116
January – March 2022

التقدم العلمي

KFAS

AL-TAQADDUM AL-ILMI

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KFAS
مؤسسة الكويت للتقدم العلمي
Kuwait Foundation for the Advancement of Sciences

Vision

A thriving culture of science, technology and innovation (STI) for a sustainable Kuwait

Mission

Stimulate and catalyse the advancement of STI for the benefit of society, research and enterprise in Kuwait

KUWAIT PRIZE 2021 – Fortieth Cycle
Invitation for Nominations

KFAS
مؤسسة الكويت للتقدم العلمي
Kuwait Foundation for the Advancement of Sciences

The Kuwait Foundation for the Advancement of Sciences (KFAS) awards distinguished Kuwaiti and Arab scientists worldwide the Kuwait Prize for their significant and outstanding achievements in research since 1979. While the main areas in various scientific fields remain consistent, the scientific subfields under these areas vary annually. For the 2021 Kuwait Prize Cycle, KFAS invites universities, scientific and research institutions, and eligible individuals, to nominate Kuwaiti and Arab scientists for the Prize in the following scientific subfields:

Fundamental Sciences	In Physics (including but not limited to): Biophysics, Astrophysics, Nuclear Physics, Atomic Physics, High Energy and Particle Physics, Geophysics, Quantum systems and computing, Condensed matter Physics.
Applied Sciences:	In Applied Medical Sciences (including but not limited to): The development of new Drugs and effective Vaccines, Combating Epidemics and communicable diseases, Public Health Interventions, Translation of Genomic research findings to clinical practice, Applications of Stem Cell research, and development of new Imaging procedures. The 2021 Prize especially welcomes submissions focused on combatting Epidemics/ Pandemics and Contagious Diseases.
Economics and Social Sciences:	In Education (including but not limited to): Education and Technology curriculum development, Development of life, Analytical, Research and other skills, Managing learning Disabilities, Educational Administration and Policies and Educational Reform.
Humanities, Arts and Literature:	In Linguistics (including but not limited to): Computational Linguistics, Cognitive Linguistics, Neurolinguistics, Semantics, Sociolinguistics, Psycholinguistics.

KFAS awards an annual Prize cash sum of K.D. 40,000 (Approx. $135,000) for each subfield, along with a gold medal, a KFAS shield and a certificate of recognition.

Conditions and requirements:

1 - KFAS accepts nominations from universities, academic and research institutions, former laureates of the Kuwait Prize, and peers of the nominees. Nominations from political entities are not accepted.
2 - KFAS accepts self-nominations. Self- nominees must provide a statement outlining the basis for their eligibility for nomination and the significance of their research production.
3 - The nominee must be from an Arab nationality and have proof of Arabic origin, such as an Arabic birth certificate, a valid Arabic passport, or a relevant document. A copy of one of these documents must be included in the application file.
4 - The nominee must be a recognized specialist and researcher in the announced subfield and must hold a PhD degree. Applicants for the Applied Sciences (who do not hold a PhD degree) must hold the Medical fellowship and/or Medical Board.
5 - Nominees must provide a list of references, three academics/researchers and one scientific institution.
6 - The work submitted should be innovative, significant in the announced subfield, and published during the past twenty years. Submitted work include papers published or accepted for publication in refereed Journals, and books with ISBN number (authored, translated, edited, and chapter in a book). MA or PhD theses and any publications extracted from them shall not be evaluated as part of the nominee's scientific work.
7 - Nominees are requested to complete the Prize Nomination Form and send it along with the submitted work electronically. The Nomination Form is obtained from KFAS website www.kfas.org/kuwaitprize2021. The Nomination Form for the subfields in Fundamental Sciences and Applied Sciences should be submitted in English.
8 - The Nomination Form along with scientific publications and achievements completed within the past twenty years should be sent in PDF format, through the cloud storage services sites such as (Google Drive–Dropbox–OneDrive) via Prize email: kuwaitprize@kfas.org.kw
9 - KFAS decisions concerning The Kuwait Prize are final and objections are not accepted.
10 - Nominations must be submitted no later than **Monday, 28TH February 2022.**

For further information and inquiries, please contact the Prize Office: Tel: +965-2227-0465; E-Mail: kuwaitprize@kfas.org.kw

