research findings.

Finally, our department will continue to develop a deeper understanding of the biology and biomechanics of the musculoskeletal system, and to apply this knowledge to the improvement of Orthopedic materials, implants, surgical instrumentation and surgical techniques, thereby improving the quality of care to Orthopedic patients world-wide.

## RESEARCH ACHIEVEMENTS

- Project # 2101099. Developmental Dysplasia of the Hip (DDH) Registry. Dr.Zayed AlZayed. Dr.Nezar Hamdi. CRC, Shuruq alsakran. Status: On going research. Last progress report : There was a total of 33 newborn in KFSH&RC for the year of 2019. 22 of them were female. All of them were documented to have one or more risk factors. 23 of newborn were scheduled to have hip ultrasound. Out of 33, 17 were referred to pediatric orthopedic. 3 of KFSH&RC newborn were diagnosed with DDH, 25 diagnosed healthy babies, 5 of cases needed further evaluation.
- Project # 2161108. Development of autologous stem cell implantation (transplantation) for treatment of avascular osteonecrosis of the femoral head, a blinded, randomized and controlled pilot study. Dr. Zayed Alzayed. Dr. Saleh Alsulimani. CRR, Shuruq Alsakran. Status: on going. Last progress report: On patient has been under stem cell procedure, then we hold it because of logistic issue.
- Project # 2171168. Is there any role of calcanectomy in primary malignant tumors of calcaneum? Dr.Pant, Dr.Irfan, CRC, Shuruq Alsakran. Status: On going.
- Project # 2181 126. Young Patient Satisfaction Following Idiopathic Scoliosis Correction In Saudi Arabia: A Cross-Sectional Study. Dr.Zayed alzayed. Dr.Saleh Alsulaimani. Dr.Anwar Alrabiah. Dr.Omer almohrej. Dr.Saeed Ali Alqahtani Status: On going. 87 patients data have been collected, and still working on data. Target is 165 patients.
- Project # 2181 157. (Results of Surgical treatment of developmental dysplasia of the hip in general hospitals: A Saudi outreach experience). Dr Thamer Alhusaina. CRC, Shuruq alsakran. Status: Ongoing.

## PUBLICATIONS

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- Publication 2180061. Dr.Imran Ilyas, Dr.hossam Alromaih. Freeze dried proximal femoral allografts in revision of femoral stems. Status: Cleared and Submitted to *The Journal of Arthroplasty*.
- Publication #2180052. Dr.Imran Ilyas, Dr. Hossam Alromaih, CRC,Shuruq Alsakran. Sickle Cell Disease and Arthroplasty. Status: Cleared and published in *The Journal of Arthroplasty*.
- Publication #2180053. Dr.Ilyas Imran, Dr.Samar Rabbani, Dr.Hossam Alromaih. Simultaneous bilateral total hip arthroplasty in Morquio syndrome. Status: Cleared and published in *The Journal of Arthroplasty*.
- Publication #2180022. Dr. Ilyas Imran, CRC Shuruq Alsakran. Abductor strengthening osteostomy in high riding developmental dysplasia of the hip. Status: Cleared and published in *Techniques in Orthopedics*.
- Publication #2180199. Dr. Ilyas Imran. Neurofibromatosis induced hip arthritis. An unusual presentation. Status: Cleared and published in *American Journal of Case Report*.
- Publication #2180212. Dr. Pant, Dr. Irfan. Novel approach to management of an unusual gigantic pelvic chondrosarcoma - preliminary short term outcome. Status: Cleared and published in *Journal of Bone and Joint Surgery*.
- Publication #2180196. Dr. Zayed alzayed, Dr. Pant, Dr.Irfan, Dr Omer, Dr. Saeed, CRC Shuruq Synovial Sarcoma in the Knee of a 4-Year-Old Child: A Rare Presentation. Status: Cleared and published in *Case Report in Orthopedics*.
- Publication #2180 241. Dr. Zayed Alzayed, Dr. Abdulrahman Alrajhi, CRC Shuruq Alsakran. The Use of Image-guided Navigation in Spine Instrumentation: A Survey of Saudi Spine Surgeons.
- Publication #2180292. Dr. Nezar Hamdi, Dr Omer Almohrej. Management of obstetrical Brachial plexus palsy: the KFSHRC Experience. Status: Cleared and published in *International Orthopedic*.
- Publication #2180355.Dr. Thamer Alhussinan. Outreach DDH treatment. Saudi Experience. Status: Cleared and presented in MEPOS ANNUAL MEETING -DUBAI.
- Publication #2180314. Dr. Imran Ilyas, Dr. Samer Rabbani. A Rare Presentation of an Intraossesous Lipoma in the Proximal Femur. *American Journal of Case Report*.
- Publication #2180375. Dr. Abdulmohsen alshammri. Hoffa's fracture of the medial femoral condyle in a child treated with open reduction and internal fixation: A case report. Status: Cleared and published in *Trauma Case Reports*.
- Publication #2180374. Dr. Abdulmohsen Alshammri. Primary subacute osteomyelitis of the talus in a child: A case report. Status: Cleared and published in *Journal of Musculoskeletal Surgery and Research*.
- Publication #2180434. Dr.Nezar Hamdi, Dr. Abdulmohsen Alshammry, Dr.Abdullah Almarshad, Dr.Faisal Alfayadh, CRC, Shuruq Alsakran. Painful Locking Elbow in a Child with Congenital Proximal Radioulnar Synostosis: A Case Report and Literature Review. Status: Cleared and published in *Journal of Hand Surgeon*.



