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THE

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Showcasing Saudi research

The annual biomedical research seminar is expected to increase national collaboration.

Researchers from across the kingdom revealed their latest findings at KAIMRC's 6th Research Day in AlAhsa in Saudi Arabia's eastern region) on May 4, 2017. The annual event enables researchers to present their work-in-progress, exchange knowledge, and build networks and collaborations, says organizer Fahad Asaad, KAIMRC's head of research, training and development.

This year's event attracted over 160 abstract submissions from research groups within and without the Ministry of National Guard-Health Affairs. Twenty submissions were chosen for oral presentations while almost 100 were selected for posters.

KAIMRC's director of clinical cardiovascular research, Mouaz Al-Mallah, gave the keynote lecture, addressing the future of clinical research in light of increasing age-related chronic conditions, such as diabetes and heart disease. He also highlighted the potential of big data as a predictive biomedical research tool.

Pharmacologist Mohammed Al Mohaini, from King Saud bin Abdulaziz University for Health Sciences, won first prize for his presentation. He investigated the resistance of a DNA lesion, induced by oxidation and ionizing radiation, to repair. In vitro assessments showed the position of the damage determined whether the ends of double-strand breaks could be joined. They also showed that end-joining is contingent on the interaction between key DNA repair proteins.

Munirah Al-Abdulathim, from King



Abdulaziz Hospital, was awarded second best oral presentation. Her team evaluated hypertension management using an ambulatory blood pressure monitor that records arterial pressure over a period of 24 hours while a person carries out their normal activities. The approach allows medical personnel to tailor and improve treatment.

"Research Day highlights the progress that KAIMRC has made over the last six years," says Asad. The organizers believe that the large number and diversity of the researchers will enhance multi-centre collaboration.





ANTICANCER STRATEGY: SHOOTING FOR THE MOON

A moonshot project that aims to eradicate cancer comes to KAIMRC’s CEO Leadership Forum for Healthcare.

A comprehensive strategy to eradicate cancer is now being implemented at the University of Texas MD Anderson Cancer Center in the United States. Ronald DePinho, its former president, introduced MD Anderson’s Cancer Moon Shots program at KAIMRC’S CEO Leadership Forum for Healthcare held at the Ministry of National Guard–Health Affairs on 12 June, 2017.

In response to a call from former US president, Barack Obama, for a national effort against cancer, the newly developed multidisciplinary approach is poised to improve prevention, early detection and treatment.

Emulating the determination that fuelled the American lunar landing, the program is initially taking on 13 cancer

types, including leukaemia, lung, breast, and prostate cancers.

Specifically, it relies on genomics, proteomics, and immunotherapy as molecular-level diagnostic tools to better understand, diagnose and treat cancer.

“With more than 100,000 patients involved annually, the program should cut down cancer-related mortality nationally and internationally.”

To enhance patient care and speed up research, the so-called APOLLO and translational research acceleration platforms continuously monitor patient response to treatments while providing input to clinicians and researchers.

The centre’s in-house Institute for Applied Cancer Science and clinical trial facilities are working on faster drug discovery and development.

Finally, the centre’s prevention and outreach activities will guide the public on cancer screening and early detection.

This unprecedented program, which mobilizes 21,000 employees and involves more than 100,000 patients annually, is expected to slash cancer-related mortality nationally and internationally.

KAIMRC’S CEO Leadership Forum for Healthcare brings together world healthcare leaders to share the sector’s latest developments and discuss opportunities for collaboration.



TAMOXIFEN: THE FATHER'S WISDOM

The mastermind behind one of the most important cancer drugs discovered suggests a change in regimen could make it even more useful.

Virgil Craig Jordan, the “father of tamoxifen”, spoke at KAIMRC on 12 June about his pioneering work of the 1970s and 80s that helped transform a failed contraceptive drug into one of the most widely used medicines for treating and preventing breast cancer.

Jordan, who is the Living Legend Chair of Cancer Research at the University of Texas MD Anderson Cancer Center in the United States, had shown that tamoxifen interferes with receptors on breast cancer cells, preventing them from binding to oestrogen and thus inhibiting their growth.