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Kuwait Foundation for the Advancement of Sciences

التقدم العلمي
AL-TAQADDUM AL-ILMI
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The Importance of Mangroves in the Ecosystem

The mangrove plant is widespread in intertidal zones of coasts of tropical and subtropical regions. It is one of a group of coastal plants that can tolerate sea water salinity. The dense growth of this plant may be substantial, forming intertwined forests with roots and branches that contribute to protecting the beaches from erosion. The mangrove forests play a vital role as a unique and distinct ecosystem that constitutes natural incubators for large communities of living organisms. It directly contributes to sustaining biodiversity by supporting the food chain, providing shelter and habitat for many marine species such as fish and crustaceans, and many species of mangrove forests' dwellers such as insects, birds, some reptiles, and other aspects of biodiversity necessary to maintain ecological balance.

The mangrove forests are also considered one of the most important carbon sinks because their roots have the ability to absorb carbon dioxide, the primary greenhouse gas causing global warming and driving climate change, from the atmosphere and store it in the soil. Mangrove forests are at least six to eight folds superior to rainforests in this regard, so they contribute effectively to mitigating the effects of climate change.

In this issue of "Al – Taqaddum Al-Ilmi" we highlight the process of differentiation of mangrove communities throughout the geological history of the planet, and this is clearly evident in the number of differences in the genera found across the coasts of the Old World (western Pacific Ocean, Indian Ocean, and east Africa) compared to those found on the coasts of the New World (Atlantic coasts of west Africa and eastern Americas), and discuss the main factors controlling its distribution, the most important of which are the climate and the relative rise in sea level.

This issue also addresses the challenges, threats, and pressures that the mangrove habitats are exposed to due to adverse human practices and development activities that do not consider the environmental impact, resulting in a rapid deterioration of this unique ecosystem. In addition to oil pollution from oil tanker accidents, coastal development projects and draining wetlands are among the most dangerous human activities that have led to the severe deterioration of mangrove habitats. This necessitated concerted international efforts to rehabilitate these degraded areas or introduce mangroves in new areas.

One of the most important tools available to these international efforts is the use of modern technologies to monitor the health of forests and track the negative impacts of various environmental pressures. Remote sensing techniques and space-based monitoring capabilities have made it possible to assess environmental damage and manage the mangrove ecosystem in a scientific way. The use of traditional environmental surveys such as field visits is difficult to achieve due to the difficulty of accessing some areas extending over huge areas, and the high cost associated with performing such surveys.

Several Gulf countries have paid great attention to preserving the mangrove forests, especially in terms of designating large areas as natural reserves for mangroves, away from human activities. The Sultanate of Oman, for example, launched a major national project to reintroduce one million mangrove trees, as part of a long-term plan to preserve the coastal resources and ecosystems. Kuwait Institute for Scientific Research conducted several laboratory research studies, in addition to a complete survey of the muddy beaches in the country to study the reintroduction of the mangrove plant to its historical areas on the coast of Kuwait.

Editor-in-Chief
Dr. Salam Ahmad Al-Ablani

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Building the United Nations of Women in Cyber

WiCSME launches its 2020 virtual conference as part of its efforts to empower women in cyber security across the Middle East

Reem Al-Shammari

In an industry dominated by men, Dr. Reem Al-Shammari, co-founder of Women in Cyber Security Middle East (WiCSME), works to empower women and enable them to secure their community through knowledge and action. From November 14-15, WiCSME launched their 2020 virtual cyber security conference, attracting 50 renowned international female speakers and a worldwide audience.

"We're building the United Nations of women in cyber," says Al-Shammari of the conference which connected women with leaders and their peers in the Middle East and globally, acting as a hub for women in cyber security.

Sponsored by KFAS and a few other leading organizations in the cyber security industry, the event offered a state-of-the-art program, structured around three pillars. The first of these, titled "The Power of the Sisterhood," covered a wide range of topics from leadership to cyber security, uniquely presented by an all-female cast. It featured keynotes on issues such as under-representation of women in cyber security and leadership, industrial cyber security, and CISO change-makers; panel discussions covering the empowerment of women in leadership and perspectives of young talent; and speaker sessions with non-technical and technical tracks discussing the arms race for cyber power, beating stress, online safety, aviation security, and cyber security trends.