# DEPARTMENT OF PEDIATRIC HEMATOLOGY/ONCOLOGY

Department of Pediatric Hematology / Oncology (PHO), is a world-class of institutions offering state-of-the-art treatment to the pediatric patients with cancer and hematological disorders in the Kingdom of Saudi Arabia. It is one of the largest centers worldwide in Hematopoietic Cell Transplantation (HCT) in the region since 1993. Being a champion of innovation, the Department also recognizes that clinical and translational research plays a starring role in its pursuit to deliver highest quality health care and to improve on existing standards and disease-specific front-line protocols, critical for providing basis on delivering routine patient care in the paradigm of evidence-based practice, for our patient population. The department boasts a well-established, highest quality infrastructure for conducting clinical research, at par international standards graded by a number of evaluators from various well known medical institutions from North America, which is vital for this very special and unique medical practice.

CHAIRMAN

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AMANI AL-KOFIDE MD

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## RESEARCH ACHIEVEMENTS

- We are a member center of Center for International Blood and Marrow Transplant Research (CIBMTR), European Society for Blood and Marrow Transplantation (EBMT), Eastern Mediterranean Blood and Marrow Transplantation (EMBMT) and Children Oncology Group (COG).
- To ensure a continued stream of influential publications, discoveries and innovation to improve patient care and healthcare delivery system, the department has developed a new entity in its hierarchy, under the name of “Departmental Office of Research Affairs” (dORA).
- The Department also revamped and expanded its independent Research Committee to review and monitor research projects being conducted at its premises.
- Statistical computing Office, another new entity established under the department hierarchy with the goal to support practitioners and researchers solve their problems in conducting quality research while helping them enhance their skills for performing excellent research to discover the cures of tomorrow, and save children’s lives today.
- A specially designed course on conducting clinical research and publication for the newly commissioned Fellows at the Department was conducted. This one month long course is vetted by SCHS.
- The department recorded 38 active research projects during the year 2018.

## OTHER ACHIEVEMENTS

- The department developed infrastructure to provide high end support for providing publication grade statistical analyses and data visualizations, especially for blood and marrow transplant data.
- Upgraded the web enabled Abstracts and Publications library.

## PUBLICATIONS

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- Annalisa Paviglianiti, Jean Hugues Dalle, Mouhab Ayas, Jan Jaap Boelens, Fernanda Volt, Anna Paolalori, Mair Pedrode Souza, Miguel Agnel Diaz, Gerard Michel, Franco Locatelli, Charlotte Jubert, Ibrahim Yakoub Agha, Henrique Bittencourt, Yves Bertrand, Chantal Kenzey, Karina Tozatto Maio, Hiromi Hayashi, Vanderson Rocha, Annalisa Ruggeri. Low Body Mass Index Is Associated with Increased Risk of Acute GVHD after Umbilical Cord Blood Transplantation in Children and Young Adults with Acute Leukemia: A Study on Behalf of Eurocord and the EBMT Pediatric Disease Working Party. *Biology of Blood and Marrow Transplantation*, Volume 24, Issue 4, April 2018.
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# PEDIATRICS

The Department of Pediatrics is one of the largest medical departments at KFSH&RC. It consists of ten subspecialty sections: Allergy/Immunology, Endocrinology/ Diabetes, Gastroenterology, General Pediatrics, Infectious Diseases, Neonatology/ Perinatology, Nephrology, Pediatric Intensive Care, Pulmonology and Rheumatology. They provide medical treatment of a highly specialized nature, promoting medical research and education programs including post-graduate accredited fellowship training programs.

Residents and Fellows are heavily involved in conducting Research Projects with high level of achievements in 2018. This report summarizes RAC approved projects that were initiated, on-going and completed for 2018. During the year 2018, the Department of Pediatrics has continued to perform a variety of activities to promote Research through workshops, International forums, and Pediatric Training Sessions.

The Pediatrics Research Unit continues to develop its Strategic Research Plan which is designed to develop and sustain, internationally acknowledged research in several thematic areas relevant to our patient population in Saudi Arabia. The Pediatrics Research Unit plans to significantly increase its research capacity in each of these areas and to become recognized internationally for its high caliber research.

