
Qatar University Research Magazine

Issue no 7 - May 2016

QU PROF RECORDS BREAKTHROUGH ON CORONAVIRUS RESEARCH

I partner with students to generate research ideas: Dr. Batoul Khalifa

Can you evaluate the cost of your medications?



جامعة قطر
QATAR UNIVERSITY



EMPOWERING RESEARCH FOR A BRIGHTER NATIONAL FUTURE

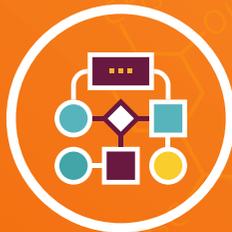


\$141.5 Million

BUDGET FOR ACTIVE GRANTS & CONTRACTS IN THE LAST YEAR



1,668 STUDENTS BENEFIT FROM UREP



414 NPRP PROJECTS



319 COLLABORATING INSTITUTIONS

\$14 Million

FOR INTERNAL GRANTS

\$22.7 Million

SUPPORT FROM OTHER AGENCIES

Message from the VP

Achievements stand us out...



Prof Mariam Al-Maadeed

Vice President for Research and Graduate Studies
Qatar University

I welcome you all dear readers to this enriching 7th issue of the Qatar University Research Magazine.

As we continue to record achievements in our research endeavors, we have not relented in ensuring that our relationship with our industry partners and collaborators remains strong and productive. Among several other achievements in this direction, our own Dr. Hadi Yassine achieved a breakthrough when his research paper on coronavirus was published in Nature journal. The Qatar Mobility Innovations Center (QMIC) received the 2015 Best Innovations Award for its Masarak program at the Qatar Foundation Annual Research Conference. Recently, Qatar Petrochemical Company (QAPCO) renewed the sponsorship of the Polymer Chair at the Center for Advanced Materials (CAM). The College of Engineering (QU-CENG) and Maersk Oil's Research and Technology Centre (MORTC) have also signed a pact to collaborate in the field of experimental and computational investigation of sand plugging.

The Research Office is working towards hosting the 2016 Qatar University Annual Research Forum on May 3. With a focus on

“Academia and Industry Collaboration: Pathway to Innovation and Entrepreneurship”, it will be an opportunity for students, researchers, academics and our other partners to showcase their research through posters, interactive presentations, exhibits, and personal discussions.

During the forum, awards will be presented to winners in three categories each in respect of Poster Award, Excellence Award, and Graduate Studies Award.

The event will feature sessions on ‘Establishing a vibrant partnership for fostering research driven-learning, discovery and entrepreneurship’, ‘Nurturing and cultivating collaboration for innovation & capacity building’, and ‘Hallmarks of QU-Industry Collaboration – current and future’. With the amount of efforts and resources that have been invested in this, I have no doubt that everything has been put together to enrich us and help us improve our research output.

In this issue of Qatar University Research Magazine, there are a variety of topics and articles that review the work of our researchers and students.

The cover story is on the breakthrough recorded by Dr. Hadi Yassine, of the Biomedical Research Center, in the research on coronavirus.

In ‘Our Partners’, Mr. Khalid Laram, CEO of Qatalum in talking about his organization’s relationship with QU lays emphasis on the importance of education, research and development.

Our students are always making impact in their research projects. This time it’s a female student whose project focused on the recycling of fluorescent lamps through an efficient detoxification mechanism. It is a must read in the ‘Student in the Limelight’ section.

As you flip through the pages of this issue, you will find interesting reports in sections like ‘Our Exclusive’, ‘Celebrating Excellence’, ‘Research Issues’ and others that you will discover for yourself.

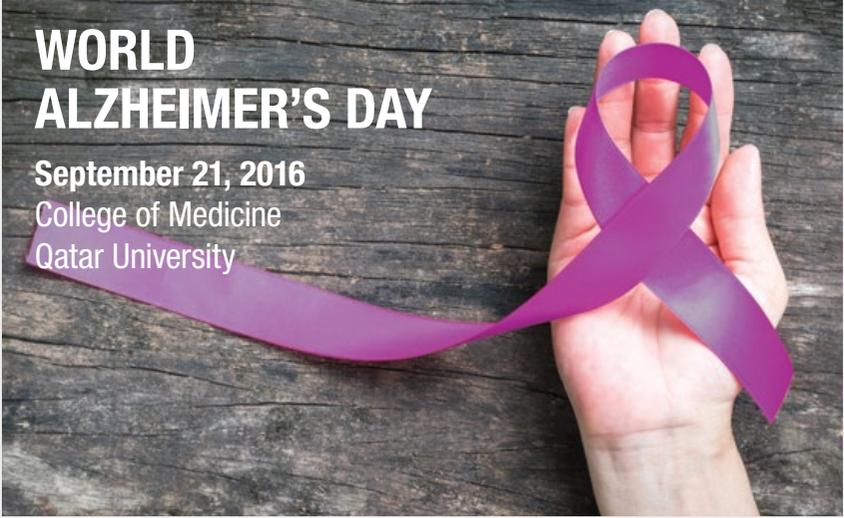
Finally, I wish you an enjoyable reading.



IS IT TIME FOR HEPATITIS E VIRUS SCREENING? - QATAR BLOOD DONOR CENTERS' PERSPECTIVES

May 19, 2016

Biomedical Research Center
Qatar University



WORLD ALZHEIMER'S DAY

September 21, 2016

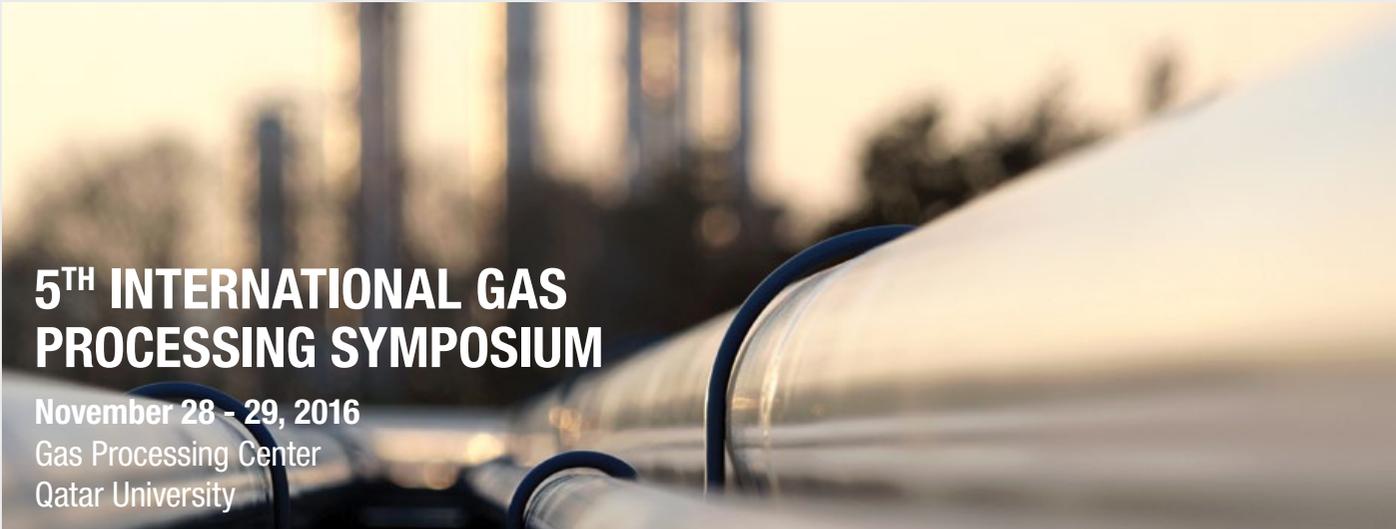
College of Medicine
Qatar University



WATER SECURITY IN THE GULF

May 31, 2016

Gulf Studies Center
Qatar University



5TH INTERNATIONAL GAS PROCESSING SYMPOSIUM

November 28 - 29, 2016

Gas Processing Center
Qatar University

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جامعة قطر
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Preserving Qatar's dugong species for future generations

A research project by Qatar University (QU) scientists, researchers and local and international collaborators will study threats to the dugong population in the Arabian Gulf with the view to establishing a preservation plan for this unique and endangered marine mammal.



News

LARC holds first-ever training on humane use of animals in research



The first-ever training program on the humane care and use of laboratory animals held by Qatar University Laboratory Animal Research Center (QU-LARC) drew twenty-three trainees from the Center, Biomedical Research Center and the colleges of medicine, arts & sciences and pharmacy.

The aim of the program was to engage trainees in a general understanding of the regulations and responsibilities in the use of laboratory animals for research.

Attendees participated in in-classroom theory and hands-on learning led by LARC Director Dr. Hamda Al-Naemi and LARC Operational Services manager Dr Vijay Kanth. The theory course was obligatory for students and researchers who intend to use Center facilities, regardless of previous training. It covered a range of issues related to animal research such as national and international laws and policies, ethics, occupational health and safety, zoonotic diseases, and rodent housing and husbandry.

Participants also learned about personal safety inside LARC facilities, the importance of personal protective equipment (PPE) requirements, and how researchers can access LARC facilities for their research. Also highlighted were details on the Institutional Animal Care and Use Committee (IACUC).

The hands-on course was for personnel who would be handling live animals at the Center. It covered working with BS60 biosafety cabinets, proper handling of rodents in terms of blood collection, euthanasia and necropsy techniques, and bio-waste disposal.

“It is our obligation to help researchers and students to be trained and certified to use the laboratory animals at the Center in a humane and responsible manner,” Dr Hamda said.

She added that the use of animals in research and teaching is a privilege, carrying with it unique professional and

moral obligations for all personnel and students involved in animal research to follow standardized and safe laboratory practices to ensure that all animals involved in research are treated humanely and in accordance with national as well as institutional policies.

Participants were awarded course completion certificates by then QU Acting VP for Research Dr Darwish Al-Emadi who said that the training was necessary because the quality of research and the welfare of laboratory animals have everything to do with the capacity and competence of the people who play active roles in the care and use of animals and related research.

Dr Hamda noted that with the participants rating it as excellent, the workshop was a very good first-start as it demonstrated the readiness of the Center to offer high quality in-house training at reasonable cost.

Our Exclusive

ADLQ, HMC, Sidra researchers address prevalent health issues



Three senior research scientists from the Anti-Doping Lab Qatar (ADLQ), Sidra Medical and Research Center (Sidra) and Hamad Medical Corporation (HMC) recently presented lectures at Qatar University (QU) Biomedical Research Center (BRC) as part of BRC's extended education outreach.

Dr. Huseyin Cagatay Yalcin, Senior Scientist, from Sidra who is also affiliated to the Qatar Cardiovascular Research Center, spoke on "Investigation of Mechano-Biological Factors Contributing to Congenital Heart Defects" while Dr. Sayed Kamel Goda, Senior Research Scientist from ADLQ, presented on "Protein Engineering and Production of Novel Protein Therapeutics for Efficient Cancer Treatment".

The third lecture on "Rapid Molecular Techniques for Identification of Staphylococcus Aureus and MRSA Directly from Positive Blood Culture" was presented by Dr. Emad Ibrahim Elmagboul, Assistant Professor of Clinical Pathology and Laboratory Medicine at HMC. Dr. Yalcin described heart disease as one of the major causes of death in the world and said that despite its prevalence, the etiology of many

types of heart disease (especially congenital ones) still remains unknown.

According to him, genetic mutations could explain some types of heart diseases but in addition to genetic factors, non-genetic factors are believed to play a role as well. "Numerous animal studies have showed that, as a non-genetic factor, disturbed hemodynamics (i.e. blood flow related forces) can lead to cardiac defects. Therefore, by altering biological signals, disturbed hemodynamic loads are also a major source of heart diseases.

"In my research, I investigate the influence of both the mutational genetic factors and non-genetic factors such as disturbed hemodynamics on the development of cardiac defects. This information is critical for developing therapies based on restoring altered biological mechanisms by these factors," Dr. Yalcin said. In his presentation, Dr. Goda explained Antibody-Directed Enzyme Prodrug Therapy (ADEPT) as a novel strategy to improve the selectivity of cancer treatment. He said that Methotrexate (MTX), a synthetic folate analogue that inhibits dihydrofolate

reductase, a key enzyme in the folate pathway, serves as an important component of various chemotherapeutic regimens for the treatment of cancer patients.

Dr. Goda stated that after embarking on a program to produce novel and long acting glucarpidases by different technologies to overcome problems associated with the therapy, they successfully produced, by DNA shuffling an ultra-active glucarpidase that degrades MTX with a very high efficiency and are continuing the production of more efficient forms of the enzyme. Dr. Elmagboul in his talk said in the case of Staphylococcus aureus and MRSA, positive blood stream infection (BSI) is one of the most important causes of mortality and morbidity. He described Staphylococcus aureus (S.aureus) as a major cause of both community and hospital acquired bacteraemia which is a serious infection. "Today mortality is approximately 20% with recurrence and secondary metastatic complication like endocarditis, osteomyelitis, arthritis and meningitis," Dr. Elmagboul added.



Feature Story

QU PROF RECORDS BREAKTHROUGH ON CORONAVIRUS RESEARCH



“THIS RESEARCH WILL REPRESENT A BREAKTHROUGH IN CONTROL AND PREVENTION OF HCOV-HKU1 VIRUS INFECTION, A TYPE OF RNA VIRUS RELATED TO HIGHLY FATAL, ZONOTIC, AND PANDEMIC SARS AND MERS BETACORONAVIRUSES.” - Dr. Asmaa

With a foundation built in the Vaccine Research Center (VRC) at the National Institute of Health (NIH), Bethesda, USA where he spent over five years as a postdoctoral and research fellow, Dr. Hadi M. Yassine joined Qatar University Biomedical Research Center in September 2015 as an assistant professor of Infectious Diseases. The VRC is globally renowned for its effort in fighting infectious diseases like HIV, Influenza, Malaria and CoV.

Dr. Yassine’s research interests span a wide range of topics in basic, applied, and translational biology, including virology, immunology, molecular diagnostics, and vaccine development. He has over 26 publications (cited more than 800 times based on Google Scholar), some of which were published

in top tier scientific journals like Nature, Nature Medicine, Lancet Infectious Diseases, and Science Translational Medicine. His latest publication in Nature describes a low-resolution structure (4oA) of human coronavirus (CoV) spike protein.