The second pillar covered the WiCSME Awards titled "Unfolding the Cyber Jewels in the Middle East" and celebrated the achievements of women in the region. "We created this sense, be proud of yourself. Let us celebrate you. Let the whole world celebrate you," Al-Shammari told attendees at the event, noting that one of the challenges was helping women overcome their shyness to nominate themselves.

Six award categories attracted over 100 nominations resulting in 30 finalists and 18 winners, who were selected by a panel of renowned regional and international male and female judges. "We make sure that we promote them, and that the whole world knows about them," Al-Shammari says.

Among the winners were Kuwait's Laial AlMansoury, Kuwait's official cyber security governmental representative; Fatma Fouad, senior information security officer and lead organizer of Women in cyber security Kuwait; and Zeinab Mohammed, a cyber security analyst and active member and organizer of Women in cyber security Kuwait.

The third pillar part of the conference featured a Capture the Flag (CTF) hacker competition entitled "WiCSME CTF Cyber Adventure" and powered by the SANS Institute, a global cooperative for information security thought leadership.

"Throughout all these three pillars, our main point of consideration against all the decisions is how can we make women better or how can we help them be more visible," explains WiCSME co-founder Priyanka Chatterjee, noting that the conference helped to positively change the perception of women in cyber security from the region.

Al-Shammari is also proud of the event's impact. "They jumped in with us, supporting with their knowledge, supporting with their thoughts, and it was a huge success for women all over the world."

First-Ever Online "Seeds for the Future" Program Leads to New Careers for Kuwaiti Students

Yasmin Burezq

Nasser Alsaqabi

Last year, Huawei and the Kuwait Foundation for the Advancement of Sciences (KFAS) were forced to get creative with the annual Seeds for the Future program. Because of the coronavirus pandemic, the in-person program was reworked to be held online. But that didn't diminish its impact. Kuwaiti participants Yasmeen Burezq and Nasser al Saqabi were hired by Huawei in Kuwait after completing the program.

"It was like the magical key that opened a lot of doors for me," said Burezq, an alumna of the Kuwait College of Science and Technology's (KCST) electronics and communication engineering programs.

Seeds for the Future is Huawei's flagship global CSR program. Launched in 2008, it aims to develop skilled local talent in the growing field of information and communications technology and foster communication between countries and cultures. Kuwaiti students were invited to apply for the program for the first time in 2015. Last year's cohort included 40 students from universities across the country.

Under normal circumstances, students selected for the program travel to China for two weeks to learn about emerging technologies and network with other students and experts in the field. But last year, the pandemic made travel to China impossible, and the program was shifted online. Nonetheless, al Saqabi said it still provided a collaborative environment where students worked together to solve problems and hone their communication and leadership skills. "My fondest memory is when my classmates and I were trying to help each other to accomplish some challenging tasks and understanding the material of the program," he said. Al Saqabi also earned his degree from KCST, where he majored in computer engineering.

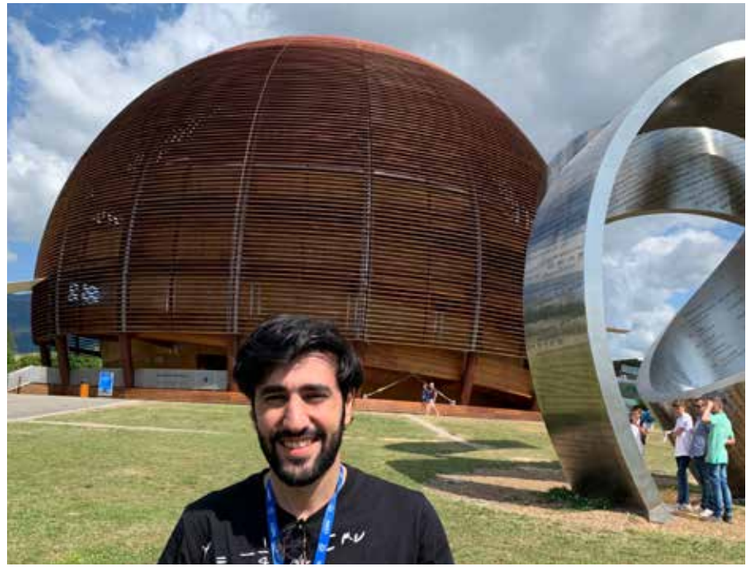
Burezq's fondest memory of the Seeds for the Future program comes from her courses on cutting-edge technologies. The best part was learning "how to keep track of new technology," she said. The program's core curriculum includes hot topics like 5G, cloud computing, and artificial intelligence. Students can also choose elective courses such as digital economy and internet trends.