CHAIRMAN

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SAMI ALHAJJAR

## RESEARCH ACHIEVEMENTS

- The department is involvement in the Annual KFSH&RC 11<sup>th</sup> Residents' Research Day 2018 has increased dramatically over the past years.
- Increased number of Approved New Research Proposal and Publications.
- Collaborative studies with National and International Institutions.
- Promoting research amongst the Pediatric trainees which reflected in their involvement in multiple research projects.
- The department conducted Pediatric Research Day on 6<sup>th</sup> February 2019 with 44 Abstract submitted.

## OTHER ACHIEVEMENTS

- Zainab Alghamdi, Afaf Alsagheir MD, Lujain Aboulkhair MD. 1<sup>st</sup> best oral presentation award in the 9<sup>th</sup> Emirates Diabetes & Endocrine Congress, held in Dubai on 1 to 3 March 2018 for the research "The use of an Arabic novel smart phone Insulin bolus calculator in Type 1 Diabetes children at KFSHRC, Prospective study".
- Hanaa Banjar MD, Meshal Alhassan MD, Ibrahim AlMogarri MD, Sami AlHaider MD, Imran Nizami MD, Mariam Dabbour, Abdullah AlZaaqi, Sara AlKaf. 2<sup>nd</sup> place winners in the Saudi Pediatric Pulmonology Association congress 23-25 February 2018, Marriot Hotel, Riyadh for presenting (Correlation of Vitamins A, E, and K deficiency in Cystic fibrosis patients (CF) and their Genetic mutations in a tertiary care center in Saudi Arabia).
- Bandar Al Saud, MD. 1<sup>st</sup> best oral presentation award in the 6<sup>th</sup> Pediatrics research and recognition day, held in KFSHRC, Riyadh on 6<sup>th</sup> February 2018 for the research "Early introduction of egg and the development of egg allergy in children: a systematic review and meta-analysis".
- Rand Arnaout MD, Nora Alrumayyan MD, Raef Qeretli MD, Muneer Al-Jomaie MD, Abdulaziz Alghonaium MD, Hasan Aldhekri, Bander Alsaud MD, Hamoud Almousa MD, Saleh Al-Mohsen MD, Ahmed Shamakhi MD, Ali Almontasheri. 2<sup>nd</sup> best oral presentation award in the 6<sup>th</sup> Pediatrics research and recognition day, held in KFSHRC, Riyadh on 6<sup>th</sup> February 2018 for the research "The Impact of BCGITIS caused by BCG vaccine on the outcome of Severe Combined Immunodeficiency patients".
- Fahad Al Hazzani MD, Saleh Alalaiyan MD, Abdulhakeim Kattan MD, Abdulaziz Binmanee MD, Mohammed Bin Jabr MD, Eyad Al Midani MD, Emad Khadawardi MD, Abdellatif Rejjal MD, Faisal Riaz MD, Weam Elsaidawi MD. 3<sup>rd</sup> best oral presentation award in the 6<sup>th</sup> Pediatrics research and recognition day, held in KFSHRC, Riyadh on 6<sup>th</sup> February 2018 for the research "Short-term outcome of very low-birth-weight infants in a tertiary care hospital in Saudi Arabia over a decade."