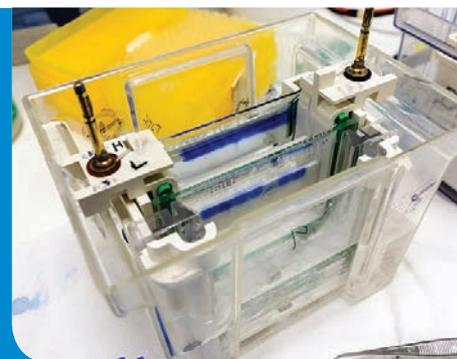
He later demonstrated that tamoxifen did not always block oestrogen everywhere in the body. It could also promote oestrogen-like effects to help build bone. He called the drug a selective oestrogen receptor modulator (SERM).

A handful of SERMs are now routinely prescribed for postmenopausal women at risk of osteoporosis. These drugs have “revolutionized women’s health,” Jordan said in his talk, the second of KAIMRC’s CEO Lecture Series.

Jordan’s recent research efforts have focused on solving the problem of acquired resistance to SERMs; a problem that can lead to cancer relapse and death. During his talk, he proposed that women receiving tamoxifen therapy pause after five years to undergo a three-month regimen of hormone-based and small molecule drugs that can kill off any and all mutated cancer cells. After the three-month period they can resume tamoxifen treatment.

This tweak to current treatment protocols, Jordan said, should “allow high-risk women to live their natural lives.”

The CEO Lecture Series is a set of regular lectures delivered by prominent medical researchers from around the globe with special focus on research and development areas aligned with MNG-HA’s and KAIMRC’s research and innovation strategies. The lecture series’ targets audience is scientists, clinicians, faculty, students, research executives and healthcare leaders from within King Abdulaziz Medical City and from other institutions.



Connecting the blots

Sixteen scientists gathered in a KAIMRC laboratory in May to brush up on their protein analysis skills. As part of a two-day workshop called ‘Western blot made easy,’ students, faculty and technicians from across Saudi Arabia learned how to transfer biological samples from a gel to a membrane, and then to use antibodies to detect proteins.

Western blotting, a staple of life science labs globally, is a technique used to separate and identify proteins. It involves separating extracted proteins based on their weight by pushing them through a porous gel using an electric field. Once separated, the proteins are transferred to a membrane, which is incubated with antibodies that are specific to certain proteins. If a protein of interest exists in the sample, the corresponding antibody will bind to it, making it identifiable.

After instruction on the basics of the Western blot technique, Hamad Al-Eidi, a senior technician from KAIMRC’s genomic core facility, answered questions and showed how to troubleshoot the method in the face of unexpected results.

Saleh Al Ghamdi, chairman of KAIMRC’s medical genomics research department, gave an overview of more advanced variations of the protocol that allow for increased specificity or automation.

Al Ghamdi now hopes to repeat the workshop annually with an expanded curriculum. “This was an introductory course,” he says. “In the future, we are planning to make it four or five days so we can cover every aspect of Western blotting and its related techniques.”



STANDING STRONG AGAINST INFECTIOUS DISEASES

KAIMRC is expanding its contribution in the global fight against infectious diseases.

Hanan Balkhy, head of the infectious diseases department, has joined the Interagency Coordination Group on Antimicrobial Resistance. Co-chaired by the United Nations deputy secretary-general and the director-general of the World Health Organization, the group was created in response to widespread antimicrobial resistance around the world. It aims to provide practical guidelines for the development of effective and long-lasting approaches in a potential post-antibiotic world.

Balkhy has also been nominated permanent fellow of the European Society of Clinical Microbiology and Infectious Diseases (ESCMID), an honorary appointment through which the organization's executive committee recognizes excelling ESCMID members. Established in 1983, the organization aims to improve the diagnosis, treatment, and prevention of infection-related

diseases by promoting and supporting research, education, training, and good medical practice. Attracting more than 33,000 individual and affiliated members worldwide, it has grown to become Europe's leading society in this field.

After obtaining her medical degree from King Abdulaziz University in Jeddah, Balkhy completed her training in paediatrics at Harvard Medical School in the United States before specializing in paediatric infectious diseases through a joint program between the Cleveland Clinic Foundation and Case Western Reserve University, Cleveland.