Following their participation in the Seeds for the Future 2020 program, Burezq and al Saqabi were recruited by Huawei as cloud business development engineers. Al Saqabi said that this step in his career was made possible by the knowledge, connections, and hands-on experience he gained from the Seeds for the Future program, "That gave me a huge advantage to be able to join a big company like Huawei."

By Marianne Dhenin

Searching for Answers to Life's Biggest Questions, Kuwaiti Physicist Travels to CERN

By Marianne Dhenin



Eissa Alnasrallah

Not many people can say they worked with the world's largest and most powerful particle accelerator while in grad school, but Kuwaiti physicist Eissa Alnasrallah can. With support from the Kuwait Foundation for the Advancement of Sciences (KFAS), Alnasrallah undertook a summer program at the European Organization for Nuclear Research (CERN) in 2019, where he worked on the Large Hadron Collider (LHC) - the world's largest and most powerful particle accelerator.

"I was lucky that KFAS gave me this opportunity," he said. "The experience helped shape my perspective on science."

Alnasrallah earned a bachelor's in nuclear engineering and physics in 2015 and a master's in nuclear engineering and engineering physics in 2016 from the University of Wisconsin-Madison in the U.S. He then returned to Kuwait to work as a fellow at the Kuwait Institute for Scientific Research (KISR) and pursue a second graduate degree, a master's in physics from Kuwait University. One of Alnasrallah's advisors at Kuwait University encouraged him to apply for the CERN summer program.

While at CERN in Meyrin, Switzerland, Alnasrallah worked on a team analyzing data from the Compact Muon Solenoid (CMS), a general purpose particle physics detector built on the LHC. With data from the CMS, physicists can study the building blocks of matter, including the well-known Higgs boson particle. This work makes visible the tiniest details that shape our universe.

Opportunities like this one to deepen humankind's understanding of the world are what inspired Alnasrallah to study physics in the first place. "As human beings, we really care about understanding nature," he said. "This is the big question: Why are we here? How is the universe operating? Physics is the field that answers these questions."

During the summer program, Alnasrallah also studied new programming languages, attended lectures, and participated in extracurricular activities like a cultural day and a hackathon. During the hackathon, his team worked for an entire weekend to design a web game based on a basic understanding of nuclear and particle physics.

The program's diverse cohort and collaborative environment made for an invigorating experience. Alnasrallah said that meeting other researchers from around the world reminded him that to answer some of life's biggest questions, "you really need the collaboration of everyone from different backgrounds."

Back in Kuwait, Alnasrallah continues to work at KISR and study for his second graduate degree. His research now involves developing metal-based nanomaterials for hydrogen storage and contributing to Kuwait's Energy Outlook, part of the institute's goals to transform Kuwait's oil-dependent economy by shifting to sustainable energy sources.

Improved Testing for Inherited Diabetes Needed

More widespread knowledge of maturity-onset diabetes of the young (MODY) is required so that patients get the best treatment and management possible.

Hessa AlKandari

Greater awareness of rare, inherited forms of diabetes is needed across the Middle East and North Africa (MENA) so patients receive the best available treatment, according to researchers at a KFAS-affiliated center.

Experts at the Dasman Diabetes Institute in Kuwait City say people with maturity-onset diabetes of the young (MODY) are often misdiagnosed because many doctors are unaware of how it differs from more common forms of the disease.

MODY is a rare and lesser-known form of diabetes compared to the more common type 1 and type 2 diabetes. It is an inherited disease and can often run in families, usually appearing at a younger age.

In a letter published in The Lancet Diabetes & Endocrinology, Professor Fahd Al-Mulla and colleagues called for greater awareness of MODY and improved availability of genetic testing for the condition in Kuwait.

Countries in the MENA region have some of the highest rates of diabetes in the world. Around one in seven adults in Kuwait has the condition, and diagnosis of type-1 diabetes in children have doubled since the 1990s.