## PUBLICATIONS

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- Departmental Collaborative Approach for Improving In-Patient Clinical Documentation (Five years' Experience). Eyad Almidani, Emad Khadawardi, Turki Alshareef, sermin saadeh, Weam Elsedawi, Raef qeretli, Rania Alobari, Sami Alhajjar and Saleh Almofada. *International Journal of Pediatrics and Adolescent Medicine*. Volume 5, Issue 2, June 2018, Pages 69–74, <https://doi.org/10.1016/j.ijpam.2018.05.002>.
- Idiopathic Urinary Bladder Perforation in Early Childhood. Turki AlShareef; Weiam Almainan, Victor H. Figueroa, Marsha A. Gooden, Darius J. Bägli and Elizabeth Harvey. Journal, *Kidney Int Rep* (2018) 3, 1497–1500; <https://doi.org/10.1016/j.ekir.2018.07.022> <sup>a</sup> 2018 International Society of Nephrology.
- Novel CARMIL2 Mutations in Patients with Variable Clinical Dermatitis, Infections, and Combined Immunodeficiency. Alazami AM, Al-Helale M, Alhissi S1, Al-Saud B, Alajlan H, Monies D, Shah Z, Abouelhoda M, Arnaout R, Al-Dhekri H, Al-Numair NS, Ghebeh H, Sheikh F, Al-Mousa H. Journal, *Allergy and Immunology* 2018 Feb 9; 9:203. doi:10.3389/fimmu.2018.00203. eCollection 2018.
- Caffeine Therapy Practice in the Management of Apnea of Prematurity: National Survey in Saudi Arabia. Eman Alansari; Emad Khadawardi; Eyad AlMidani; Saleh AlAlaiyan; Fahad AlHazzani; Abdulaziaz Binmanee; Raef Qeretli; MenatAlla Abdalla Fayed; Hessa Abdulaziz Altammami; Lama Nathem Akhras. *Journal of Clinical Neonatology*. Vol 7 / Issue 4 / October-December 2018, [www.jcnonweb.com](http://www.jcnonweb.com).
- Use of bone densitometry to assess bone disease in aluminum toxicity complicating parenteral nutrition. Wajeeh AlDekhail, Ali AlMehaidib, Mohammed Abanmi, Khalid AlSaleem, Haifa AlAwadi. Journal, *International Journal of Pediatrics and Adolescent Medicine*: 27-FEB-2018 DOI.
- The growth hormone-insulin-like growth factor-1 axis in the diagnosis and treatment of growth disorders. Blum WF, Alherbish A, Alsagheir A, El Ashwal A, Kaplan W, Koledova E, Savage MO. Journal, *Endocrine Endocr Connect* 2018 Jun;7(6):R212-R222. Doi: 10.1530/EC-18-0099. Epub 2018 May 3. Review. PMID: 29724795 Free PMC Article.
- Monogenic interferonopathies: phenotypic and genotypic findings of CANDLE syndrome and the overlap with C1q deficient systemic lupus erythematosus. Al-Mayouf SM, Alsaleem A, Almutairi N, Almousa H, AlAzami A, Alzayed T, AlSonbul A. *Int J Rheum Dis* 2017 Nov 8. doi: 10.1111/1756-185X.13228.
- Non-inflammatory disorders mimic juvenile idiopathic arthritis. Al-Mayouf SM. *Int J Pediatr Adolesc Med* 2018; 5: 1-4
- Long-term outcome of juvenile idiopathic arthritis in early adulthood: clinical experience from a Saudi tertiary hospital. Al-Mayouf SM, Aldalaan H, Alfada R, Alhaymouni B, Alshiakh M, Eldali A, Al Shaikh A. *JARR* 2018; 1: 1-6.
- Combination of tacrolimus and mycophenolate mofetil in persistent proteinuria due to refractory childhood lupus nephritis. Almutairi A, Alkathiri Z, Al-Mayouf SM, *Int J Pediatr Adolesc Med* 2018; 5: 99-102.
- Expanding the phenome and variome of skeletal dysplasia. Alsahli S, Alhabeeb L, Ibrahim N, Abdulwahab F, Hashem M, Abouelhoda M, Monies D, Al Tassan N, Alshammari M, Alsagheir A. Journal, *Endocrinology Genet Med* 2018 Apr 5. Doi: 10.1038/gim.2018.50

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- Early introduction of egg and the development of egg allergy in children: a systematic review and meta-analysis. Al-Saud B, Sigurdardóttir S. *Int Arch Allergy Immunol*. 2018 Sep 5:1-10.
  - Novel CARMIL2 Mutations in Patients with Variable Clinical Dermatitis, Infections, and Combined Immunodeficiency. Alazami AM, Al-Helale M, Alhissi S, Al-Saud B, Alajlan H, Monies D1, Shah Z, Abouelhoda M, Arnaout R, Al-Dhekri H, Al-Numair N, Ghebeh H, Sheikh F, Al-Mousa H. *Front Immunol*. 2018 Feb 9; 9:203.
  - Haematopoietic stem cell transplant for hyper-IgM syndrome due to CD40 defects: a single-centre experience. Al-Saud B, Al-Jomaie M, Al-Ghoniaim A, Al-Ahmari A, Al-Mousa H, Al-Muhsen S, Al-Seraihy A, Arnaout R, Elshorbagi S, Al-Dhekri H, Ayas. *Bone Marrow Transplant*. 2018 Jun 8.
  - Monogenic interferonopathies: Phenotypic and genotypic findings of CANDLE syndrome and its overlap with C1q deficient SLE. Al-Mayouf SM, AlSaleem A, AlMutairi N, AlSonbul A, Alzaid T, Alazami AM, Al-Mousa H. *Int J Rheum Dis*. 2018 Jan;21(1):208-213. doi: 10.1111/1756-185X.13228. Epub 2017 Nov 8.

# DEPARTMENT OF RADIOLOGY

Department of Radiology at KFSH&RC provides the highest quality of patient care using the state of art technology in diagnostic, interventional and therapeutic procedures.

Each section in the department is actively doing clinical and scientific research activities, often in collaboration with other departments and institutions across the Kingdom. There are some members who are also presenting abstracts to various national or/and international conferences and submitting publications, case reports to different journals worldwide.