Since her return to Saudi Arabia in 1999, she has concentrated on infection control within healthcare settings. Holding an associate professorship at King Saud bin Abdulaziz University for Health Science, the past 16 years have allowed her to sharpen her skills in building infection control programs,

conducting surveillance, and addressing healthcare-associated infections within the kingdom's healthcare system. Balkhy's most recent focus has been on emerging public health concerns, such as multidrug resistance pathogens, hospital infections, and tuberculosis, a pursuit that earned her KAIMRC's senior researcher award in 2013.

Currently executive director of the infection prevention and control department at the Ministry of National Guard-Health Affairs, which manages infection control in five hospitals, Balkhy also leads the Gulf Cooperation Council Center for Infection Control and the WHO Collaborating Centre for Infection Control in Saudi Arabia. She has lent her expertise nationally through the Saudi National Infectious Disease and National Immunizations Committees, as well as in various WHO committees, such as the advisory group on antimicrobial resistance and surveillance.



FROM LAB TO CLINIC: TECHNOLOGY IN TRANSFER

Expert help is available for KAIMRC researchers to see their innovative research flourish in the clinic and marketplace.

Transforming research discoveries into commercial technologies that will improve lives is the final step in making medical research useful and profitable. There are, however, many challenges facing researchers whose work might have commercial and clinical potential.

Helping scientists to understand and overcome the obstacles is one of the major roles of the Innovation and Technology Management Office (ITTMO) at KAIMRC. ITTMO research projects manager, Anas Alhunaihin, recently addressed the key issues in a workshop covering the essentials of what scientists and students in the medical technology field need to know about intellectual property and commercialization.

“Around 40 professors and students attended, and I was glad to see the young generation interacting with me and sharing their experiences and ideas,” says Alhunaihin. The workshop took place at the College of Applied

Medical Sciences at King Saud University. Further events are scheduled, including a series of lectures at Prince Mohammad Hospital in Madinah.

The ITTMO was established in 2012 with the main aim of managing intellectual property produced by KAIMRC researchers and shedding light on the complexities surrounding the issue. Researchers who are predominantly focused on the scientific aspects of their work need to learn what intellectual property is, the process of patenting, the procedures and risks involved in disclosing details of their innovations, and the various licensing arrangements that might be set up.

Researchers are also understandably keen to learn about the potential rewards if their work becomes commercialized, and how their remuneration fits within the overall share of royalties among inventors, institutions, funders and industrial partners.

Alhunaihin explains that his role is to liaise and negotiate with all those involved and to tackle challenges that might prevent commercialization from running smoothly. He points out that misunderstanding the process can result in missed opportunities. He adds that success seems imminent. “We expect to have some good news soon from negotiations to license two of our medical technologies.”

Ali Al Muntasheri, ITTMO’s director, highlights the risks of making contacts with external technology transfer brokers who may claim to take inventions to the marketplace. “Often nothing happens,” he warns. The ITTMO can help guide researchers and their innovations through the unfamiliar territory of commercialization, hopefully bringing reward to the researchers, their institutions, industry partners, and of course the patients who eventually benefit from innovations beginning at KAIMRC.



BRINGING GLOBAL EXPERIENCE HOME

Saleh AlGhamdi is drawing on his years of international experience to find treatments for Saudi cancer patients.

Saleh AlGhamdi was always interested in science while growing up in the Al Bahah region of southwestern Saudi Arabia.

Now 44, he is in charge of a cancer genetics laboratory and two scientific units at KAIMRC: the medical genomics research department and the Saudi Biobank. He also serves on the boards of the Saudi Society of Medical Genomics, the Middle East Molecular Biology Society and the Saudi Society of Apoptosis.

AlGhamdi brings to these positions great expertise in advanced biological research techniques and in operations management.

After earning his bachelor's degree from King Abdulaziz University in Jeddah, he worked for three years in the pathology departments of Saudi hospitals before going to the United States in 2001 to gain advanced training in cytotechnology at Johns Hopkins University in Baltimore.

In 2003, he went to the United Kingdom, where he earned a master's degree from what is now called Cardiff Metropolitan University in Wales.

He returned to Saudi Arabia, first to run a cytopathology lab at King Abdulaziz Medical City in Riyadh and then to manage a 300-staff laboratory at King Abdulaziz Hospital in Al Ahsa.