Unlike type 1 and type 2 diabetes, MODY is 'monogenic'– meaning it is caused by a mutation in a single gene. If a parent has one of the causal gene mutations, their children have a 50% chance of inheriting the condition.

Since the disease is so rare and its symptoms are similar to those of type 1 and type 2 diabetes, doctors often misdiagnose it as one of the two more common forms of diabetes. However, the condition requires different treatment. Most patients, for example, do not need insulin or require only small doses. It is usually managed through lifestyle changes, weight loss and oral drugs.

"It is important to increase awareness of monogenic forms of the disease to allow patients to be referred for genetic testing so they get the right management and treatment," says Dr. Hessa Al-Kandari, head of Public Health at the Dasman Diabetes Institute.

Correct diagnosis also means associated complications can be better managed. One form of MODY, called HNF1-beta, is, for example, associated with kidney problems, uterine abnormalities and gout.

Genetic testing also allows for improved management of relatives who may be unaware that they have MODY as well. Children born to parents who are members of the same extended family may be at an increased risk of inherited forms of diabetes.

The prevalence of MODY in Kuwait is still unknown. In a study due to be published later this year, Al-Mulla, Al-Kandari and colleagues identified several types of the condition among 60 patients whose symptoms suggested they may have it. They hope to establish a specialist MODY clinic at the Dasman Diabetes Institute to provide improved diagnosis, management and treatment and address this gap in the control of diabetes in Kuwait.

Hend AlQaderi

Using Salivary Biomarkers to Predict Inflammatory Diseases

Dr. Hend AlQaderi's passion for public health is constantly growing, her regular visits to the dentist inspired her career. Prior to her research journey, AlQaderi studied dentistry at the Faculty of Dentistry in Alexandria, Egypt. She then started her employment at the Kuwait School Oral Health Program, the only comprehensive oral health program for school children in the Middle East. She was quickly promoted to Clinical Supervisor and then to Head of Mubarak Al-Kabeer Dental Center. The Kuwait School Oral Health Program is an initiative by the Government of Kuwait and the Forsyth Research Institute in Boston, USA, to provide oral health education, prevention, and treatment to thousands of Kuwaiti school children.

Being the Head of the Dental Clinic Centre meant that her responsibilities extended to providing care to thousands of children and training new dentists and evaluating their performance. "Looking at the big picture was not easy," AlQaderi said. "I was trained to treat patients and oral cavity ailments, but I suddenly had bigger responsibilities, and I wanted to do them well, so I started applying to post graduate programs to study Dental Public Health."

Today, AlQaderi has a Doctorate in Medical Science and a Certificate in Dental Public Health from Harvard University. She is a Diplomate of the American Board of Dental Public Health, and she has a certificate in Health Economics and Outcomes Research from the University of Washington.

She worked with her colleagues and fellow researchers at Dasman Diabetes Institute (DDI) and at the School Oral Health Program to set up the largest longitudinal study of its kind in the Middle East. The study involved collecting data from over 8,000 Kuwaiti children to study risk factors of obesity, a disease caused by excessive body fat, and diabetes, which occurs when the body's ability to produce the hormone insulin is impaired, leading to elevated blood sugar levels.

PHOTO: BANDELE ZUBERI

She and her fellow colleagues successfully identified significant salivary biomarkers linked to diabetes and obesity. Biomarkers are used to identify that there is something happening in the body. The team then recommended lifestyle and system changes to health care providers and those involved in public health policy matters regarding the rapid increase in new cases of Type 2 Diabetes among children and teenagers. This study set the path for AlQaderi to pursue research more passionately. This study, called the "Kuwait Healthy Life Study," was funded by the Kuwait Foundation for the Advancement of Sciences (KFAS) and DDI in Kuwait.

At Harvard, she learned to conduct top-notch research, evaluate programs, identify problems, and provide effective solutions based on evidence and not opinions or anecdotes. She came to a new-found enthusiasm for research, which she ultimately pursued after gaining her Ph.D. in 2016. She completed a Post Doctorate program; an advanced degree that allowed her to conduct more advanced research after her Ph.D. that was funded by KFAS.