ACTING CHAIRMAN

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YUSUF ALKADHI

## RESEARCH ACHIEVEMENTS

- N-ammonia positron emission tomography-computed tomography (PET-CT) is being increasingly used as a non-invasive imaging modality for evaluating patients with known or suspected coronary artery disease (CAD), but information about the diagnostic accuracy of PET-MPI is sparse. This study was published *Cardiovasc Diagn Ther*. 2019 Feb;9(1):35-42. doi: 10.21037/cdt.2018.10.12.
- Cardiac magnetic resonance imaging (CMR) offers a comprehensive evaluation of the cardiovascular system including cardiac function, extent of myocardial fibrosis, characterise cardiac masses with differrate pulse sequences and guide to further treatment. This study was published *Curr Cardiol Rev*. 2019 Jan 16. doi: 10.2174/1573403X15666190117101607. [Epub ahead of print]
- Recessive congenital methemoglobinemia type II is a very rare autosomal recessive hematologic disorder due to NADH-cytochrome b5 reductase deficiency, usually caused by full-stop mutations or deletions. This disease classically presents with mild neonatal cyanosis, early onset severe progressive developmental delay, movement disorders, and progressive microcephaly. This study was published *Neuroradiol J*. 2019 Apr;32(2):143-147. doi: 10.1177/1971400918822153. Epub 2019 Jan 7.
- Immunoglobulin 4 (IgG4)-related systemic disease (IgG4-RSD) is a systemic inflammatory disease characterized by elevation of serum IgG4. IgG4-RSD can affect any organ in the body, and the list of organs associated with this condition is growing steadily. This study was published *Curr Cardiol Rev*. 2019 Jan 16. doi: 10.2174/1573403X15666190117101607. [Epub ahead of print]
- There are few reported cases of tectocerebellar dysraphia with occipital encephalocele (TCD-OE) in the literature. This malformation was first described by Padget and Lindburg in 1972 and consists of an occipital encephalocele, a cerebellar midline defect, inverted cerebellum, and deformity of the tectum. This study was published *Childs Nerv Syst*. 2019 Jan 7. doi: 10.1007/s00381-019-04048-9. [Epub ahead of print]
- The mucopolysaccharidoses are a heterogeneous group of inherited lysosomal storage disorders, characterized by the accumulation of undegraded glycosaminoglycans in various organs, leading to tissue damage. Mucopolysaccharidoses include eight individual disorders. This study was published *Pediatr Radiol*. 2018 Sep;48(10):1503-1520. doi: 10.1007/s00247-018-4139-3. Epub 2018 May 11.
- BAC is a type of medial artery calcification that can be seen incidentally on mammography, but the relationship between coronary artery calcification and MI on MPS is yet unknown. This study was published *Cardiol Res*. 2017 Oct;8(5):220-227. doi: 10.14740/cr604w. Epub 2017 Oct 27.

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## OTHER ACHIEVEMENTS

- International Conference of Radiation Medicine, 12 Feb 2018, KFSH&RC, Riyadh, Saudi Arabia.

## PUBLICATIONS

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- Right Ventricular Hypertrophy and Hypertrabeculation Misdiagnosed as a Right Ventricular Mass on Echocardiography, *Radiology Case Report*. 2018 (RAC 2180449).
- The Appearance of Pulmonary Alveolar Microlithiasis on Dual-Energy X-Ray Absorptiometry, *European J of Research*. 2018 (RAC# 2180448).
- Successful Localization of the Source of Hemorrhage in Patient with Post-Whipple surgery by 99mTc-Labelled red Blood Cell Scintigraphy. *Case Rep Radiol*, 2018 Aug 14; 2018: 1381203 (RAC# 2180447)
- Mucopolysaccharidoses: Overview of Neuroimaging Manifestation. *Pediatric Radiology* 2018;48:1503-1520. Nicolas-Jilwan Manal et al, (RAC# 2180328).
- Vein of Galen Aneurysmal Malformations: An Overview for the Diagnostic Neuroradiologist. *Neurographics*. 2018 (RAC# 2180268).
- Isovaleric Acidemia: A Rare Cause of Isolated Cerebellar Atrophy. *Journal of Pediatric Neurology*. 2018. (RAC# 2180255).
- Tectocerebellar Dysraphia with Occipital Encephalocele: A Phenotypic Variant of the Tmem231 Gene Mutation Induced Joubert Syndrome. *Child's Nervous System*. 2018 (2180252).
- Recessive Congenital Methemoglobinemia Type II: Hypoplastic basal Ganglia in two siblings with a novel mutation of yje NADH- cytochrome b5 reductase gene. *Brain and Development*. 2018 (RAC# 2180247).
- Cardiac & Pericardial Tumors: A Potential Application of Positron Emission Tomography -Magnetic Resonance Imaging. *International Journal of Cardiology*. 2018. (RAC# 2170196).
- Trans-cranial embolisation of a complex transverse sinus dural arteriovenous fistula by direct puncture of the superior sagittal sinus. *Asian J Neurosurgery* 2018; 84: 547-555. Bhattacharya Joti et al.
- Cross-sectional study of a UK cohort of neonatal vein of Galen malformations. *Ann Neurol* 2018; 84: 547-555. Bhattacharya Joti et al.
- Endovascular rescue of vertebro-basilar thrombosis in cervical spine injury. *Spinal Cor Ser Cases* 2018 Nov 9;4:10. Bhattacharya Joti et al
- Vein of Galen Malformations: An overview for the diagnostic neuroradiologist. *Neurographics*: accepted. Bhattacharya Joti, Nicolas Jilwan Manal et al.
- Adrenal oncocytoma: An incidental fluorodeoxyglucose positron emission tomography/computed tomography findings with magnetic resonance imaging correlation. *Indian J Nucl Med* 2018; 33. Alsugair Abdulaziz, Abouzied Mohei Eldin.
- Tectocerebellar dysraphia with occipital encephalocele: a phenotypic variant of the TMEM231 gene mutation induced Joubert syndrome. Nicolas-Jilwan Manal et al. *Childs Nerv Syst*. 2019 Jan 7. doi: 10.1007/s00381-019-04048-9. [Epub ahead of print].