With the great support of Dr. Asmaa Al-Thani, BRC director, he said, “we are developing a cutting-edge virology laboratory in the center that will enable advanced innovations and discoveries. We are also working on obtaining a Biosafety Level 3 (BSL3) lab, the first of its kind in Qatar, to conduct advanced research on Category A pathogens: organisms/biological agents that pose the highest risk to national security and public health; e.g. MERS.



“

Infection with HKU1 typically results in mild illness; it could be more deleterious in immune-compromised people.”

- Dr. Yassine

Dr. Hadi M. Yassine

Dr. Yassine's work has been well recognized in the scientific, academic and public fields. Specifically, his work about universal influenza vaccine was reported in *Nature Medicine* (August 2015) and featured in international newspapers like *The Guardian*, *Washington Post* and *BBC*. Dr. Yassine has received several awards and filed three patents about next generation influenza vaccines.

Recently, through the research efforts of Dr. Hadi and his colleagues, there has been a major breakthrough in efforts to fight coronaviruses through solving the first low-resolution structure of human coronavirus Spike trimer; a protein that enables the virus to enter host cells.

The study was published on March 3, 2016 in *Nature*, a highly cited interdisciplinary scientific journal, according to the 2013 *Journal Citation Reports Science Edition Journal*.

In this report, Dr. Hadi speaks about the record breaking achievement, its meaning, relevance and other related issues.

Research project essence and motivation

The paper that was recently published in *Journal Nature*, one of the most prestigious scientific magazines, describes the first low-resolution structure of human coronavirus (HKU1) spike protein. The paper

can be accessed through the following link: <http://www.nature.com/nature/journal/v531/n7592/pdf/nature17200.pdf>.

HKU1-CoV is one of six coronaviruses that infect humans and it falls into the same group like SARS- and MERS-CoV (betacoronaviruses). Other human coronaviruses are: OC43, 229E, and NL63. HKU1-CoV virus was first identified in 2005 in a 71-year-old man that was hospitalized with an acute respiratory distress and radiographically confirmed bilateral pneumonia. HKU1 virus causes between 2-5% of respiratory infections in humans and typically results in mild respiratory illness but might lead to hospitalization in immunocompromised patients; i.e those

with chronic diseases like asthma, diabetes, etc. Very little is known about HKU1-CoV biology. In fact, research about HKU1-CoV virus had been hindered for several years by the difficulty to grow the virus in ordinary cell culture systems that are used with other viruses like Influenza and even MERS-CoV. The virus only grows in differentiated human airway epithelial cells, which are very intricate to grow and they take 45 days to develop before being used in infection studies.

Accordingly, Dr. Yassine, formerly at the Vaccine Research Center, National Institute of Health, initiated a project to identify the receptor of this virus on human lung cells and to evaluate the immune response against its infection.

For that purpose, Dr. Yassine designed several constructs to express the Spike (S) glycoprotein, the outer protein on the virus envelope that encompasses the receptor binding domain and to which most of the neutralizing antibodies are directed. After evaluating several constructs, few yielded good trimeric proteins, that is, protein that is very similar in conformation to those on viral envelope. This was different from previous observation with MERS-CoV spike protein that was hard to express as a trimer.

As a matter of fact, the large size of CoV-Spike protein (larger than influenza-HA and HIV-Envelope proteins) and its extensive glycosylation (sugar motifs that cover the surface of the protein) have stalled structural studies of the full ectodomain, thus preventing a molecular understanding of its function and limiting development of effective interventions, like drugs and vaccines.

This inspired the investigators to solve the first low-resolution structure of a human coronavirus spike protein. Since the paper was the first to describe structure of Human-CoV spike protein, it was accepted for publication in *Nature* in a relatively very short period of time. Interestingly, the same volume of the journal featured another article that describes the structure of another CoV-spike protein, Mouse Hepatitis Virus (MHV), a virus that is more similar to HKU1 than other human CoV!

Meaning and relevance on healthcare and wellbeing of people

Humans are susceptible to a half-dozen coronaviruses including HKU1, MERS

and SARS. Although infection with HKU1 typically results in mild illness, it could be more deleterious in immune-compromised people, like those with chronic diseases, older people, and pregnant women.

Further, MERS-CoV is still a major threat to public health in Qatar and the surrounding region. New cases are being identified in the GCC region, including a 66-year-old Qatari man who was diagnosed with Middle East Respiratory Syndrome (MERS) in February 2016 and died from complications related to the illness.

Following this, Dr. Yassine says it is of prime importance to develop effective preventive and control measures against these viruses. Vaccines are one of the major prevention measures to reduce incidences of infectious diseases. Many groups around the globe have developed vaccines against MERS-CoV, but these vaccines were based on small domains/subunits of the whole spike protein.

At least one of these vaccines is under phase-1 clinical trial in the U.S. Solving the structure of human CoV will enable scientists to evaluate at the molecular level the characteristics and functions of these proteins and eventually develop better vaccines and drugs with broader and more potent activities. The recently published work represents a major breakthrough towards achieving this goal, he said.

Consequence of outcome

Any protein function depends on its amino acid composition and structure. Therefore, knowing the structure of a protein will enhance the knowledge about its function and therefore, promote the development of vaccines and drugs for prevention and therapeutic uses, respectively. There have been an increasing number of reports that describe structure-based design of immunogens (vaccines) against major viruses like influenza, HIV, RSV (Respiratory Syncytial Virus) and others.

In fact, Dr. Yassine recently published a paper in *Nature Medicine* that describes a structure-based development of influenza HA-stem vaccine that was shown to elicit broader immune response compared to commercially available influenza vaccines (<http://www.nature.com/nm/journal/v21/n9/abs/nm.3927.html>). In such work, scientists solve structures of immunogenic proteins, typically the proteins on the outer surface of

the virus like Influenza-HA, RSV-F, and HIV-Env. Scientists then utilize these structures to introduce mutations and modifications to make proteins more stable, more immunogenic and/or safer for clinical use.

In many cases, the protein structures are solved in complex with a binding and stabilizing antibody.

In this context, Dr. Yassine says this discovery will enable the development of better vaccines and therapeutic drugs against CoV. Nonetheless, such drugs and vaccines might take several years of testing and validations in clinical settings before being approved and becoming available in the market. Note that such work can also be done on the antibody part rather than the protein itself.

In this case, scientists can utilize a structure of an antibody to design and introduce mutation that would increase the half-life of the antibody and make it broader and more potent. This work is being done with HIV antibodies that can now neutralize more than 95% of HIV strains, he stated.

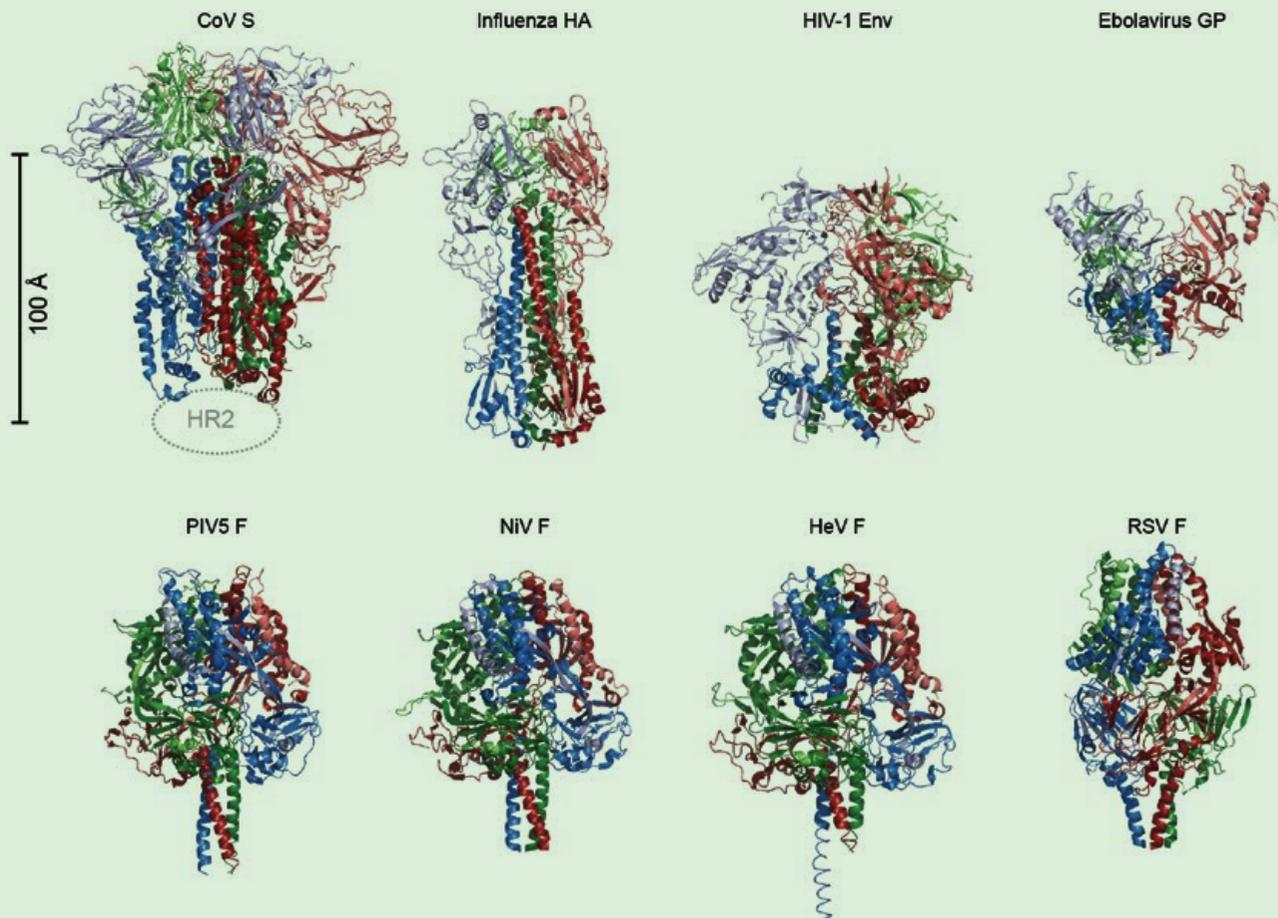
Team members and roles played

The work evolved through several stages. It was initiated in Dr. Barney Graham Laboratory in the Vaccine Research Center-NIH. The purpose was to identify HKU1-CoV receptor on surface of human lung epithelial cells and to establish serological assays to evaluate immune responses to spike protein and use that as a model to evaluate immune responses to other CoV.

The initial work involved the construction, expression and characterization of the spike protein trimers that harbor the receptor-binding domain. Dr. Yassine contributed significantly to this work. After several rounds of modifications, few constructs resulted in a good trimer expression.

As mentioned above, it was hard to express other CoV-spike proteins like MERS as good trimers. That was the trigger to solve the structure of this huge, complex, and highly glycosylated protein. Collaboration was then initiated with outstanding researchers in Geisel School of Medicine at Dartmouth, New Hampshire, a group that also solved the structure of RSV F-protein that is being considered as a vaccine candidate for clinical use.

Collaboration involved also a group in The Scripps Research Institute, California who were able to solve the structure at



Class I viral fusion proteins. All class I fusion proteins require proteolytic cleavage adjacent to the fusion peptide or loop, and the metastable prefusion state is triggered by a series of events that involve pH change or receptor binding. The postfusion conformations all contain anti-parallel six-helix bundles composed of the HR1 and HR2 from the membrane-proximal subunit. However, there is a great diversity in prefusion conformations as shown here. Members of this class that also participate in receptor binding (14-16, 28, 53 (top row), including S glycoproteins of coronaviruses, are organized such that their receptor binding subunits sit atop the fusion machinery, and need to be shed in order for membrane fusion to proceed. Paramyxovirus F proteins 54-57 (bottom row) have a different architecture than the capped fusion proteins on the top row. The F proteins all have disulfide bonds between the membrane proximal and membrane distal subunits, and the two subunits remain interconnected throughout the rearrangement process. (Images courtesy of <http://www.nature.com/nature/journal/v531/n7592/pdf/nature17200.pdf>)

a resolution of 40Å (angstrom is a unit of length equal to 10⁻¹⁰ m (one ten-billionth of a metre) or 0.1 nm) using Cryo-Electron Microscope Technology.

Funding

The research was funded through different agencies but mainly through National Institute of Health (NIH), Bethesda, USA.

Lesson for students

Dr. Yassine’s main project was to develop a universal influenza vaccine and the above project was initiated as a side project amongst many others. Several of these projects resulted in major publications in internationally renowned journals. The success of this work could be attributed to several factors and components: selecting a right topic for research, availability of resources, dedication and hard work, good

organization and planning, continuous discussion and critical thinking with peer colleagues at work and conferences, collaboration with researchers of various backgrounds, and rapid and fast execution of research activities.

As for the opportunities for students in Qatar, Dr. Yassine says the Biomedical Research Center has the vision to promote and enhance research activities in Qatar University. The center has great facilities and hosts leading scientists in the fields of communicable and non-communicable diseases. “Thus, we encourage students, graduate and undergraduate, to exploit this opportunity to engage in research activities that enrich their knowledge and benefit their communities. I would also like to invite students to think about continuing graduate studies in the fields of bioinformatics and computational biology, programs that I

would hope the university would adopt in the near future,” he said.

Global implications

To Dr. Yassine, question about the global implication of the research, although important, is complicated. “First and foremost, we do what we do for the sake of science. We run research to answer questions and solve problems that might not even be of interest to the public. In that context, HKU1-CoV virus might not be a very important virus because it is not deadly as MERS, SARS-CoV, Ebola or others.

Even when we started the whole project, we had a totally different aim than what we reached! That is typical in research; we do generate more questions than answers and a door of knowledge opens many others,” he said.



The data obtained from this research will promote the solution of other CoV spike proteins like MERS, SARS, and any other CoV that might emerge in the future.”

- Dr. Yassine

“The current achievement might not have a direct impact on human lives. It is just a small brick in the wall to combat infectious diseases, CoV in specific. Generated knowledge will enhance our understanding of HKU1 virus in specific and CoV in general. This is an important step towards solving the structure of other coronaviruses spikes like MERS at SARS using the same methodology or even better methods like X-ray crystallography which might yield better results.

Most importantly, solving the structure of a functional protein (involved in virus entry to host cell) would help in designing new vaccine candidates and also developing drugs against these viruses that pose a significant threat to the world and the GCC region in particular.”