Having secured a place in a post-doctorate program, AlQaderi continued studying the risk factors of obesity and diabetes in children. After a research project that she conducted, she concluded that children who have poor sleep behavior are more susceptible to becoming obese and diabetic and have a higher risk of developing inflammation in the body. When a person is injured or unwell, the body naturally swells up to heal itself. This is called inflammation; however, an inflammatory response can occur when the immune system goes into effect without any actual cause.

Pre-existing literature tells us that certain biomarkers found in blood mean that a person could be at high risk of getting a disease. To understand how saliva could do the same, her research team analyzed ten biomarkers found in saliva and blood to verify which leads to inflammatory diseases. They later followed up with the same children in 2019 to check which had diabetes or pre-diabetes and 20 percent of the children were at risk to develop diabetes. As a result, the team was able to link some biomarkers to the risk of diabetes or pre-diabetes. Another benefit of this study is that using saliva is an easier tool as opposed to drawing blood from the body.

While AlQaderi's research focused on using saliva as an identifying tool, she also wanted to emphasize the importance of preventative medicine through her work, but there exists a problem with prevention itself. "Many people don't do well with prevention," she said. "We all know that smoking is bad for health, but people do it anyway."

After the death of her father in 2020 due to COVID-19, AlQaderi became curious to understand how the immune system works, why some people have no symptoms, some require hospital care, and some die.

She has closely followed growing evidence showing that the oral cavity is one of the first susceptible sites for COVID-19 infection, replication, and local immune cell activation. She believes that learning more about the immune response in the oral cavity can lead to a new understanding of the virus that might lead to developing new preventative strategies. Given her experience studying salivary biomarkers, she wants to expand her knowledge by investigating the microbial and immune response to COVID-19. She hopes her findings can help other families like hers and prevent more deaths.

She is now working at DDI, in collaboration with the J. Craig Venter Institute in the U.S., to understand the immune response of patients with COVID-19.

AlQaderi plans to further expand her efforts to improve public health through her research. She views research as a way to identify problems in society, provide solutions, and evaluate the effectiveness of solutions. AlQaderi is committed to promoting Kuwait's research infrastructure, as she believes it is still growing and requires a lot of support and funding. She is looking to make unique contributions in her communities and her field of study by engaging and training junior researchers to impact public health. She feels strongly about making a true impact in public health, and is determined to help people improve their quality of life.

By Pearl Coutinho

Ali Almutairi

Innovating Imaging Systems for Stroke Detection

Ali Almutairi, a professor in the electrical engineering Department at Kuwait University, has put together a team to create a machine that will facilitate medical professionals in detecting strokes in a way that no one has done before.

A stroke is a deadly medical condition in which the blood supply to the brain cuts off due to a severe injury of a vascular cause - it is a medical emergency that needs treatment as soon as possible to avoid the maximum amount of damage to the patient.

"Brain stroke is one of the most frequent causes of death and disability in the world. Worldwide, each year, approximately 16 million people are affected by strokes, of which six million die and another six million become disabled eternally," said Almutairi. "According to the latest World Health Organization data published in 2018, stroke deaths in Kuwait reached 8.82 percent of total deaths."

In light of these statistics, Almutairi wanted to bring together a team to create an imaging machine that would detect these medical hazards in their initial stage, without exposing the patient to any harmful radiation. Almutairi received his bachelor's in electrical engineering from the University of South Florida in early 1993. He was offered a full scholarship in the same year from Kuwait University for his graduate studies and ended up pursuing his master's and Ph.D. in electrical engineering from the University of Florida, focusing mainly on wireless communication.

His career boasts many achievements, the most recent being his services to his alma mater, Kuwait University, where he served as the Vice Dean for Academic Affairs at the College of Engineering and Petroleum, and then as the Dean for Admission and Registration until recently. He is a senior member of the Institute of Electrical and Electronics Engineers (IEEE) – an esteemed society for professionals – and has served as an editor and reviewer for many technical publications.

When faced with the jarring realities of strokes and the lacking medical equipment, Almutairi had the vision to create a portable microwave imaging system that would be relatively quick and cost-effective, as opposed to the traditional imaging scans that are common today. As microwave imaging is the core of this project, his team consists of qualified individuals that have been carefully selected based on their research experience and publications in the related field of microwave imaging. However, the road to realizing this project has not been easy.