# DEPARTMENT OF SURGERY

The Department of Surgery provide qualified research either by members of the Department, in collaboration with other Hospital departments, other nationally, or international institutions.

It is the goal of the Department to encourage research activities, and involve most of the junior staff and new generation of surgeons in research by conducting the Annual Surgical Research day.

At the end of 2018, the Department of Surgery has 47 publications, with total impact factor of 169, 29 abstracts presented individually and in collaboration with other Departments at KFSH&RC and Internationally. We completed and closed 8 projects. Currently there are 50 RAC approved active projects, 15 research projects were initiated in 2018, and few waiting for approval from the office of Research Affairs (ORA). These projects included basic, clinical, prospective and retrospective studies.

CHAIRMAN

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DIETER BROERING, MD, PHD,  
FEBS, FACS

## RESEARCH ACHIEVEMENTS

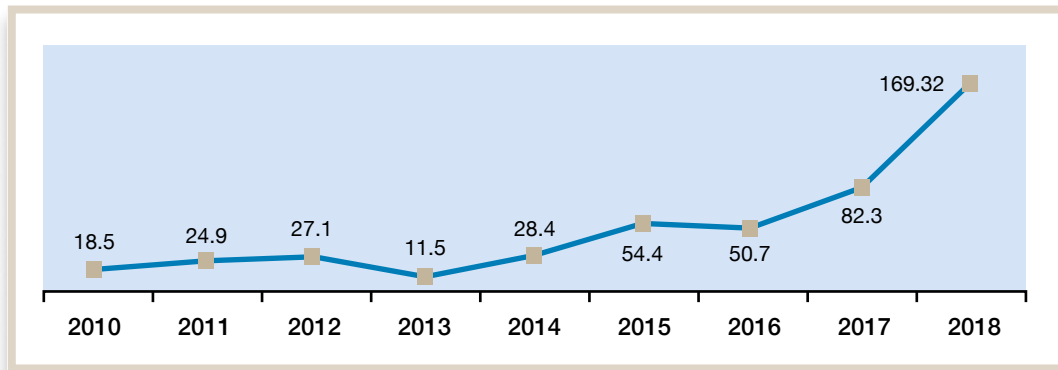
- For the last 5 years we have completed and published 125 publications in International peer-reviewed journals.
- The total number of impact factor has been doubled to be 169 in 2018 compared to a total impact factor of 82 in 2017.
- We initiated 15 new RAC approve project in 2018, and we were working on other 35 active research projects.
- Dr. Samar Alhomoud, Colorectal surgeon, honored by the King of Saudi Arabia, as the First Saudi Woman appointed by the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO), as Chair of its Ethics Committee.
- Participate in the Global study, Performance outcome in the treatment of colorectal cancer. Collaboration: Cornell University (Presbyterian hospital). Tokyo university, Osaka university.
- Dr. Amal Alhefdhi, Breast and Endocrine Surgeon, appointed as member of the Clinical Research Committee, Office of Research Affaires, KFSH&RC.

## OTHER ACHIEVEMENTS

- 18<sup>th</sup> Annual Surgical Research & Residents' Day, 06 December 2018.
- Weekly Animal Lab Activity, "Training of Surgical Residents in Bowel Anastomosis" Every Monday, 09:00–15:00, KFSH&RC.
- Weekly Animal Lab Activity, "Microsurgery Training". Every Sunday, KFSH&RC.
- Weekly Teaching for Plastic Residents. Every Tuesday, 07:30–08:30AM, KFSH&RC.
- Animal Workshop – Video Assisted Thoracic Surgery Lobectomy. Every Wednesday 08:30–11:00 AM.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
<b>Publications</b>	13	13	18	20	8	22	31	47	47
<b>Active Research (Ongoing)</b>	8	11	14	13	19	14	43	42	50