Future goals of project; other projects

The work is ongoing to identify the receptor of HKU1 virus. Identifying the receptor may enable the development of a better in vitro system to study this virus and know more about its biology.

Further, the obtained structure will be a useful tool to solve structures of other coronaviruses spike proteins and several labs around the globe are working on this

subject. This is crucial to develop effective vaccines and vaccine strategies that not only work for these viruses, but also against any other coronavirus that might emerge in the future. “In Qatar, we are acquiring resources and developing methods to study host immune responses to coronaviruses infection and vaccination. We would also like to test some of the MERS candidate vaccine in camels in farm settings. We have initiated talks with Ministry of Public health for that purpose.

“On the other hand, I’m also initiating few other projects about two other respiratory viruses: influenza and RSV. Briefly, my work will focus on studying humoral immune response to major viral surface glycoproteins, HA protein in case of influenza and F protein in case of RSV.

For that purpose, I have also initiated collaboration with partners in HMC that are highly motivated and eager to initiate this research. We hope to publish the work in top-tier scientific journals,” Dr. Yassine said. More importantly, Dr. Yassine was recently

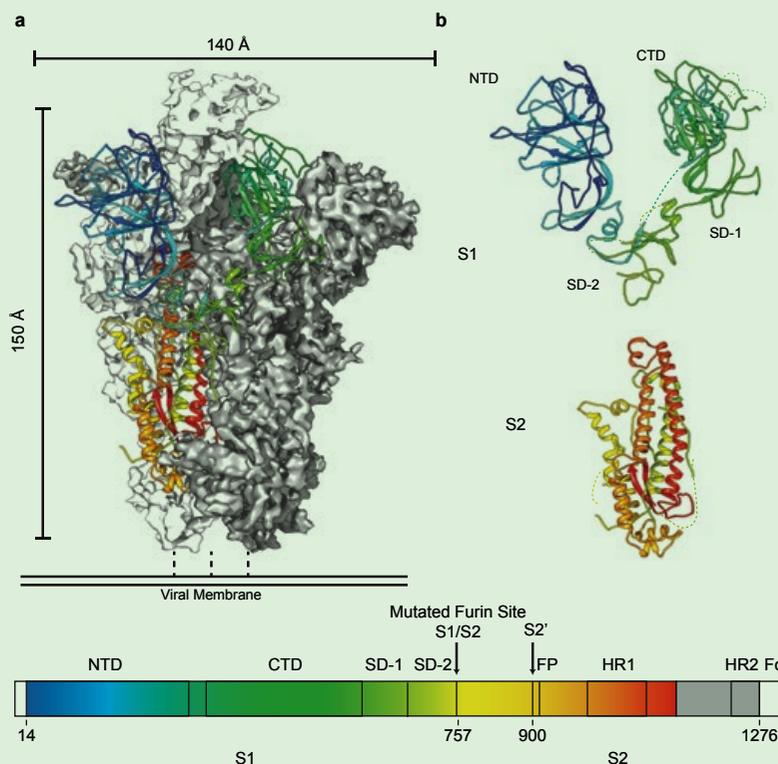
awarded an NPRP grant in its 9th cycle to study viral gastroenteritis in pediatrics in Qatar.

Challenges in Qatar

“I’m honored to have joined Qatar University Biomedical Research Center to carry on my research career. The university and the center are dedicated to enhance biomedical research capacity and quality in the State of Qatar. In fact, our center hosts state-of-the-art equipment that enable cutting-edge research in the fields of communicable and non-communicable diseases.

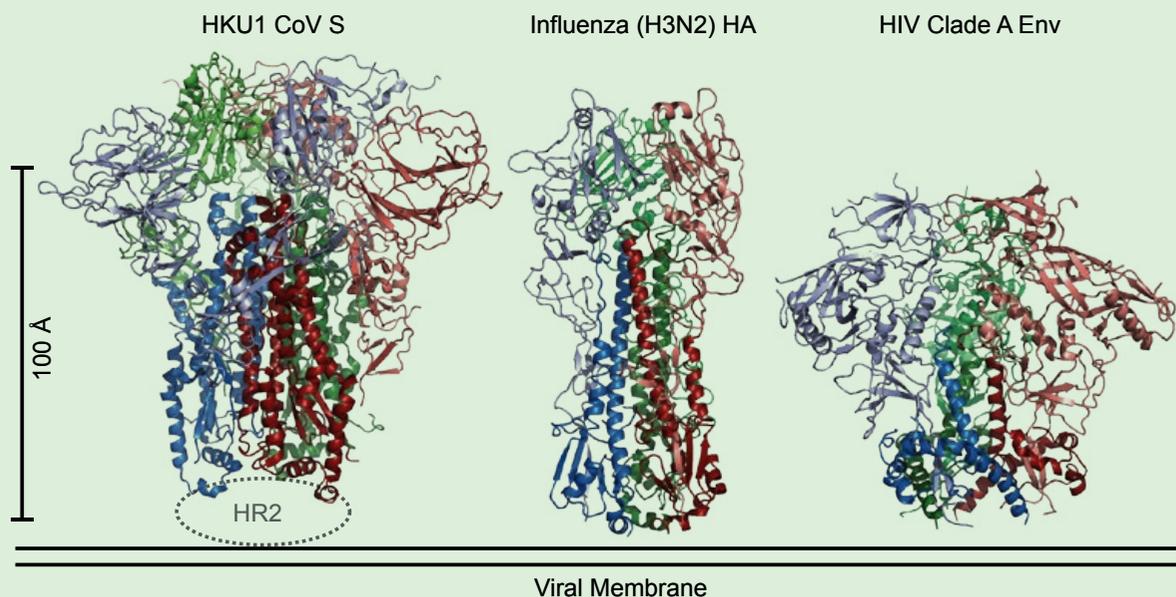
Nonetheless, there are still a lot of work that we need to do to reach the level of highly advanced Western nations,” Dr. Yassine says.

“For example, we need to build an infrastructure that enables fast delivery of research. We have to establish a good system for fast delivery of materials and reagents needed for research. While it takes less than 24 hours to obtain reagents in the U.S., it takes at least one month to obtain



Structure of the HKU1 prefusion spike ectodomain:

- a) A single protomer of the trimeric S protein is shown in cartoon representation colored as a rainbow from the N- to C-terminus (blue to red) with the reconstructed EM density of remaining protomers shown in white and grey.
- b) The S1 subunit is composed of the NTD and CTD as well as two sub-domains (SD-1 and SD-2). The S2 subunit contains the coronavirus fusion machinery and is primarily -helical. inset, Domain architecture of the HKU1 S protein colored as in (a).



Comparison of structurally related class I viral fusion proteins. The fusion proteins from coronaviruses, influenza virus and HIV-1 are cleaved into receptor-binding subunits (pink, light green, light blue) and the viral fusion machinery (dark red, dark green, blue).

them in Qatar. This would be more difficult when the reagents are transported on cold chain like dry ice or liquid nitrogen. In many cases we have to depend on a third agent to deliver these reagents or at least release them from customs at the airports, and that could be very costly. I believe that the university should establish a better system that would help us as researchers to deliver rapidly and efficiently.

Further, I find it hard to obtain samples (human tissue for examples) to run research. Sometimes, these samples are sent abroad to be analyzed while we can do the work in Qatar! As a researcher, I cannot wait for 6 months or more to just obtain samples.

If I do not act quickly, others might surpass me and publish their work before me. We have to establish a good system that enables the researchers to deliver quickly, or we will always stay behind.”

Last words

Dr. Yassine is full of appreciation for everyone and institution who have helped and facilitated his research journey. “I would like to thank everyone who contributed to the work and everyone who helped me build my research capacity. I would also like to thank Dr. Asmaa Al-Thani for giving me the opportunity to implement my research in the Biomedical Research Center.



Students should exploit this opportunity to engage in research activities that enrich their knowledge and benefit their communities.”

- Dr. Yassine

I use this medium to invite students at Qatar University to visit our facility and exploit opportunities of joining the research field. We are committed to serve the vision of Qatar University and we hope that our center will be a leading center in infectious diseases in the whole region,” he said.

Dr. Asmaa speaks

Dr. Asmaa Al-Thani, Associate Professor of Virology and Director of Biomedical Research Center - Qatar University, said: “As a virologist, I have the impression that this research will represent a breakthrough in control and prevention of HCoV-HKU1 virus infection, a type of RNA virus related to highly fatal, zoonotic, and pandemic SARS and MERS betacoronaviruses.

“The novelty in such kind of research relies in the use of a high resolution Cryo (freezing) electron microscope (Cryo-EM) to decipher the 3D structure of coronavirus spike (S) protein, a type of protein present on the surface of the betacoronavirus, and provides the virus with the ability to infect wide range of cell/hosts.

Due to the large size of this protein, previous studies were unable to understand its function, and therefore, no effective preventive strategy was designed for such dangerous viral infection till now.

“This study provided a detailed structure for HKU1 S protein, and the way by which this protein is used by the virus to attack and infect different cells/hosts. Highlighting the 3D structure of coronavirus spike (S) protein would provide a foundation for the structure-based design of betacoronavirus vaccine.”

News

QMIC receives 2015 Best Innovations Award



Dr. Adnan Abu-Dayya of QMIC (second from left) receiving the award from Sheikha Hind bint Hamad Al-Thani, CEO and Vice Chairperson of Qatar Foundation, in the presence of HH Sheikha Mozah bint Nasser Al Missned, Chairperson of QF, during the 2016 Annual Research Conference.

Qatar Mobility Innovations Center (QMIC) received the 2015 Best Innovations Award for its Masarak program at the Qatar Foundation Annual Research Conference 2016. The award was given to QMIC for delivering the best local innovation program which has a significant impact on the community and in the market place.

The award was delivered by her Excellency Sheikha Hind bint Hamad Al-Thani, Vice Chairperson and CEO of Qatar Foundation for Education, Science and Community Development (QF), and was received by Dr. Adnan Abu-Dayya, Executive Director of QMIC on behalf of the QMIC team during the opening session of the conference.

“We are very proud to be recognized for our many years of hard work that resulted in delivering Masarak; one of the first large-scale digital solutions developed fully in Qatar. We are delighted that Masarak has been adopted by many government entities and private enterprises to serve their operational needs in the areas of fleet management, road

safety, and traffic operations. Furthermore, the Masarak iTraffic application is being used by thousands of travelers in Qatar to provide them with rich location-based services to enhance their safety and improve their driving experience”, Dr. Abu-Dayya said.

“Our gratitude goes to our partners as we wouldn’t have done it without the strong partnership that we established with many national organizations; mainly with Qatar Foundation, Qatar University, Ministry of Interior, Ministry of Municipality & Environment, and others,” he added.

QMIC started working on building Masarak Intelligent transport system from scratch in 2010. Since then, Masarak has evolved over the years from a simple solution to a very comprehensive suite of services and solutions that serves three market segments: traffic & navigation, road safety, and fleet telematics. In recognition of its innovative service-oriented and data-centric approach, Masarak has won three regional and international awards in the last two years.

As part of the Masarak system, QMIC developed the first bluetooth traffic sensing hardware device in Qatar (WaveTraf™), which is currently deployed on many of the intersections in the country and bring in few millions of traffic records per day which helps build the rich bank of data that feeds all the applications and services in Masarak with real time and historic data to produce very meaningful information about current as well as trending traffic data in the country.

Masarak represents a successful example of building digital industries based on knowledge and local know-how. QMIC fortunately, didn’t stop at building the magnificent Masarak system; on the contrary, Masarak was just the beginning of deploying many other digital systems to tackle other needs of the local community such as the Hawa’ak environmental monitoring solution, the Salamtek road safety solution, the Labeeb IoT platform, and soon to come connected vehicles and others.

Profile

Name:

Dr. Hamad A-Saad Al-Kuwari

Major:

Geology / carbonate stratigraphy

Occupation:

Director, Center for Sustainable Development, Qatar University

CSD will make substantial contribution in achieving QNV 2030 goals - Dr. Al-Kuwari

Dr. Hamad Al-Saad Al-Kuwari, Director, Center for Sustainable Development (CSD) at Qatar University has been Associate Professor of Geology in the university since 2003. He was the Chair of the Geology Department (1998-2013) and the Acting Director of the Environmental Science Center (ESC) (2013 - 2015).

He has published 24 peer-reviewed papers in international prestigious journals. He has represented Qatar University at the UNESCO and Islamic Education, Scientific & Cultural Organization. Dr. Hamad was proposal reviewer at Sultan Qaboos University, Oman

(2008-2014) and curriculum reviewer at King Saud University, Saudi Arabia (2011-2014). He is a member of the Advisory Board of the Department of Biological & Environmental Sciences, QU.

He has participated in several research projects funded by various national and international institutions and companies. Currently, he is the co-lead of a research project with ETH Zürich University on the coastal sabkhas of the State of Qatar funded by Qatar Foundation (QF).



Dr. Hamad Al-Saad Al-Kuwari



Protecting the environment also requires a change in societal paradigm.”

What are some of the long and short term goals of CSD?

Climate change has become a major issue due to unprecedented rise in carbon dioxide concentration which has increased from 360 to 440 in few decades. This has caused global warming leading to unpredictable changes in the climate pattern.

We just had a cloud burst on the UAE few weeks ago, unusual cyclone hitting Oman recently, drought in Australia, elevated rains in California and warmer weather in Europe during the last 10 years and increasing.

Rapid development in and along the Arabian Gulf has potential for environmental destruction and if care is not exercised it would result to the loss of biodiversity and polluting of sediments, water and air.

The region needed a place where all these issues could be tackled from various interdisciplinary ways and generate local knowledge to address the local problems which would eventually contribute to a sustainable world.

The Center for Sustainable Development aims to commence work on food security (algae and halophytes), environmental conservation, social sustainability and waste management and gradually advance and expand interdisciplinary research to achieve a creative balance between human development and conserving natural resources.

What does it take to manage the Center? How do you relate with other team members of the CAS family?

Sustainable development is a broad concept and all inclusive. It is imperative to achieve balance between what needs to be done in the long term and what can be done immediately. Expertise on environmental science, sociology, economic, engineering and various other disciplines need to be integrated, making full use of the CAS family to develop a viable sustainable model for Qatari sustainable development.