"The Kuwait Foundation for the Advancement of Sciences (KFAS) has a major role in improving the proposal through a rigorous review process," Almutairi said, as he recounted the initial struggles they faced. The team still has a long way ahead of them.

Magnetic Resonance Imaging (MRI), X-Rays, and Computerized Tomography (CT) are amongst the common procedures undertaken for the treatment of strokes. But unfortunately, they have the potential to pose various hazards to patients who are already undergoing a medical emergency. "The main disadvantages of CT scanning and X-Ray imaging are the dangerous radiations," he said.

A brief list of hazards posed by these procedures includes ionizing radioactivity and cancer as potential risks, along with the high possibility of a false negative report. MRIs can detect the presence of a disease within the human body, but the procedure is more expensive than the others and is less effective in cases of strokes. Ultrasounds are another commonly used procedure, and while they work better for certain diseases, they are unable to produce a perfect image of the scanned area. For a medical emergency like a stroke, there must be a system in place that is quick, safe, and accurate.

"There is a strong demand to solve the aforementioned problems by developing a compact and mobile technology that can be applied to the patient in real-time, either at the bedside or emergency room to monitor the stroke," he said. "Because of the attractive features of non-ionizing radiations, less cost, and no side effects, the proposed imaging technique can frequently be used to identify stroke in the human head at any time, which give it an upper hand over presently-used imaging systems."

The imaging system works by employing prototyped wideband antennas that will be uniformly placed over the patient's head. The signals transmitted by these antennas will have a higher detection sensitivity and will be collected by a commercially available microwave transceiver.

"Stroke monitoring using a microwave imaging system is based on measurement and analysis of microwave signals that are scattered by a microwave illuminated human head," said Almutairi.

One antenna at a time transmits the signals while the others receive them; these signals are then converted to digital data after which they are processed and analyzed to detect the pool of blood formed in the brain due to the stroke.

The team plans to conduct several experiments where they will, as Almutairi explained, "mimic the monitoring process of the brain stroke from its onset to chronic state." This monitoring process will observe experiments that will run the imaging system through different physiological stages, and their result will determine the consideration of clinical trials in realistic scenarios. Once the system has proven efficient in clinical trials, it will then be open to application in clinics and ambulances for the earliest care and monitoring of the patients.

As the project is still in its initial stages, there is still a long way to go until they can see results, however, Almutairi is optimistic about the progress and appreciates the funding KFAS has provided.

"The outcome of the project will expedite the increasing demand for imaging systems by preventing the fatality rate due to stroke, supporting KFAS' mission to stimulate and catalyze the advancement of science, technology and innovation for the benefit of society, research, and enterprise in Kuwait," he said. Almutairi hopes that the success of this project will be able to help those who cannot afford expensive treatments and will thus aid in reducing the number of deaths caused by stroke in Kuwait, while also reinforcing the country's economic growth. He hopes that this project would inspire more research in this field and that the local technical capabilities would be pushed to new limits.

By Eman Qaiser

PHOTO: TWENTYEIGHT MARKETING & ADVERTISING CO

A Surgeon and his Quest to Curb Obesity in Kuwait

A surgeon, a researcher and an educator, Mohammad Jamal is pioneering the way for bariatric surgery in Kuwait.

By Saugat Bolakhe

PHOTO: NASEER BEHBEHANI & MOHAMMAD QASEM

With humming medical machines and mumbling human voices in the background; Mohammad Jamal surely seemed busy when I first called him for our interview.

An associate professor of surgery at Kuwait University and acting chairman of the department of transplantation, Jamal leads a busy life. He is one of the country's leading researchers in the field of fatty liver and bariatric surgery - a surgical procedure that helps in weight loss by modifying the digestive system.

Jamal completed his medical degree at the University of Aberdeen in Scotland and surgical training at McGill University in Canada. He was fascinated by the surgeries of the upper gastro-intestinal (GI) tract, as the anatomy of the region itself is quite variable and unique within each individual.

He got a fellowship in the field of hepatopancreatobiliary surgery – the surgery of liver, pancreas, and gallbladder – and liver transplantation. During this fellowship, he noticed emerging cases of a relatively newly recognized disease called fatty liver; a disease in which excessive fats are accumulated in the liver cells, leading to inflammation of the liver and liver failure.