Total Number of Impact Factor 2010–2018



## PUBLICATIONS

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- The IARC Perspective on Colorectal Cancer Screening. Lauby-Secretan B, Vilahur N, Bianchini F, Guha N, Straif K; International Agency for Research on Cancer Handbook Working Group. Collaborators (23): Pinsky P, Blom J, Rabeneck L, Smith RA, Wiesner Ceballos C, Alhomoud S, Bretthauer M, Bulliard JL, Corley D, Forman D, Garcia Martinez M, Hoffmeister M, Hultcrantz R, Lansdorp-Vogelaar I, Nagtegaal I, Sangrajang S, Sasieni P, Steele RJC, Sung JY, Zauber AG, Augé Fradera JM, Robertson D, Senore C. *N Engl J Med*. 2018 May 3;378(18):1734-1740. Epub 2018 Mar 26. No abstract available. Handbook: N Engl J Med. Impact factor= 79.258 .
- Functional Subunit Reconstruction of Giant Facial Congenital Melanocytic Nevi in Children with the Use of Matriderm and Skin Graft: Surgical Experience and Literature Review. Nehal Mahabbat, MBBS, Nawaf Alohaideb, MBBS, Faris Aldaghri, MBBS, Feras Alshomer, MBBS, MSc, and Mohamed Amir Murad, MBBS, FRCSC. *Eplasty*. 2018; 18: e30. Published online 2018 Oct 5. Case report: Eplasty impact factor= 6.166.
- IL-8 Activates Breast Cancer-Associated Adipocytes and Promotes Their Angiogenic and Tumorigenic Promoting Effects. Al-Khalaf HH, Al-Harbi B, Al-Sayed A, Arafah M, Tulbah A, Jarman A, Al-Mohanna F, Aboussekhra A. *Mol Cell Biol*. 2018 Nov 5. pii: MCB.00332-18. Original Research: Mol Cell Biol. Impact factor=3.813.
- Thoracic duct cyst presenting as abdominal pain. Abu-Zaid A, Alakhtar AM, Alshamdin FD, Saleh W. *Surgery*. 2018 Feb 21. pii: S0039-6060(18)30013-8. Case Report: Surgery Impact factor= 3.574.
- Dose Escalation with Simultaneous Integrated Boost (SIB) Using Volumetric Modulated Arc Therapy (VMAT) in Rectal Cancer. Alsuhaibani A, Elashwah A, Mahmood R, Abduljabbar A, Alhomoud S, Ashari L, Bazarbashi S, Aljubran A, Alzahrani A, Mohiuddin M, Almanea H, Alhussaini H, AlSanea N. *J Gastrointest Cancer*. 2018 Jul 14. Original Research. J Gastrointest Cancer Impact factor= 2.813.
- Pulsed Ultrasounds Reduce Pain and Disability, Increasing Rib Fracture Healing, in a Randomized Controlled Trial. Santana-Rodríguez N, Clavo B, Llontop P, Fiuza MD, Calatayud-Gastardi J, López D, López-Fernández D, Aguiar-Santana IA, Ayub A, Alshehri K, Jordi NA, Zubeldia J, Bröering DC. *Pain Med*. 2018 Nov 29. Pain Med Impact factor=2.782.
- Surgical Outcome of Thyroid Nodules with Atypia of Undetermined Significance and Follicular Lesion of Undetermined Significance in Fine Needle Aspiration biopsy. Saad AlQahtani, Saif Alsobhi, Riyadh I Alsalloum, Saleh AlNajjar, Hindi N Alhindi. *World J Endc surg* 2017;9(3):100-103. Review Article: *World J Endc surg*. Impact factor= 2.766.
- Suspected Acute Appendicitis: Research in Saudi Arabia. Mariam Ahmed Galal<sup>1\*</sup>, Ihab Fouad Anwar. *J Surg*. Sep 2018. JSUR-1167. Original research: *J Surg*. Impact factor= 2.728.
- Cenani-Lenz syndrome and other related syndactyly disorders due to variants in LRP4, GREM1/FMN1, and APC: Insight into the pathogenesis and the relationship to polyposis through the WNT and BMP antagonistic pathways. Al-Qattan MM, Alkuraya FS. *Am J Med Genet A*. 2018 Dec 20. doi: 10.1002/ajmg.a.60694. [Epub ahead of print] Review. Review article: *Am J Med Genet*. Impact factor= 3.016.
- Ozone Therapy as Adjuvant for Cancer Treatment: Is Further Research Warranted? Clavo B, Santana-Rodríguez N, Llontop P, Gutiérrez D, Suárez G, López L, Rovira G, Martínez-Sánchez G, González E, Jorge IJ, Perera C, Blanco J, Rodríguez-Esparragón F. *Evid Based Complement Alternat Med*. 2018 Sep 9; 2018:7931849. doi: 10.1155/2018/7931849. eCollection 2018. Review. Original research: *Evid Based Complement Alternat Med*. Impact factor=2.064.

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  - Phyllodes Breast Tumors: A Review of a Single Saudi Institution Experience. Yousef Al-Alawi, Amal Alhefdhi, Badr Aldrees, Sara AlSani, Ihab Anwar, Asma Tulbah, Taher Al-Tweigeri and Osama Al-Malik. *Clinics in Surgery*. Feb 2018. 3; 1904. Original research: *Clinics in Surgery*. Impact factor= 1.82.