Protecting the environment is not only a challenge to the scientific community but also requires a change in paradigm in the society at large. People need to be educated that taking care of their environment, not only facilitates their immediate welfare but also the long term survival of this planet. Whatever innovation developed by the scientist has to be introduced in the society and the society needs to be prepared to accept this paradigm shift.

It takes a long time to convince people to change their customary ways. This can be only achieved if the hard core scientists work in collaboration with social scientists.

What contributions has CSD been making to the Qatar society?

The CSD is a young centre that was established less than two years ago and it is passing through the initial phase of establishment and development. Sensitizing society on sustainable development issues has been a major target involving students, faculty and society at large.

CSD has also presented a viable model for using the Qatari environment to produce non-conventional crops for biomass production, which could be used as food, fodder, medicine, biofuel and biodiesel etc. The main objectives for the creation of the centre are:

- To develop a focused and integrated scientific research program with a close link to social dimensions through interdisciplinary approaches to improve food and water security, and introduce environmentally friendly practices and solutions to attain a sustainable and secure society as per Qatar National Vision 2030.
- To provide knowledge and research capacity to various government agencies, Qatar University, academic institutions, NGO's, private entrepreneurs and the local communities to implement novel sustainable development practices in their current operations and future planned projects.

- To facilitate the integration of various components of sustainable development through synergistic collaborations within and between Qatar University, Qatari society, the Gulf region and globally.
- To create adapted and need-specific models based on conditions of Qatar and the Gulf that can demonstrate the practical application of the concepts of sustainable development.
- Train new generations of environmentally aware Qataris who possess research skills in sustainable development and contribute to building of a knowledge-based society as per Qatar National Vision 2030.
- Organize high profile events and awareness campaigns to promote environment-friendly lifestyle, business practices and public policy.

What are the main activities provided by the center in order to educate the students of QU? Who are your target student group?

We have been conducting a series of activities (trips to nature and workshops) and the most popular among them is our field trip to mangrove areas which are under threat from coastal development.

We were able to motivate a number of students and faculty and provided a platform to interact with other sectors of society. Students have always worked as good-will ambassadors by connecting the dots with various sectors of the society with that of CSD.

We have taken students to various places like wild life sanctuary in Qatar where they were given information about the wild life and their conservation and their significance to the local environment. We have taken students for kayaking trip in the mangroves where they were able to see things first hand and learn about the importance of the mangrove.

In addition, several trips were undertaken to educate students about the importance of mangrove and other related plant

species. We have conducted several workshops and discussion sessions and discussed sustainable development issues.

CSD's focus is on research on food, water and energy security, environmental conservation and waste management. What major activities have been undertaken towards overcoming environmental threats? What are the major projects in the other areas?

Food and water security has been the major challenge in Qatar. In the absence of any abundant source of freshwater conventional agriculture is out of question.

A small reservoir of underground water at north central part of Qatar has already been misused and polluted. CSD is developing technology using both halophytes and algae to produce biomass and cash crops using seawater or saline ground water.



Food and water security has been the major challenge in Qatar.”

Can you talk about the effectiveness of researches being undertaken in the Center?

The arid regions of the world in particular and whole world in general are facing water scarcity with various degrees. This water scarcity is leading to soil salinization of prime agricultural land which makes the soil unfit for conventional agriculture. In addition the world population is already approaching 7 billion.

If we put all together it would become increasingly difficult to feed this mass of humanity by conventional methods.

Therefore some out of the box solutions need to be sought to address this issue. We are trying to understand biology of halophytes and algae, the requirements to grow them under saline Qatari conditions and yield products particularly food which could be marketed locally and globally.

What are the challenges?

Major challenge is the development of critical mass of resources and facilities to provide ideal conditions to conduct state of the art research. Hiring high quality professionals and training Qatari youth to take charge and promote the sustainable development of Qatari society is also an issue. The CSD is facing similar challenges that all new centers face during the initial phase of their development.

I am sure that soon Qatar University would begin to fund the CSD more lavishly given its importance for the Qatari society at large.

Do activities at the CSD contribute in building momentum for the Qatar National Vision 2030? How? What major contribution has the CSD made in this direction?

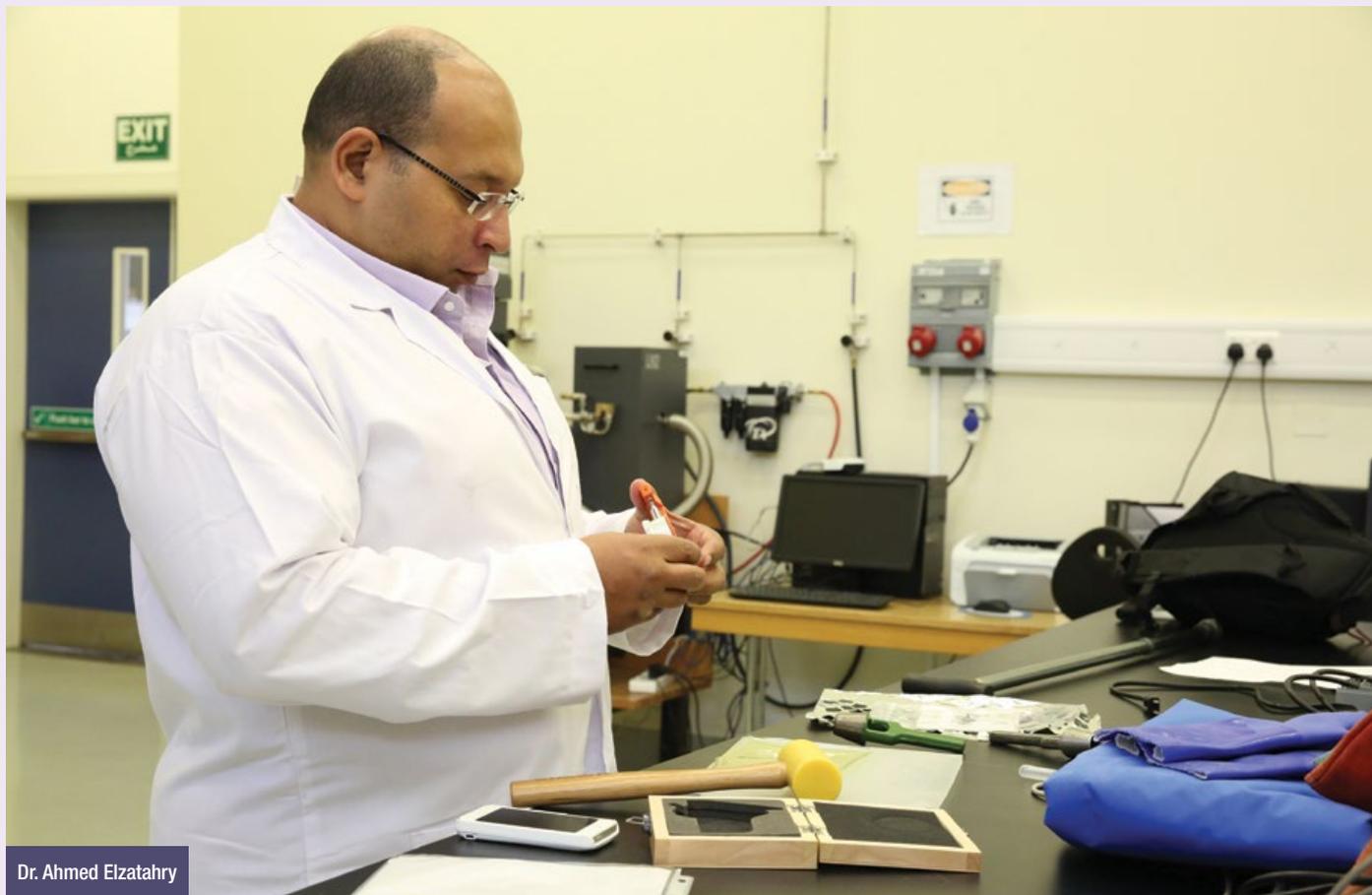
CSD was created in line with the objectives of the Qatar National Vision 2030. Food and water security and environmental conservation are among the major emphasis made in the National Vision and we are focusing more on that.

Achieving food and water security in Qatar and adjacent Gulf countries is a major challenge and CSD is making significant progress in that direction.

I am confident that in due course the center will grow in size and scope and will make a substantial contribution in achieving QNV 2030 goals, particularly in the areas of food and water security.

Our Exclusive

Collaborative research develops ultra-thin film among new advanced materials



Dr. Ahmed Elzatahry

A team of researchers from Qatar University, Fudan University, China and King Saud University, Saudi Arabia have developed different nanoporous materials with different functions and applications.

One of the materials is ultra-thin 2D single layer nanoporous and transparent film, using a very simple technique. The unique film is only a single layer with a thickness of 1 nano meter and can expand up to inch size in the plane.

The new method will not only enable the construction of hierarchical porous nanostructures but also lead to many other

unique applications due to the development of high multifunctional properties of carbon. The research outcome has already been highlighted in Nature Arabic, a monthly publication that gives readers in the Arab world a chance to read about cutting-edge science in their native language.

The work was also chosen as back cover for Angewandte Chemie journal, one of the leading journals in the field of chemistry with excellent impact factor of 11.261.

The team comprised of Dr. Ahmed Elzatahry, Associate Professor of Material

Science and Technology in the College of Arts and Sciences, Qatar University; Prof. Donguan Zhao, Director of Laboratory of Material Science at Fudan University; and Prof. Yonghui Deng, Department of Chemistry, Laboratory of Advanced Materials, Fudan University.

Dr. Elzatahry said the team was able to successfully develop an efficient nanocomposite based on the 2D single layer film to work as a high sensitive, high selective photo electrochemical biosensor for glutathione, an important antioxidant which plays a critical and crucial role in preventing damage to important cellular

components and detoxification of heavy metals. Another interesting nano porous material produced from the efforts of their research works has yielded core-shell magnetic mesoporous microspheres, similar to sweet dumplings, exhibiting response to magnetic field for simple magnetic separation and providing huge surface area for efficient immobilization and transport of guest molecules or nanoparticles.

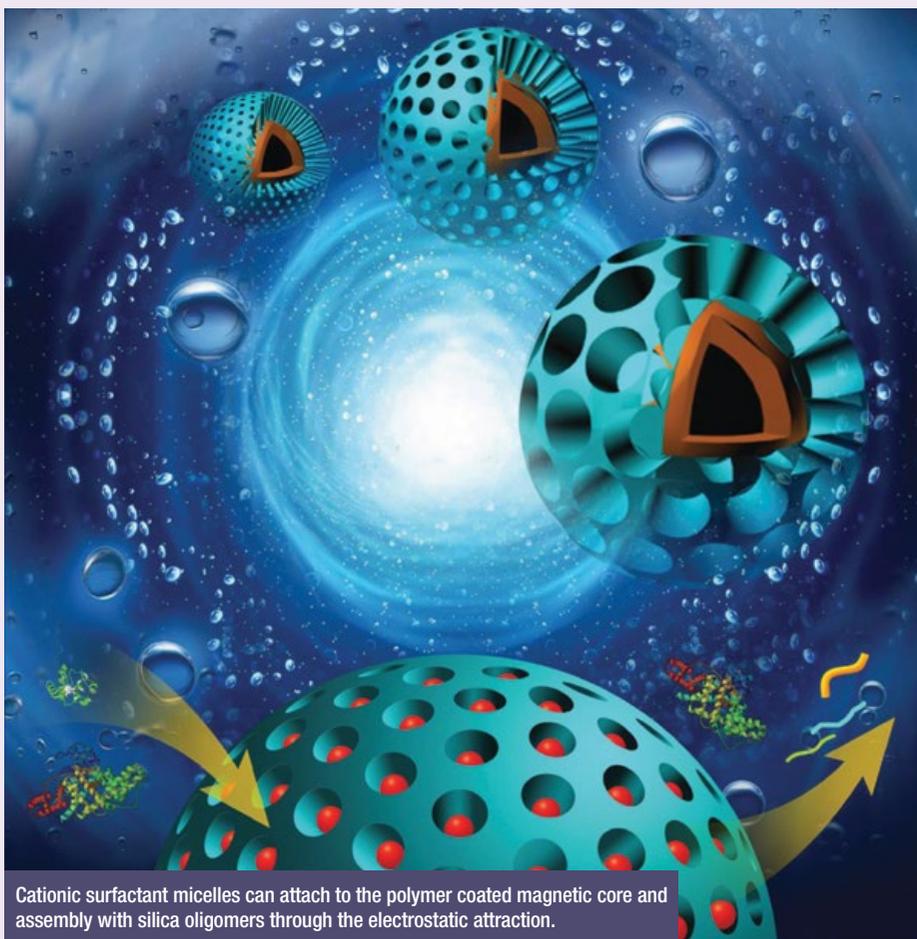
Previously reported magnetic mesoporous silica microspheres have limited mesopores smaller than 2.5 nm, which is inappropriate for immobilization and transport of large molecules like protein and enzyme.

“Here, we develop a shearing force assisted interface co-assembly in biliquid phase system to achieve the synthesis of highly dispersed core-shell structural magnetic mesoporous silica microspheres with large and tunable mesopores,” Dr. Elzahatahry said.

In brief, cationic surfactant micelles can attach to the polymer coated magnetic core and assembly with silica oligomers through the electrostatic attraction.

During the biliquid phase, n-hexane can absorb into the micelle center through the “like dissolve like” interaction. In addition, the stirring force can help the n-hexane get dissolved into the water and expand the micelles, enabling a good control over mesopore size through changing the stirring rate. After fixing the structure of the composite with silica framework and the subsequent removal of surfactant and n-hexane, core-shell magnetic mesoporous silica microspheres with large and tunable mesopores of 5-9 nm size can be obtained.

The resulting microspheres have high-quality pores and can efficiently capture the bio-enzyme trypsin. Only small proteins are allowed to enter the pores and be digested by trypsin, achieving efficient size-selective proteolysis in a mixed protein solution. This simple and straightforward technique should readily transfer to other nanoparticle systems. Dr. Elzahatahry's research mainly focuses on developing novel mesoporous materials for energy,



Cationic surfactant micelles can attach to the polymer coated magnetic core and assembly with silica oligomers through the electrostatic attraction.

environment and biomedical applications. He has so far supervised five PhD students and five master students. Six of his current master students are from Qatar University. Since joining Qatar University early 2015, his group has published several papers in the prestigious *Advanced Science* and *ACS Central Science* journals and four more papers were published in *Materials Today* (IF:14), *Nanoletters* (IF:13), *Advanced Energy Materials* (IF:14), and *Journal of the American Chemical Society* (IF:12).