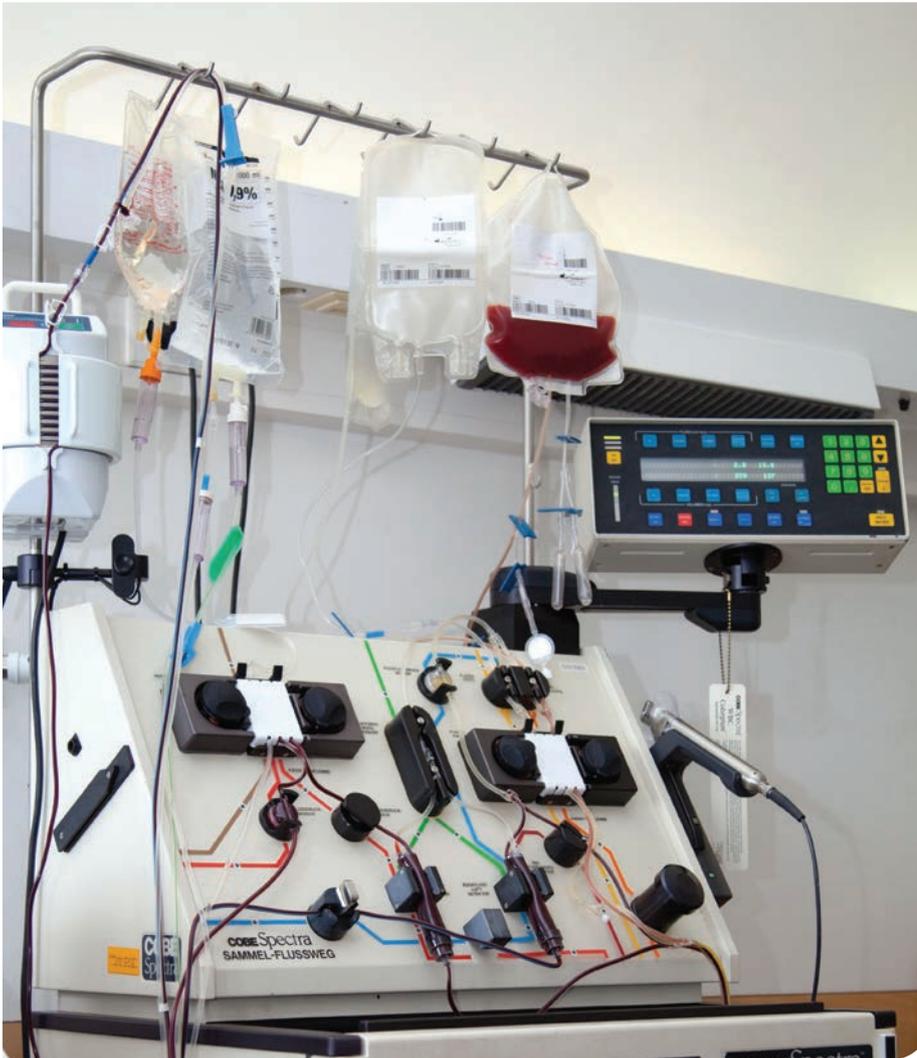
AlGhamdi's quest for knowledge led him to study for a PhD under the guidance of Mohammad Ilyas, professor of molecular pathology at the University of Nottingham in England.

Ilyas remembers AlGhamdi as "an affable and courteous individual who was very popular in the lab." Over the course of his four-year degree, AlGhamdi published a handful of papers showing how the C-terminal tensin-like gene, or CTEN, could promote the spread of colorectal and pancreatic tumours. Ilyas says AlGhamdi also showed unique

leadership qualities, and by the end of his PhD was supervising several other graduate students. "He was among the most productive students in the lab and our collaboration continues to this day," Ilyas says.

Reflecting on his time abroad, AlGhamdi says, "It was very helpful to have had different experiences and exposure to different flavours of science." The international network of scientists he met has enabled him to maintain active collaborations around the world. "My attitude toward science has always been to take it globally and implement it locally."

His drive has become even stronger since AlGhamdi's mother was recently diagnosed with colorectal and synchronous gastric cancers. His studies are inspired not just by scientific interest. Now, he says, "I want to find a cure more than ever for these patients."



SETTING THE STANDARD FOR STEM CELL TREATMENT

The stem cell transplantation program reports its first seven years have been highly successful in treating patients with blood cancers.