"It alerted me about the growing challenges of obesity for mankind," he said. At the end of this fellowship, Jamal decided to pursue bariatric surgery, a field that offers a solution to obesity.

Obesity is a complex medical problem that causes the body to accumulate excessive fat. More than 650 million people in the world are obese, according to the World Health Organization. However, obesity is not only a problem of being overweight, overeating, or a lack of exercise. It's a far more complex disease that invites a lot of health issues.

Over the last thousand years, humans have evolved to be very efficient in storing fat, according to Jamal. Our genetic makeup is very resistant to starvation and favors fat storage. So, evolutionarily, the most efficient people who could conserve fats were the ones who survived better.

"But it's what makes people obese in modern times," Jamal said.

Between 1975 and 2016, the obesity rate across the world almost tripled and Kuwait ranks among the top ten countries, with almost 38 percent of its population obese.

When diet control and exercise become practically ineffective, bariatric surgery helps treat the condition. It's regarded as one of the most effective weight loss strategies that helps alleviate risks of heart disease, stroke, high blood pressure, cancer, and type II diabetes, said Jamal. The surgery restricts food intake and changes the metabolism favorably. For the first time in 1967, two prominent surgeons, Edward Mason and Chikashi Ito, successfully performed this surgery, which resulted in significant weight reduction among their patients. But the technique didn't gain popularity until the early 1990s.

Though the surgery was a well-known strategy of weight reduction, how exactly the body gets rid of such a huge mass of fat remained a mystery for a long time.

In 2016, with the support of the Kuwait Foundation for the Advancement of Sciences (KFAS), Jamal and his team, which included 12 other colleagues representing various departments within Kuwait University and Dasman Diabetes Institute, led a unique research study to figure out how the bodily pathways eliminate excess fat following bariatric surgery.

The researchers used several rats and divided them into two different groups, feeding one group a regular rat chow diet, while another was fed high calorie foods including cheese, cupcakes, chocolate spread and peanut butter, etc.

As the weeks went by, the rats eating high calorie foods became obese. At the end of 21 weeks, the obese rats underwent surgery. The sleeve gastrectomy surgery removed a large portion of their stomach, leaving a long pipe-like pouch for the passage of food.

At the end of 25 weeks, the team collected samples of blood, muscle tissue and fatty tissue from the rats. They wanted to analyze the change in composition of proteins and other biomolecules as a result of the surgery. The analysis revealed the dominance of special proteins called irisin and meteorin-like. Irisin protein helps to improve muscle activity, it burns fat and prevents the formation of fat cells. Meteorin-like protein facilitates the conversion of white fat, often considered the 'bad' fat, into a usable brown fat - the 'good' fat.

Jamal and his team also carried out the same procedure for people undergoing bariatric surgery and the

results were quite similar. “Following surgery, weight loss was observed not because people [or rats] eat less, but because the essential patterns of metabolism were changed,” Jamal said. They discovered increased levels of meteorin-like and irisin hormone following the surgery.

“We don’t know what’s causing the increased level of proteins, but we will keep looking,” he said. With a firm understanding of physiological processes involved in weight loss following surgery, Jamal and his team have bigger ambitions. They believe it can be possible to design therapeutic drugs that can help treat extreme forms of obesity without the need for surgery.

“Mohammad is someone who is truly hungry for solutions; someone who loves to create knowledge by asking questions, tackling problems and trying to find answers by mixing expertise from multiple fields,” said Hamad Ali Yaseen, associate professor of genomic medicine at Kuwait university and a collaborator on the research project. “He is an all-in-one kind of MD holder.”

Yaseen also praises the efforts of KFAS for expanding the research horizon in Kuwait. “It’s excellent to see the commitment of foundations like KFAS,” he said. “They provide us with virtually all the support, ranging from basic infrastructures and specialized laboratories, to advanced medical machineries.”

Looking ahead, Jamal is committed to contribute further to the field of bariatric surgery and liver transplantation. Through rigorous research, he wants to redefine the role of the liver, hormones, and gut for a proper understanding of the prominent health conditions like diabetes and obesity.

“For me, research is not a luxury,” he said, “It’s an ultimate necessity for the survival and prosperity of humankind.”

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