He said that with the support of the College of Arts and Sciences at QU, three of his students were able to visit Ewha Women University, Korea and University of Akron, USA to conduct research work related to their thesis. Also, two of his students have been invited to spend next summer at the Department of Materials Science at Fudan university, which is one of the world's top universities for materials science, based on its reputation and research in the field.

His group focuses on multidisciplinary research activities on international, regional and local sites. Five students are currently active in research work with Prof. Dongyuan Zhao and Prof. Yonghui Deng (Fudan University), Prof. Karim Alamgir (University of Akron), and Prof. Khalil Khalil and Dr. Abdullah Al-Enizi (King Saud University).

The group is also highly active with groups in Qatar University such as Center of Advanced Materials (Dr. Mariam Al-Maadeed, Dr. Aboubakr Mustafa and Dr. Mohamed Hassan) and Biomedical Research Center (Dr. Gheyath Nasrallah, and Dr. Mohamed El Zowalaty). Students' master theses under the Materials Science and Technology program focus on solving problems related to industry, energy and environment and are within the objectives of the Qatar National Vision 2030.

Research Issues



CANCER PROTEOMICS AND SYSTEMS BIOLOGY FOR PERSONALIZED MEDICINE

Dr. Serhiy Souchelnytskyi,
Professor, College of Medicine, Qatar University

**“SCIENCE KNOWS TODAY A LOT ABOUT
MECHANISMS GOVERNING CHANGE OF
NORMAL “GOOD” CELLS INTO CANCEROUS
“BAD GUYS”.”**



How do you explain that cancer can be treated, when many people still die from this disease? How can you say that cancer research has made enormous progress, when many drugs do not help? Or how do you show that in Doha there may be world-leading help for cancer patients, when many people still go abroad to get treatment?

My goal is to contribute to changing cancer into a fully treatable disease. This is when the diagnosis of “cancer” will not

be frightening anymore. For a patient, it would be just to get a treatment, get well and continue with life as usual; like treating cold. Nobody has to die from cancer.

Why people die from cancer?

When people die from cancer today, it is because of a late detection or lack of efficient treatment. Scientists have accumulated enormous amount of information about cancer. Science knows today a lot about mechanisms governing change of normal “good” cells into cancerous “bad guys”.

Why is this knowledge not sufficient?

Well, science showed that there are many ways to turn normal cells into a tumor.

As people are different, these ways are also different in different people, and therefore treatments have to follow different ways. The problem today is to identify these ways for each cancer patient.

This has called for personalization of cancer treatment. Currently, the expectation is that personalization of cancer treatment, finding patient-specific changes in cells and in the body, would lead to much better treatment. We already have examples of success of this approach. Moreover, strong incentives to apply results of fundamental research give hope that the success will grow.

Thus, it is because of the complexity of cancer that people still die from this disease. However, the rise of personalized cancer

medicine, development of molecular diagnostic and novel drugs give hope that the challenge of cancer complexity will be solved.

What have you done?

Since the beginning of my career, I have always been interested in cancer. First, it was a study of the molecular mechanisms governing cancer. In 1992, I was the first in Europe who successfully purified one of the key regulators of tumor growth – polypeptide transforming growth factor-beta (TGFbeta). I had to go to a slaughterhouse to collect animals’ blood (by myself), then back to the lab, get white coat on, and purify TGFbeta. These were days when senior scientists saw the task as non-realistic, and only young enthusiastic optimism could overcome hurdles.

As the consequence, obtaining of purified TGFbeta allowed me to complete my PhD, publish a number of papers, get my first grants, and on top of that to organize a company which was selling TGFbeta to customers in Europe.

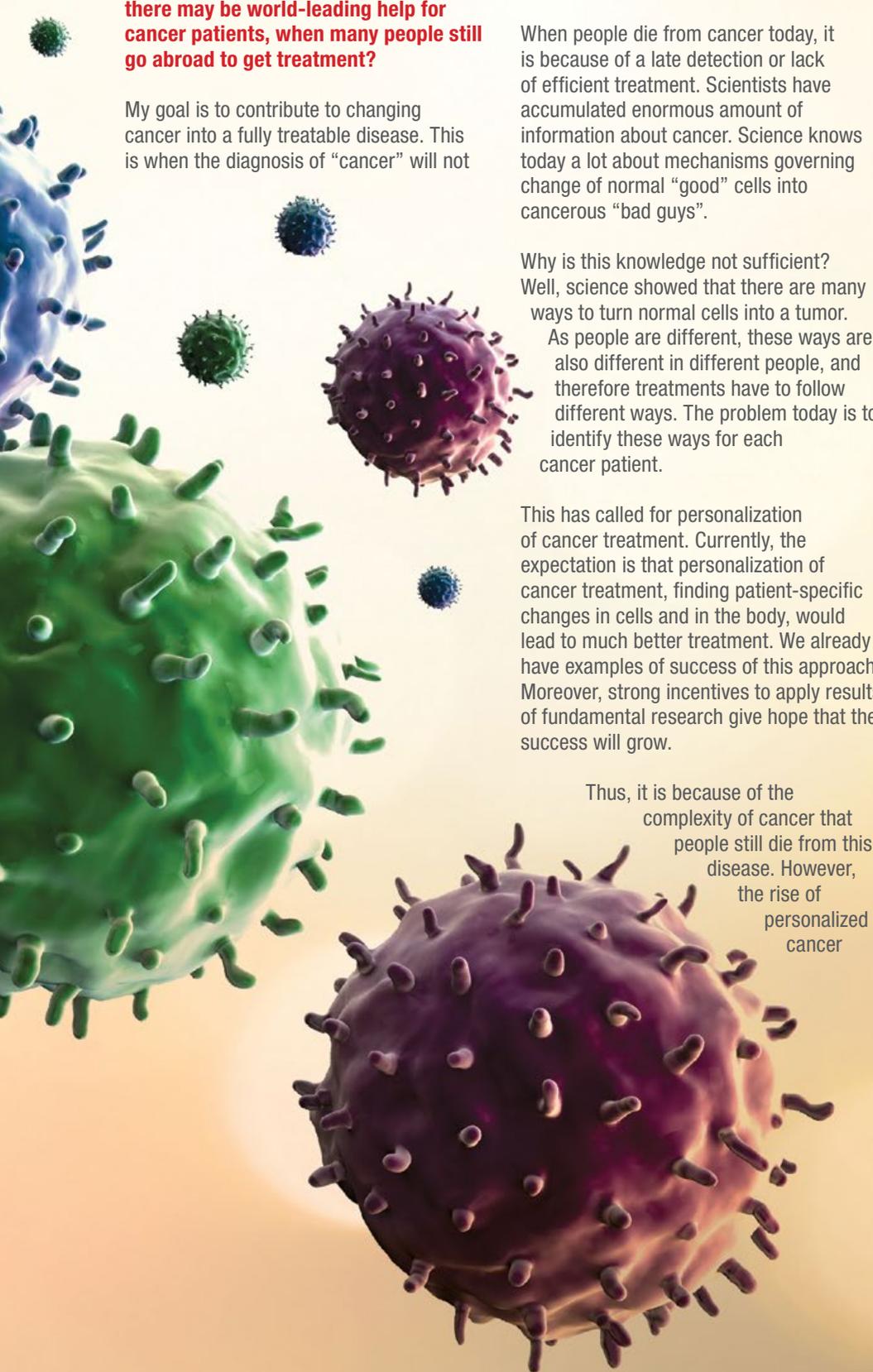
TGFbeta turned out to be so important for regulation of tumor growth, that a number of big international pharmaceutical companies are developing TGFbeta-related drugs. Think of it; one of such companies, Eli Lilly, had more than 200 people working on TGFbeta signalling-addressing drugs! I have been involved in this race also.

Novel type of a drug was developed – peptide-based inhibitors of TGFbeta receptor kinase, with the following patenting.

First pre-clinical and clinical trials showed that targeting of TGFbeta for treatment of cancer requires dedicated diagnostic, so called companion diagnostic. That in its turn requires comprehensive studies of TGFbeta signalling in the context of all regulatory processes in cells.

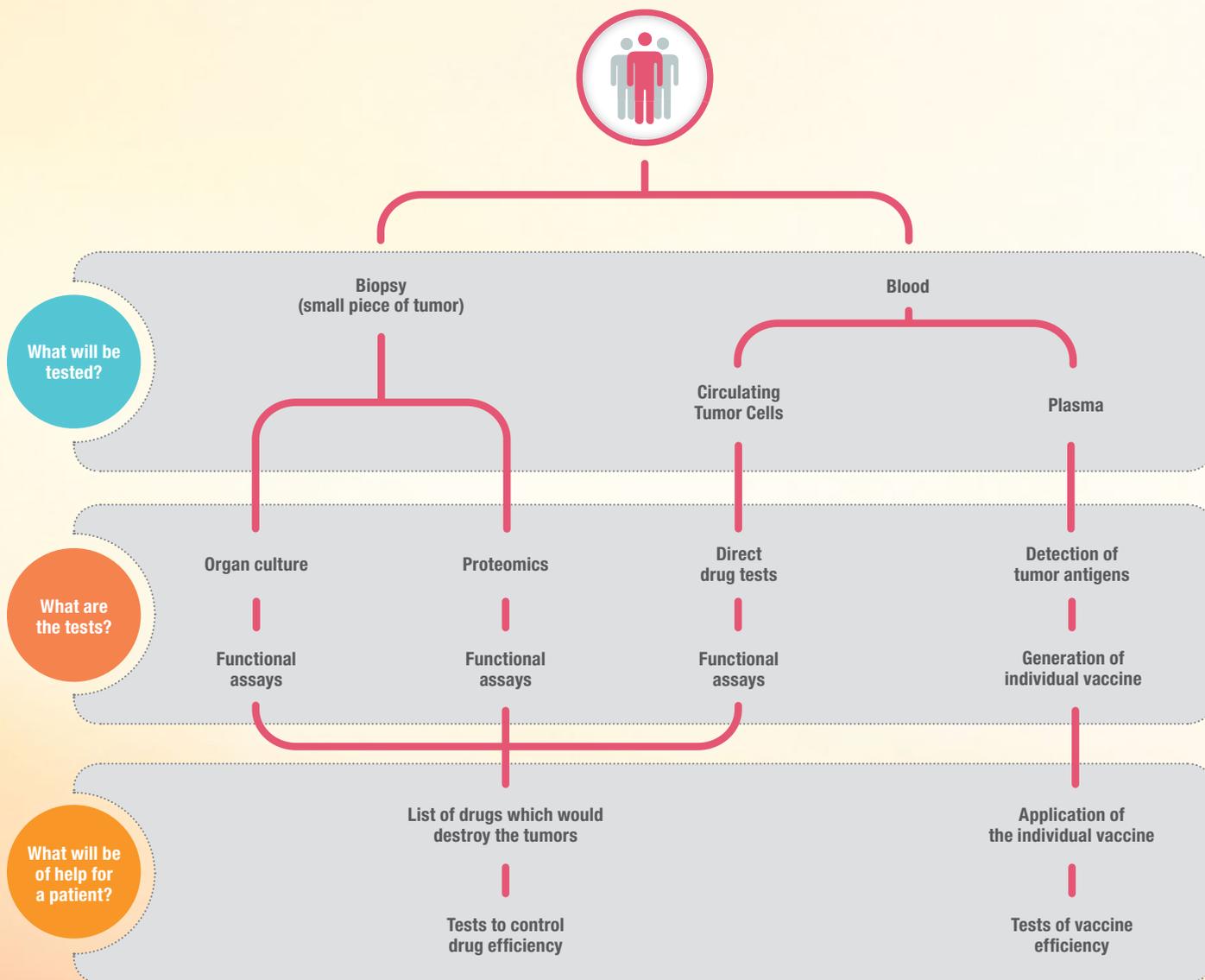
As all known drugs act directly on or via proteins, proteomics has become one of the key areas of my research. The other component is the systems biology.

Proteomics allows to describe and analyse all proteins present in our bodies, and systems biology allows to understand how these proteins work together to make us



Workflow of FMDx

(schematic presentation)



Souchelnyskiy S., 2012. All rights reserved.

healthy or sick. Good biomedical science is one which works in clinic. Having extensive experience of cancer research, I saw that a lot of my knowledge may be put in use.

The result is Functional Molecular Diagnostic (FMDx). FMDx is a set of different assays, and is presented on my personal homepage www.serhiysouchelnyskiy.expert. You may see also in the figures how FMDx works.

When a patient comes to a hospital, a doctor has to decide what can be used for diagnostic, which tests may be applied, and

how to use results of the tests (panel A). Panel B shows results of testing.

Two of the tested chemotherapeutic drugs (methotrexate and cyclophosphan) showed no effect, while gemcitabine and paclitaxel showed ability to kill tumor cells. This information allows a doctor to make a decision of not using methotrexate or cyclophosphan, but consider using of gemcitabine and paclitaxel. Such selection of drugs prevents unnecessary over-treatment, and offers a possibility of using drugs which will help that patient.

Here, I want to mention that FMDx has been used to help patients with different types of cancer, e.g. breast, pancreas, prostate, lung, endometrial, brain and lymphomas. FMDx tests for diagnostic, monitoring of disease and selection of efficient drugs for individual patients have been the most frequently requested by clinicians.

Sweden, Ukraine, Poland and Germany have been among countries from where patients have been coming. Hopefully, Qatari patients will soon also benefit from FMDx.

What is the future of cancer research?

We are living in exciting times! Right now, in front of our eyes, is unveiling unprecedented development and transition of cancer medicine from a “one size for all”-way of treatment to the way when individual features of tumors are used to find individually-adjusted treatment.

I work with clinicians who managed to keep away from cancer patients who were given few months to live! And these cancer patients are living normal lives for many years! That is the best proof that cancer medicine is progressing well.

However, the majority of cancer hospitals still use the old-fashion methods. The reasons are many - from simple unwillingness to learn and to incompetent management, with incompetent management being probably the biggest obstacle.

To my estimate and experience, the numbers of forward-looking hospitals vary from 10% to 20% in Ukraine, Sweden and Germany. I do not yet know the number in Qatar. Progressive developments always have to fight their way. With new methods of cancer treatment it is the same, but prognosis is rather good. IT revolution, social media, and high level of education lead to much higher awareness.