Stem cell therapies are now a standard treatment for cancers of the blood, lymph nodes and bone marrow, including Hodgkin's lymphoma, multiple myeloma and leukaemia.

In 2010, King Abdulaziz Medical City in Riyadh launched its stem cell transplantation program for adult and paediatric patients. With the initial treatment and follow-up period now complete, the program's team has

revealed promising results in a study published in *The International Journal of Science and Research*.

The team followed the progress of all adult patients who received autologous stem cell transplants between 2010 and 2013. Autologous stem cell transplantation involves harvesting and freezing stem cells from the patient's own bone marrow. The patient then undergoes chemotherapy, sometimes

accompanied by radiotherapy.

"This high-dose chemotherapy kills both cancer cells and normal bone marrow cells. This would ordinarily result in bone marrow failure to produce healthy new blood cells," explains KAIMRC's Mohsen Alzahrani, one of the study's co-authors. "To prevent this, and to replenish normal marrow cells, the harvested stem cells are re-infused into the patient after the chemotherapy is complete."

The reinstated stem cells begin replacing damaged tissues and ensure a return to normal blood cell production. The technique has proven effective in treating blood cancers, and runs a low risk of rejection by the body because the stem cells originate from the patients themselves.

The patient cohort comprised 38 patients, including 25 males and 13 females. They were suffering from a variety of conditions, with Hodgkin's lymphoma (61%) being the most common. Hodgkin's represents 30% of all lymphomas in Saudi Arabia — a figure far higher than in the western world— although the reasons for this are not yet clear.

"Our initial findings indicate that our program, which is relatively young compared to international centres, is producing excellent results, which we hope to build on," says Alzahrani. "For this report, we only had a short follow-up period of three years, but 79% of our patients have survived to this point and 76% were disease-free three years after treatment."

Alzahrani's team plans to increase the number of patients undergoing autologous and allogeneic transplantations (receiving stem cells that originate from another person) to meet the national need for these procedures.

"We also hope to expand the variety of conditions we can treat with autologous stem cell transplants, for example, autoimmune diseases," says Alzahrani. "I am greatly encouraged by our initial findings, which place our program alongside other international centres in terms of its positive results."



MOHAMED ABUMAREE: LAYING THE GROUNDWORK FOR BODY REPAIR

Placenta-derived stem cells offer alternative therapeutic approaches to organ repair and regeneration.

A new weapon may soon be added to the armoury in the fight against inflammatory and immunological diseases, such as multiple sclerosis, cancer, diabetes, as well as Alzheimer's and Parkinson's diseases. KAIMRC researchers have come up with a cell-based approach to tissue regeneration using the placenta as a stem cell source.

Stem cell therapy has emerged as a viable course to take in treating various diseases. This non-conventional approach relies on 'mesenchymal' stem cells, which differentiate into bone, fat, muscle and cartilage cells to promote organ repair and regeneration without the need for replacement. However, these cells are typically isolated from human bone marrow through a highly invasive procedure that requires healthy adult donors. In addition to their low concentration in the bone marrow, their ability to differentiate decreases as a

donor's age increases.

Mohamed Abumaree is a cell biologist and immunologist and an expert in reproductive biology. In his quest for an alternative, sustainable and convenient stem cell source, he has turned to the placenta, which is usually discarded after normal delivery. His work has laid the foundations for KAIMRC's stem cell and regenerative medicine department.

Since its inception nine years ago, the state-of-the-art facility has become a leading research institution, allowing KAIMRC to compete with peers in countries in which the field of stem cell and regenerative medicine is more developed. "This competition is not based on the tools or equipment only but also on the outcome of our research," says Abumaree. His team has benefited from training and technology transfer opportunities through collaborations with Melbourne

University, Karolinska Institutet and Tokyo Women's Medical University.

In addition to generating and establishing in-house populations of stem cells, the researchers established the therapeutic usage of these cells against several diseases, especially cancer, multiple sclerosis and cardiovascular diseases. Specifically, they evaluated the performance of placenta-derived stem cells against an animal model of multiple sclerosis called experimental autoimmune encephalomyelitis.

They discovered that the cells effectively inhibited the functions of T cells, which are responsible for the degeneration of neurons in this disorder. "With these encouraging results, we are now starting clinical trials involving multiple sclerosis patients using these stem cells and products developed and tested in our laboratory," Abumaree says.