# DEPARTMENT OF UROLOGY

The Department of Urology continuously conducted various research projects specifically in the field of Urology, Andrology/ Infertility and Oncology. On-going research activities primarily focus on the correlates of the male sexual dysfunction in liver transplantation patients, outcome of laparoscopic nephrectomy vs open for upper tract urothelial tumors, the value of screening and early detection of carcinoma of the prostate in Saudi Arabia, patterns of care and outcomes of men who are at high risk for poor clinical outcomes after experiencing biochemical failure following definitive prostate cancer therapy, chances of sperm retrieval during testicular sperm extraction in adult cryptorchid testes, Arabic translation and validation of female sexual function index in Saudi population, impact of action II petite lady laser machine in the treatment of urinary incontinence and sexual dysfunction female, preoperative optimization of testosterone and FSH in the improvement of sperm retrieval rate by microsurgical testicular sperm extraction, utilization of disposable flexible cystoscopy in the follow up of patients with non muscle invasive bladder cancer, genetics of male infertility, early effect of sleeve gastrectomy on urogenital function in morbid obese Saudi male patients, molecular profiling for prostate cancer, clinical presentation and treatment strategies for renal masses, management of chromophobe renal cell carcinoma and association of renal cell carcinoma with gastrointestinal stromal tumors.

CHAIRMAN

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PROF. WALEED AL TAWHEEL,  
MD, FRCSC, MMM

## RESEARCH ACHIEVEMENTS

- Two (2) research projects (RAC# 2181020 & 2161132) were presented during the Emirates Forum of Urology held in Dubai, UAE last 16-17 February 2018.
- One (1) research project (RAC# 2181020) was presented during the 8<sup>th</sup> International Meeting on “ Challenges in Endourology” at Amsterdam last 17-19 June 2018.
- One (1) research project (RAC# 2161132) was presented during the 36<sup>th</sup> World Congress of Endourology in Paris, France last 20-23 September 2018.
- One (1) research project (RAC# 2161132) 18<sup>th</sup> Annual Surgical Research Day at KFSH&RC last 06 December 2018
- One (1) research project (RAC# 2131102) was presented during the 12<sup>th</sup> Masterclass of GURS/ 2<sup>nd</sup> Joint Meeting of Adult and Pediatric GUR-Surgeon in London UK last 5-7 November 2018;
- One (1) research project (RAC# 2171081) was presented during the 20<sup>th</sup> Congress of European Society for Sexual Medicine in Lisbon, Portugal last 28 February - 03 March 2018.
- Basic science research in collaboration with the Research Centre has pursued novel areas in all disciplines of specialty; members of the department of urology have published eight (8) articles for 2018 in peer reviewed journals with results shared worldwide in major conferences.

## OTHER RESEARCH ACHIEVEMENTS

- Ongoing collaboration with Comparative Medicine Department for the Bladder Augmentation and Reconstruction Workshop recognized by the International Continence Society.
- Ongoing collaboration with the Saudi Urological Association and Comparative Medicine Department for various workshops in Andrology/ Infertility, Hypospadias Repair and Urethral Reconstruction Workshops.



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- RAC# 2171071/ Publication# 2180220. Junejo NN, Vallasciani S, Alshammari A, Aljallad H, Alshahrani S, Abasher A, Almathami A, Alhazmi H. Robotic versus open pyeloplasty in pediatric patients: a single center experience in Saudi Arabia. *Minerva Urol Nefrol*. 2018 Oct;70(5):486-493..
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# NURSING AFFAIRS

In 2018, Nursing Affairs continued supporting nurses to conduct high quality research. They were focused on studies from nursing staff members that were initiated in the clinical area that support the organizational priorities, which included those related to nursing sensitive quality indicators, patients' quality of life, satisfaction, and length of stay. They also included studies related to the experience of staff and their work environment.

Nursing Affairs is committed to increasing the number of clinical studies, elevating the standards of research, as well as partnering with outside facilities to participate in multi-site studies. As a Magnet designated facility on the journey to becoming a High Reliability Organization, Nursing Affairs is committed to constantly striving for discovery and innovation, as they participate in leading the reformation of health globally.

EXECUTIVE DIRECTOR

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ROSEMARIE PARADIS

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## RESEARCH ACHIEVEMENTS

- A healthy work environment plays a significant role in today's health care system. The study showed the correlation between the work environment and patient outcomes, associating increased work complexity and stress with an increase in staff turnover.
- Readiness Evaluation and Discharge Interventions (READI) was an ANCC- commissioned multi-site study, utilizing 3 discharge readiness protocols and comparing emergency readmission rates, using results to a paired control unit. Readmission rates within 30 days remained stable.
- Hematopoietic Stem Cell Transplantation (HPSCT) offers cancer patients hope for a cure. This is a study that showed how HPSCT is important to patients' physical, psychological and spiritual well-being, including the patient's way of thinking and perception of life.
- Roles of Clinical Nursing Preceptors in Developing Clinical Competence Among Saudi Nursing Interns, is a study that provided direction for enhancing the preceptorship program, including improved strategies to facilitate nurses' transition from academia to clinical practice.
- Association between Nurse Skill Mix and Patient Outcomes is a study that demonstrated a significant association between a nurse skill mix and the reduction of pressure injury rates in inpatient units.

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