This awareness organizes patients and pushes governments to pay serious attention to the healthcare problems. I have seen how positive development is taking up speed in many European countries. The same, I believe is to happen in Qatar. There is no alternative to development of personalized and more efficient cancer medicine. The next question is when actually we may be able to cure cancer? My forecast is for 10 years, by 2026.

This estimate is based on my knowledge of current status of cancer research, readiness of healthcare systems, governments, and even growing pressure on the pharmaceutical industry. Thus, the future of cancer treatment has already arrived. It is only starting its establishment in hospitals, but it is here. Let us organize together researchers, doctors, patients’



When people tell me that “in this part of the world things do not work efficiently”, I refuse to accept that.

organizations and governments. These four forces will certainly turn cancer into a fully treatable disease.

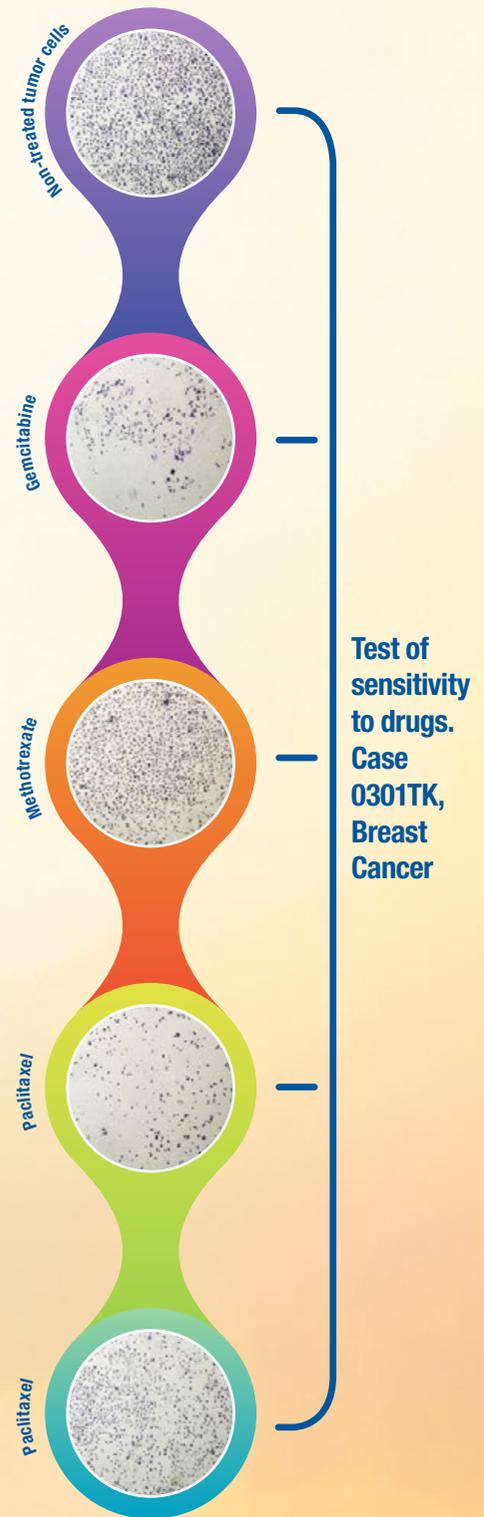
What of that may be in Doha?

I am at the College of Medicine, Qatar University since September 2015. It may sound too short a time to make things happen. However, I already have received requests from patients in Sweden to do tests in Doha.

Together with very active and good researchers at the interim Translational Research Institute and top clinicians at the National Center for Cancer Care and Research, we try to establish a platform for personalized cancer medicine. Hopefully, soon we will also have the College’s laboratory ready at the QU campus.

When people tell me that “in this part of the world things do not work efficiently”, I refuse to accept that. After 5 months in Doha, I have met many efficient and professional people.

When the leadership and management are open about challenges and genuinely try to find solutions, those are the proof that respect and professionalism will make Qatari cancer research as efficient as in anywhere else.



Tumor cells were obtained from the blood and an body fluid (ascites). The cells were treated with different drugs. Here are shown treatments with gemcitabine, methotrexate, paclitaxel and cyclophosphan, and non-treated cells. If a drug works, cells will die or stop growing. If a drug is not working, cells will grow. Cells are visible as small dots.

Our Exclusive

QU participates in ARC '16 as researchers give overview of research results



Dr. Hassan Al-Derham

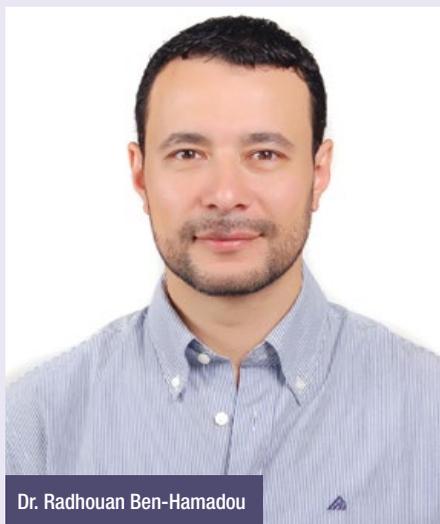
Qatar University (QU) had an impactful outing at the Qatar Foundation Annual Research Conference (ARC '16) which was in March at the Qatar National Convention Center (QNCC).

With presentations by its President and a number of its esteemed researchers and academics, QU hosted a booth in the complementing exhibition where it showcased some of the outstanding research outputs from the university. Qatar University President Dr. Hassan Al-Derham was a panelist during the keynote panel discussion on “Strategic Investment in Research and Innovation for Society”.

He said: “At Qatar University, we use opportunities like this to demonstrate what we have been able to achieve and prove our commitment to be recognized within the region for distinctive excellence in education and research through the work of our committed faculty and talented students that touches on local and regional challenges and advances knowledge.”

Dr. Asma Al-Thani, Dean, College of Health Sciences, while contributing during the healthcare session on Biomedical and Health Research in Qatar which focused on “Transforming Challenges into Competitive Advantages and Economic Opportunities” shed light on how the Qatar Genome Program (QGP) would advance personalized healthcare and stimulate innovation.

Incubated by Qatar Biobank, the QGP aims to identify a genetic marker unique to the Qatari population and transform Qatar into a leading center for the implementation of advanced personalized healthcare. Dr. Al-Thani said that the QGP seeks to assist in creating a roadmap for the study of genetics and its functions, enabling the development of personalized healthcare through the implementation of precision medicine measures and using research conducted at various research centers in Qatar.



Dr. Radhouan Ben-Hamadou

Dr. Radhouan Ben-Hamadou, Assistant Professor - Marine Sciences, College of Arts and Sciences, who spoke on research about “Investigation of Spatiotemporal

Variability of Microplastics in Qatar’s Coastal Environment” relayed that the study provided “the first insight on the spatiotemporal variability of plastic marine litter in Qatar and seemingly in the Gulf region.” He said that with over 8 million tons of plastics dumped in the ocean annually, plastics are persistent in the environment and take several decades to degrade especially in the ocean. The results of the study, according to him, indicate that microplastics are ubiquitous and the fact that they are easily mistaken for food and ingested by zooplankton and smaller fishes makes them a serious threat to the marine food web.



Dr. Mohamed Ahmedna

Dr. Mohamed Ahmedna, Associate Dean for Research & Graduate Studies, College of Arts and Sciences on the outcome of research on “Effect of intensive weight loss camp and maintenance clubs on overweight school children in Qatar”, said the intervention camp was effective in significantly reducing the weight of all

“

Children’s social development is facilitated in the context of the unique, socialization experiences they encounter at school.”

participants, despite its short duration of 11 days. “After school clubs showed effectiveness in maintaining or further enhancing weight loss achieved in the camp and in engaging parents. The synergistic effect of the camp and after school/ community clubs suggests promising potential for successful incorporation of this integrated intervention into the school curriculum, especially since the camp occurs during mid-year school break and the after school clubs during school days”, Dr. Ahmedna said.



Yara Qutteina

Yara Qutteina, Senior Research Assistant, Social and Economic Survey Research Institute (SESRI) while presenting the first study in Qatar to explore how women understand their agency scale items, said that even though decades of research has been conducted to understand the processes that undergird women’s empowerment and one of its core components-women’s agency, few inroads have been made into the study of how the processes work in Arab Middle Eastern societies.

The study, according to her, revealed that the majority of women originally reported that they made their own decisions; but probing revealed family input as an important part of the decision-making process, even as women’s responses to gender attitude items were reflective of broader Qatari societal norms rather than their own individual opinions.



Dr. Yassir Semmar

On his part, Dr. Yassir Semmar, Assistant Dean for Student Academic Support, College of Education, while giving an overview on a research on “An Exploratory Study of Teachers’ Perceptions of Prosocial Behaviors in Preschool Children”, said that “children’s social development is facilitated in the context of the unique, socialization experiences they encounter at school” which are likely to manifest themselves in prosocial or aggressive behaviors.

He said the purpose of the study was to assess the occurrences of prosocial behaviors in preschool children according to teachers’ perceptions and examine if variations of prosocial behaviors exist across gender and level (i.e., KG 1 vs. KG 2).

The findings revealed that prosocial behaviors occurred at moderate levels irrespective of gender and school level. Girls were noted to display relatively more prosocial behaviors than their boy counterparts.



Dr. Nader Meskin

Dr. Nader Meskin, Associate Professor, College of Engineering, speaking on “Robust Controller and Fault Diagnoser Design for Linear Systems with Event-based Communication” said that in the past few years, the problem of event-triggered feedback control design in which the control action is only driven when required and determined by a certain condition on the plant measurements, has received considerable attention.

He said that the research showed that by using the proposed event-triggered strategy applied to both the sensor and controller/ filter nodes, the amount of data that is sent through the sensor-to-controller/filter and controller/filter-to-actuator channels are dramatically decreased.

Student in the Limelight



Recycling fluorescent lamps through efficient detoxification mechanism

“My project aims to increase awareness about the importance of the right disposal of spent fluorescent lamps.”

- Reem Abuqaoud

Qatar University student Reem Abuqaoud was one of the outstanding students in the Department of Biological and Environmental Sciences. She received the third place award for her project entitled “Detoxification of mercury pollutant extracted from spent fluorescent lamps by bacterial strains” in 2015 at an event organized in collaboration with the Anti-Doping Lab-Qatar.



Reem Abuqaoud

Working on such a multidisciplinary project that connects biological techniques with chemical techniques enriched her scientific skills and knowledge about diversified chemical and biological techniques. Moreover it provided her with the training skills required for placing her in an excellent career position in the future. She was supervised during the project by Dr. Mohammad A. Al-Ghouti, Assistant Professor of Applied Analytical and Environmental Chemistry, and Dr. Mohammed Abu-Dieyeh, Associate Professor of Plant Ecology, both of the College of Arts and Sciences.

In the past few years, the use of fluorescent lamps had increased over incandescent bulbs, due to their lower

energy consumption. The mercury in fluorescent lamps is in the elemental form where it can be vaporized under high pressure. The elemental form of mercury is also lipid soluble and can pass through both brain barrier and the placenta which can cause neurological disorder. The ionic species of mercury present in fluorescent lamps can form compounds more soluble than metallic mercury, thus having a greater impact on the environment.

This is due to a much easier transportation via the aqueous phase, oxidation and methylation processes. The amount of mercury in the fluorescent lamps would be different; depending on the manufacturing company and on how long the lamp has been in use. So when the fluorescent

lamps reach to the end of their life span, they will be disposed, and contaminate the surrounding soil and water. The fluorescent lamps are considered as a hazardous waste and their disposal should be carried out in a safe way.

This could be done by recycling and/or mercury extraction to reduce the toxic effect of mercury. In the process, they could become useful for the economy by reducing the cost needed for raw materials.

Recycling is one of the solutions to the large quantities of waste generated every year. While it allows decontamination of fluorescent lamps waste (mercury removal), it can also lead to the recovery of valuable materials.

“

The research is an excellent indicator of the high level of the competitiveness of Qatar University against other global universities.”

- Dr. Mohammed Abu-Dieyeh

Globally, hundreds of millions of fluorescent lamps are sold and disposed every year. They contain tons of phosphorus powder which has, among others, high amounts of mercury and a large quantity of valuable metals. Developing a sustainable industrial process to remove mercury from the phosphorus powders is of great importance.

Two aspects are of great importance when it comes to recycling of fluorescent lamps: mercury and valuable metals content. Many fluorescent lamps contain high concentrations of mercury, failing the toxicity characteristics when they

are disposed. One of the problems that fluorescent lamps waste recycling poses is mercury contamination. Without special treatment it is always a possibility that recycled components such as glass and metal caps will be contaminated with hazardous mercury. Although it's not difficult to separate the phosphorus powder from the other components, the material will be contaminated as well. In order to recover the valuable metals contained in the phosphorus powder, mercury must first be removed.

That was the challenge before Reem. In the research, the powders in the fluorescent lamps were collected and disposed safely. Two different methods were used to extract the mercury from the fluorescent lamps: acid extraction by different concentrations of HCl and HNO₃ along with H₂O₂ and the microwave extraction methods using different concentrations of acid and different power.

Then the samples were analyzed by inductively coupled plasma (ICP). After mercury being extracted a green biotechnology was investigated to reduce the toxicity of mercury and dispose it safely using bacterial bioremediation.

Different bacterial strains isolated from soil contaminated with hydrocarbon were cultured along with the extracted mercury, the strain that have specific adaptation would be able to oxidize the mercury from Hg⁺² to Hg⁰ which is a less toxic form and more stable. In the project, the efficiency of mercury bioremediation was investigated and evaluated.

Seven out of twenty bacterial strains showed a degree of tolerance to mercury. The bioremediation capacities of the promising strains were investigated using the mercury extracted from the fluorescent lamps (5.5 ppm). Three of the strains (*Enterobacter helveticus*, *Citrobacter amalonaticus*, and *Cronobacter muytjensii*) showed bioremediation efficiency ranging from 28.8 to 63.6%. Further research is required to improve bacterial growth conditions henceforth the bioremediation capacities.

Speaking about her experience in the

project, Reem said when it came to choosing her graduation project she was guided by her supervisor Dr. Mohammad Al-Ghouti who when approached suggested that she should work on a project about extracting mercury from spent fluorescent lamps. She gave herself into knowing more about the subject and topic. "After reading about this interesting topic, I found out about another aspect which could be added to the project and make it more involved in applying the experience and knowledge that I have gained from studying biological science," she said.

She set about the project by using bacterial strains that have the ability to bioremediate the mercury by having certain genes. It was after deciding to expand the scope of the project through the addition of other aspects that Dr. Abu-Dieyeh thankfully agreed to supervise the project along with Dr. Al-Ghouti.

"Therefore I could not have been any happier having two supervisors to help me and guide me during my work. My supervisors were always supportive and they did try their best to provide me with all the needed equipment, materials, and most importantly their advice and guidance.

Reem said the project could not have been successfully carried out if the Department of Biological and Environmental Sciences had not contributed meaningfully by providing the students with a working area, and fully established and functional labs. She was equally thankful for the help of the lab technicians especially Mr. Mohammad Abud-Almateen and Mr. Mohammad Hebeaballah. She said they were ever ready and willing to invest their attention on the research project and take care of issues because of the perceived huge impact it would on both the society and the environment.

"My project aims to increase awareness about the importance of the right disposal of spent fluorescent lamps because of the fact that they have high quantities of mercury by using green biotechnology to remediate them.

This might lead to recycling the other components of the lamps after treating



them,” she said. According to her, the aim is in tandem with the objective of two of the pillars of the Qatar National Vision 2030 on environment and energy.

Reem wishes that new students of Qatar University would wish from the beginning to work deeply and constantly on new projects that would have impact on both the society and environment. They should also make themselves accessible to benefiting from any upcoming projects and enriching their experiences and knowledge, she added.

Dr. Abu-Dieyeh said that as a researcher in the field of applied ecology, he could say that this was one of the most exciting and successful experiences he has had.

“To have an environmental health problem like mercury from spent fluorescent lamps and search for a solution from the environment using bacterial strains and also to have an undergraduate student working on such research, made the work much more interesting and exciting,” he said. “This work would never have been successful if the student was not a true young scientist. The cooperation between the two faculty members from two different backgrounds, biology and chemistry, was optimal. The outcome was the publication in *Waste Management*, a high standard

peer-reviewed international journal with impact factor of 3.5,” he added.

According to Dr. Abu-Dieyeh, the research is an excellent indicator of the high level of the competitiveness of Qatar University against other global universities. He noted also that the outcome indicated a positive academic environment in the Department of Biological and Environmental Sciences and confirmed the commitment of the leaderships of both the Department and College of Arts and Sciences in supporting and facilitating the success of the students. He also said that the work highlighted the resourcefulness of the Qatari environment in providing green solutions for current and future environmental problems.

With Reem’s outstanding success and graduation, Dr. Al-Ghouthi and I have taken the research to a higher level with the help of another brilliant student aiming to make the bioremediation of mercury from spent fluorescent lamps more efficient and valuable using native bacterial strains from the Qatari environment.”

Dr. Al-Ghouthi said that he believes that the essence of inter- and multidisciplinary research is to create new knowledge and innovation, while working on such a project would also enrich the student’s scientific skills and knowledge about

diversified scientific knowledge and techniques. “As a matter of fact, our success in this undergraduate research project was a result of a combination of different integrated elements; starting from a passionate undergraduate student supervised by two faculty members from different scientific backgrounds and endless support from the Biological and Environmental Sciences department and the College of Arts and Sciences,” he said.

The outcome, he added, was an outstanding publication in a highly prestigious international peer-reviewed journal that has added value to the department, college and university, offering the best way up the academic ladder. “I also believe that the undergraduate research project is a real transition option for students moving forward from university to exceptional career life. It cultivates productive and creative work practices, immersion experiences and indispensable personal skills needed for the workplace,” he said.

Dr. Al-Ghouthi expressed appreciation to the Qatar National Research Fund (QNRF) for its financial support. The research was made possible by Undergraduate Research Experience Program (UREP) grant (#UREP17-066-1-004).

News

CAM symposium addresses role of collaboration in advancing innovation

Qatar University Center for Advanced Materials (QU-CAM) in conjunction with Texas A&M University at Qatar (TAMUQ) held its 7th Materials Science and Engineering Symposium. It was sponsored by Qatar Petrochemical Company (QAPCO).

Under the theme “Academia and Industry: Fostering Innovation through Collaboration”, the symposium brought together over 100 researchers, academics and industrial experts. It aimed to promote dialogue and exchange of ideas among experts from various disciplines, as well as identify and address prospects for future interdisciplinary collaborations.

Attendees included QU QAPCO polymer chair Prof Igor Krupa, and QU Qatar Fuel Additives Company Limited (QAFAC) chair Prof Syed Zaidi, University of Cambridge head of Electric Carbon Nanomaterials Group Dr Krzysztof Koziol, TAMUQ regents professor Prof Dallas Little, QAPCO Learning & Development manager Eng Abdulla Naji, as well as QU and TAMUQ faculty, students and staff.

QU VP for Research and Graduate Studies Prof Mariam Al-Maadeed and TAMUQ vice dean Dr Eyad Masad delivered the welcome remarks at the opening ceremony. Keynote speaker, QAPCO Chief Operations Officer Mr Yousuf Rebeeh presented on “Academia and Industry: Fostering Innovation through Collaboration”. The program agenda comprised a panel discussion on “Key to Successful Industry-Academia Partnerships”, and eight sessions presented by experts from CAM, TAMUQ, Cambridge University, Qatalum, Qatar Shell Research and Technology Centre (QSRTC), and Qatar Environment & Energy Research Institute (QEERI).

Topics included “Innovative method for Polymer Stabilization of Soils”, “Role of



Dr. Krzysztof Koziol

Nanotechnology in Erosion Protection”, “Aluminium & Non-hydro Carbon Industries -- An Educational Experience in Qatar”, “Direct Methanol Fuel Cell: A Sustainable Green Energy Technology”, “Impacting Qatar for a Sustainable Energy Future: Building Stronger Connections between Industry and Academia”, “Structural Health Monitoring: Selected Case Studies”, and more.

The event also included presentations by two QU materials science and technology Masters students Abdullah Holozadeh and Sara Ahmad. They gave an overview on their working experience with the industry as part of their MSc thesis. Prof Mariam Maadeed said: “One of the primary research aims of Qatar University is to expand the relevance of research it carries out and effectively employ it to overcome local challenges, which necessitates industry-academia collaboration.”

Dr Masad said: “The partnership between Texas A&M University at Qatar and Qatar University continues to grow stronger and more strategic. We are highly appreciative of the support from QAPCO that made it possible to continue to organize the materials symposium and develop partnerships with the industry.”

Abdullah Holozadeh said: “I strongly believe that working on an industrial research project is vital to realize the connection between research activities and industry demands. My project has helped me gain valuable insight into the waste recycling area. I would like to thank QU and Qatalum for giving me an opportunity to solve real-world problems through top quality research.”

Interview
with
Researcher



Dr. Batoul Khalifa

“ My

**Relationship with
students generates
research ideas.”**

Innovation is making significant contribution to psychology research, being important in competition, and significantly improving the quality of human life. Achieving success in innovation and research to satisfy the needs of the society, and enhance the quality of life, has increasingly become a challenge in education and psychology research. Dr. Batoul Khalifa has been motivated to study and research about how people think, influence and relate to one another to make life better. It is all about social psychology, the study about how to solve problems and have a better understanding of ethics. In this interview, she gives a revealing insight. Excerpts:

Researcher Profile

Dr. Batoul M. Khalifa, coordinator for B.Ed. in Special Education, and Associate Professor in Mental Health, Psychological Sciences Department, in College of Education, Qatar University received a Ph.D. in Educational Philosophy (Mental Health) and a Master's degree in Education (Psychology) from Ain Shams University, Cairo, Egypt.

She has led many successful projects and workshops in Qatar and globally as well as engaged in research for over 23 years in Psychology of Women and Family, Child Abuse, Creativity of Youth, and Quality Assurance in Higher Education.

Dr. Khalifa was the chairperson of the Quality Assurance and Program Enhancement Committee at College of Education, Qatar University for seven years. She was a board member of Division of International Special Education & Services (DISES) of the Council for Exceptional Children (CEC) for three years. She is also a scientific reviewer at International Journal of Multicultural Education, and has received many awards over the past 20 years.

Some of the awards include one from QU Vice President and Chief Academic Officer for her constant involvement in Office of Faculty and Instructional Development (OFID) activities, and in the Quality and Measurement team, advising and following up on the implementation of training programs.

She was awarded Shield of Higher Appreciation by President Daniel Papp of Kennesaw State University (KSU), Georgia, USA for her efforts in the field of special education and

academic works. The Gulf Disability Society also awarded for her efforts and work with the scientific committee of its Forum.

Dr. Khalifa's research interests focus on the study of the components of attitudes, how attitudes develop and how attitudes change.

She has written several scientific papers about societal attitude towards the role of women, work, leadership, socialization of children, domestic maids and the attitude of children and their relationship with the maids. Some of her papers have also focused on attitudes towards children with disability, and children with learning disability. She has written many books about socialization and learning disability. There have also been many grants in collaboration with regional and international institutions in USA and other countries.

Do you see research and innovation in your field lasting into the future? What are the prospects?

Future trends of social psychology, in my opinion, will be more dynamic due to cross-cultural research, with better equipment and much more refined research ethics which make research safer. Most of my studies have been about the family, women, children and social problems such as the relation between the house maid and the children, and the impact, the positive and negative effects of the maids on the children, not overlooking what they can contribute to the adjustment of the children and their mothers.

I have done a study on cyberbullying and its effect on the adolescent academic achievement; and also about the effect of the social media on children. The result is not yet published. I just finished writing a paper about acculturation.

I think acculturation plays a role in future trends as it allows social psychologists to test their hypotheses over many groups of people to understand whether the principles apply across different cultures.

Through cross-cultural research, social psychologists could run researches from one culture and compare them with results from another culture. Hence, we will be able to see whether the principles work universally for all cultures or just for a few cultural specifics or probably just one.

My work in the National Priority Research Program (NPRP) projects helps me to dig more into the sciences of interdisciplinary research, which combine both social psychology and special education. For example, to understand more about the explanations, behavior may include biological, cultural, environmental and religious influences. I think the interdisciplinary professionals have to join to achieve more affirmative results, which are more generally accepted.

Research and teaching are my career. My philosophy is that students at Qatar University should become researchers. Accordingly, most of my teaching is based on research and they have to do their work based on scholarly standards.

What do you like most about your job? What are the challenges? Which of your projects tickles your interest most?

Perhaps my favorite aspect of being a professor is my relationship with students and former students. I have close relationship with my own students as well as many across the country. I enjoy nurturing an intellectual spirit in students and watching them take hold of that spirit and grow with it, especially in the field of special education.

I like as well to help students with writing and generating scholarly ideas. Because of this relationship, so many projects and grants from the government were based on ideas and recommendations by my former students. Believe me these relationships keep my own ideas fresh and maintain a connection for me with the many changes taking place in the

community, in social psychology and special education. I am also inspired by the work that young students at Qatar University and other universities are doing. Their energy makes me hopeful for the future of the professoriate. Recently, I was the chair of the Judges Panel for Undergraduate Awards (UA) which takes place in Ireland.

UA is cited as the ultimate championship for high-potential undergraduates. It is the world's largest academic awards program. It is uniquely pan-discipline, identifying leading creative thinkers through their undergraduate coursework. The Undergraduate Awards provides top performing students with the support, network and opportunities they require to raise their profiles and further their career paths, as well as coming to Dublin for an all-expenses paid trip to receive their medal. I was one of the 2015 speakers and it was one of my best academic experiences.

Have your research projects been making the desired impact on the society?

Yes, as an academic I have done so much work to enhance the quality of life for people in Qatar such as my

project about the house maids. This is one of the most important studies that have ever been conducted in Qatar and it has been referred to and cited in so many scientific papers in the country and the region. It is about domestic workers, and their relationship with parental styles and compatibility with psychology of children in Qatar, Qatari and non-Qatari. The samples were chosen randomly, without interference from the researcher, and divided into three different age groups. The measures used included attitude towards home work as perceived by children; and consisted of sub-measures such as the roles and responsibilities of the domestic workers, their intervention in family upbringing, their social and personal relationship, parental styles, and children's psychological adjustment.

Results of the study showed that there were significant differences between the mean scores of individuals and group (elementary, intermediate and secondary) on measures of children attitudes towards parents' styles and domestic workers in favor of the primary stage. There was no significant relationship between the dimensions of the children's attitudes towards domestic workers, parental styles and psychological adjustment of children.



My philosophy is that students at Qatar University should become researchers."



Attitudes towards parental treatment methods have had the greatest impact in predicting the psychological adjustment of the children, through parental styles, and the interference of domestic workers in the family upbringing of the children, as it was clear that this equation showed negative attitudes towards both parental styles and domestic workers relations.

The results further showed that social and personal characters of the domestic workers, and their intervention in the upbringing of the children, indicated instability in the psychological adjustment of children.

I am still working in this area and I am trying to conduct this work with my other colleagues to keep our eyes on the changes that are taking place after the reform of education and develop the strategies that will enhance the independent behavior of the children and youth in Qatar society.

One of my most cited scientific paper is about Qatar University. This paper presents a brief overview of Qatar University's history since it was established in 1973. Its primary focus is on the various small, but important, steps taken by the University to address the needs of quality assurance and enhancement. The Qatar University Reform Plan is described in detail. Its aims are to continually improve the quality of instructional and educational services, and promote administrative efficiency in the institution.

The paper also discusses changes made following the report of the university's participation in the United Nations Development Program/Regional Bureau for Arab States review of the Graduate Diploma in Special Education in the College of Education. In this paper we tried to indicate the importance of QU's steps toward enhancing the quality of its programs with our program as an example.

What major breakthroughs have you achieved since joining QU? What major assignments have you handled?

I have been working in QU since 1992, and my work has helped me to learn a lot about my country Qatar, and develop my thoughts about enhancing the quality of teaching, learning and research in the institution and outside. I was

the chair of the Quality Assurance Committee in College of Education and member of the first Quality group in QU, and the Office of Faculty and Instructional Development (OFID). I had the opportunity to develop the learning outcomes system when it was first implemented with my other colleagues, and I was the coordinator for the project.

In addition, I have been granted three NPRP projects which have offered me the opportunities to work with elite universities in the world such as Weill Cornell University, Basque Center on Cognition, Brain and Language (BCBL) as well as with Portland State University in the United States. All these have built up my experience and knowledge, enabling me to exchange ideas about my work and projects with my peers in the region and internationally.

Looking ahead, what are your future ambitions and expectations?

My ambition is to work hard to activate and enhance the quality of services for people with disabilities in Qatar and beyond. I was a member at large in one of the most important organizations for persons with disabilities, Council for Exceptional Children, division for international services for special education for three years. I am still working with them as a member.

How were you motivated to go into your choice of career?

I was drawn to academics and research when I had the opportunity to accompany my husband to Egypt for further studies. I graduated from the College of Education, Qatar University in English Literature and Education. Then I went to Egypt with my husband to study there, I was admitted in Ain Shams University from 1985 to 1987 for the special diploma in education, and I was the first in my class. The Women College of Education nominated me as the first student for the diploma for the year 1987.

Once I finished my diploma excellently with honors, Prof. Safaa Al Assar, one of the highest professors in Ain Shams University, accepted to be my supervisor for my Master. I worked with her and Prof. Jabber Abdul Hameed for three years until I finished my Master in Educational Psychology. Both of them are the top authorities in psychology in the Arab world,

and they were helpful to me, I learned and gained from them knowledge and skills.

After that, I returned with my family to Qatar and I worked at Qatar University in the psychology department, in the psychology lab for four years, and then traveled again to Egypt to study for my PhD program in mental health in Ain Shams University for three years. The title for my PhD, "The Role of Conflict between Home and Work", was conceived based on my experiences as a mother and worker.

Work-home interference and work-family conflict have been defined as "a form of inter-role conflict in which the role pressures from the work and family domains are mutually incompatible so that participation in one role, home is made more difficult by participation in another role, work,

"The main aim of the study was to explain the dual roles at homes and work, and balancing the demands of work and the responsibilities of the family. The results of the study aligned with other studies in the world, it indicated that there were both work-to-family and family-to-work conflicts that affect the mental health of women and their children. Work and family roles and the balance between the two may be important for the mental health of women in Qatar, for both Qatari women and non-Qatari women.

They have great impact upon the children as well. The effect of work-to-family conflict and family-to-work conflict on mental health varies among working and non-working women. Any analysis of the effect of multiple roles on health needs to take into account the psychosocial content of such roles.

What work experiences did you have before joining QU?

I had earlier worked five years with QGPC, Offshore. My working with professional people enhances the quality of my work and makes me more systemic in my career, and has added more experiences to me especially on how to work with different and diverse people from all the world. I consider myself a person with diversity.

News

QU, MORTC to collaborate on experimental investigation of sand plugging



A collaborative agreement was recently signed between the Department of Mechanical and Industrial Engineering at Qatar University College of Engineering (QU-CENG) and Maersk Oil Research and Technology Centre (MO-RTC) to study the advanced application of sand plugging to isolate and stimulate specific zones in hydrocarbon wells.

The project will use computational simulation and experimental investigation to visualize and test how sand dunes and plugs are formed in an annulus when deploying sand particles through a nozzle in an inner pipe. The learnings can then be applied in the field to support reservoir management.

The agreement was signed by QU VP for Research and Graduate Studies Prof Mariam Ali Al-Maadeed and MO-RTC head Abdulrahman Al-Emadi in the presence of QU President Dr Hassan Rashid Al Derham

and CENG Dean Dr Khalifa Al-Khalifa, as well as officials from both institutions and CENG faculty and staff.

In the terms of the agreement, MO-RTC researchers will work together with both QU students and faculty on the project, which is expected to last one year.

Commenting on the agreement, Prof Al-Maadeed said: "This agreement emphasizes Qatar University's continued determination to find solutions to the challenges facing the society. Through this we seek to promote the common relationship with Maersk Oil Research and Technology Centre, and expand ways of cooperation between the two sides in the field of scientific research and development. This would serve the domestic industry, particularly the oil and gas industry in Qatar, in line with national priorities towards the achievement of a knowledge-based economy."

Al-Emadi said: "Maersk Oil is very proud to be expanding its long-standing partnership with Qatar University.

This new research project is another successful example of our cooperation with academia in Qatar to develop innovative technology and applicable solutions to industry challenges and to deliver the greatest possible value to Qatar from its natural resources."

Dr Al-Khalifa said: "This agreement will result in observable benefits to Qatar University in particular and Qatar in general, and will contribute to strengthening collaboration between the two parties towards sustainable and long-term solutions, in line with the objectives of Qatar National Vision 2030 and the national research and development strategies."



Our Partners

We advocate importance of education, research and development

- Mr. Khalid Laram, Qatalum CEO

This section showcases the fruitful relationships between Qatar University and its partners and the positive outcomes that have been generated as a result. In essence, it will offer insight into research collaborations focusing on a distinct entity in each edition. It is an opportunity for companies and research-oriented establishments to showcase what they are doing to further enhance the achievement of the mandate of Qatar University as a teaching and research university.



Mr. Khalid Laram

Qatar University (QU) and Qatar Aluminium (Qatalum) have a long standing relationship geared towards the achievement and realization of a knowledge-based society. The association has resulted into several projects, programs and sponsorships. In this interview, Qatalum CEO Khalid Laram beams light on some of the accomplishments and future expectations. Excerpts:

Can you provide a brief background to the QU-Qatalum partnership? What is the driving force for this relationship? What does Qatalum aim to achieve through this?

Our relationship with Qatar University began since the inception of Qatalum. Qatalum has since sponsored a professor's chair at the Centre for Advanced Materials in QU to teach aluminium science. The initiative is unique as Qatalum needs to educate students in subject matter other than that related to the predominant hydrocarbon industry.

The Qatar National Vision 2030 lays emphasis on capacity building through the Human Development Pillar. Did this influence the relationship between Qatar University and Qatalum?

What are the ready fruits that can be harvested from this collaboration?

Within all its sustainable business cases and planning for the future, whether it is in production, the environment and human development, Qatalum always aligns its goals with QNV 2030.

In line with the industrial diversification plan within the Qatar National Vision 2030, Qatalum endeavours to develop a local workforce within a local industry to serve the community and the world at large with premium aluminium products. Qatalum received the 'Support and Liaison with the Education Sector' certificate in 2013 from Qatar Petroleum (QP) for its efforts through collaboration.

Qatalum advocates the importance of education, research and development. A partnership with QU represents a resource of strong professional resources. The resulting education of its staff and prospective QU students allows for hands on experience and the ability to integrate into Qatalum's development and employment plans to the benefit of all parties. An example of collaboration reaching fruition is the development of national Jassim Al – Mejali. Jassim joined Qatalum in 2011 as a graduate trainee - part of the 'developee' programme. In 2013, after completing the program he qualified for a position as process engineer. Driven by a desire to learn and further his career, sponsored by Qatalum, Jassim perused a Master's degree at Qatar University in Material Science and Technology.

Please offer insight into some of the programs or projects that highlight the relationship between QU and Qatalum?

Encouragement is key to develop interest towards the internship programs available at Qatalum. The summer and winter programmes run for 4 to 6 weeks. They have been fruitful for both institutions as well as the students who attend the programmes. The students work side by side with the engineers, operators, and managers on predetermined projects gaining valuable hands-on experience.

There are other ongoing training programs and students participate as interns and assistants on class projects or master thesis with Qatalum staff. Furthermore several events have been hosted serving as a platform for students to highlight their research to the community and in turn for experts within the academic and industrial sectors to transfer their knowledge to the academic and local business community.

The Grand Research Challenges outlined by Qatar Foundation are particularly significant for operators in the extractive industry. What is Qatalum doing to further these research objectives?

We are always working on innovative ideas and projects that enhance our operation to make it sustainable. Reports are published yearly, in which collaborations with QU are thoroughly explained.

Qatalum and QU have worked on various projects, producing several master degree

theses; some of which have been done by Qatalum staff and others by graduate students who are thinking of continuing their education abroad in the aluminium field to come back and seek employment at Qatalum.

Some of the projects that QU and Qatalum worked on during the winter internship program involved finding innovative ways to deal with the aluminium industry's by-products/waste with very advanced and encouraging results to date.

Underscoring the importance of Hydro and Qatalum in driving research and bringing international best practice to the region Qatalum worked closely with Qatar University on the aim of The Zero Energy and Emission Neutral Building. The ZE²B Research Laboratory tested different aluminium curtain wall solutions. Each test chamber itself can be individually cooled, artificially lit, mechanically and naturally ventilated. After completion of data gathering Hydro handed the building over to Qatar University, in 2015, to further its own research.

The Center for Advanced Materials at QU has been benefitting from Qatalum's sponsorships and technical and advisory support. Can this relationship contribute to improving the environment, industrial waste management and carbon emission reduction? Does Qatalum have a stake in issues concerning global warming?

Qatalum is actively pursuing a policy of recycling all by-products within the smelter or neighbouring industries through the

collaboration of academic and industrial participation. The projects with CAM are and have always been of great benefit to the company since Qatalum began production. Students, faculty and Qatalum staff have been diligently working on issues in the environment arena. Their work on Spent Potliner (SPL) is ongoing. They also have been submitting proposals to Qatar Foundation to ask for funding to work on green concrete. Green concrete can use some of Qatalum's process by-products.

CAM and Qatalum are always in pursuit of ideas and projects to conduct research that will end up in saving the environment from waste or by-products produced by the aluminium industry. Our concern with global warming is always up front and centre when operating our plant. We not only use dry scrubbers to clean our fumes, we also use wet scrubbers to almost eliminate particulate matter from our emissions. We also use the best available technologies in our furnaces and at our power plant to ensure minimum NO_x and SO_x emissions.

What benefits accrue to the larger society through Qatalum's activities? Are you contributing to capacity building and manpower development?

Qatalum does its best when it comes to Qatarization. We have a special department that deals with that issue. Collaboration with educational resources in Qatar further streamlines this process, building the knowledge base Qatalum requires for continual sustainability.

Education by Training and Development is a key development tool within Qatalum. The establishment of the Training and Device Center, a centre which caters for the Blended Learning Centre (computer based), competency development skills, Matrix for the Graduate Development Programmes which include the Qatalum Performance System, management skills, English language skills, HSE, certifications, technical job functions and functional skills.

Are your objectives for supporting education and research initiatives in Qatar University being realized? Are your facilities open to QU students? Do our researchers benefit from your resources?





Our work is continuing with QU at various departments and with different research professors. We have realized the potential are always in pursuit of further projects to work on together.

Qatalum has an excellent history in accommodating students and professors from QU. Our doors remain open for collaboration. Researchers from QU benefit greatly from this relationship and continue to do so. The Qatalum Professor Chair is an excellent example of the strong relationship we have with QU.

Tell us more about Qatalum's role in contributing to the realization of the other objectives of the Qatar National Vision 2030?

Alignment with the QNV 2030 has always been Qatalum's policy and QU plays a large part in the partnership required for human development. Qatalum's main ambition to attract newly Qatari graduate electrical, mechanical and chemical engineers who can be developed to hold key positions in the company contributes to our Qatarization strategy in developing of national's competence.

In conclusion, can you share your thoughts about the Qatalum – QU partnership or other initiatives in Qatar? Give us a few recent programs or projects that highlight this partnership?

The students that go through Qatalum's internships and project programs are highly exposed to the development process as they given opportunity to have hands on experiences in the smelter and interact with experienced Qatalum staff in various activities, technical and non-technical. Also they engage in team work which improves their communication skill in a multi-culture environment.

The partnership contributes to national's development in education and competency. Recently we had three nationals who completed their masters from QU and are holding senior positions. They included two female nationals.

The summer and winter internships that are being provided to QU students had produced excellent results mainly in:

Chiller Pump Casing Failure – The purpose of this project was to evaluate failures and come up with a solution in root cause analysis (RCA), risk assessment, preventive maintenance plan, preparing an emergency response plan

Alumina Campaign - The purpose of this project is to decrease fluoride variations through increased filter hopper inventory.



Our Exclusive

Research study to determine the possibility of the treatment of psoriasis



Dr. Muralitharan Shanmuga Konar

A research project, collaboration between Qatar University and Biogem Institute, Italy, is looking into the possibility of evolving an ameliorating treatment routine for psoriasis which is a debilitating and incurable disease of the skin that affects approximately 2-3% of the world's population.

The project is being undertaken by Dr. Pasquale Vito of Biogem as Principal Investigator, and Dr. Muralitharan Shanmuga Konar of the Laboratory Animal Research Center (LARC) at Qatar University as Co-Principal Investigator. Working with Dr. Muralitharan on the project as research assistant is Dr. Kavitha Varadharajan.

Psoriasis is a chronic disease and clinically characterized by the presence of red plaques due to dilation of blood vessels, with silver or white scales due to abnormal proliferation of keratinocytes.

Dr. Muralitharan says that in almost 30% of cases, psoriasis is associated with chronic inflammatory psoriatic arthritis, cardiovascular disease, metabolic syndrome, obesity, type 2 diabetes mellitus, depression and reduced quality of life.

“The pathophysiology of psoriasis is complex and dynamic, with involvement of skin cells and immune cells. Histologically,

the disease is characterized by thickening of the epidermis. Due to this, for long time psoriasis was considered to be exclusively a hyper proliferative disorder of keratinocytes,” he said.

“However, over the past decade, a great deal of evidence has established a role for the immune system and its interactive network of leukocytes and cytokines in the pathogenesis of the disease.”

He said there is no effective cure for the disease but that genome-wide association studies have identified over 20 susceptibility loci for psoriasis and very recently only

mutations in CARMA2/CARD14 (CARMA2) have been shown to cause psoriasis dominantly and with high penetrance.

CARMA proteins are called “Caspase Recruitment Domain Family of Proteins”. The three CARMA proteins (CARMA1, 2 and 3) are characterized by the presence of different functional domains shared by all members of the family.

Dr. Muralitharan said functionally, CARMA proteins are involved in the regulation of activation of NF- κ B, a family of transcription factors ubiquitously expressed in mammalian cells that have a central role in the control of immune and inflammatory response, and in the regulation of cell survival and proliferation.

“Our collaborators from Biogem, Italy recently reported the identification and characterization of two alternative splicing variants of CARMA2,” he said adding that one of them that has been termed CARMA2short (CARMA2sh) is the most prominent CARMA2 isoform expressed in human keratinocytes.

Studies according to him have already identified that CARMA2sh induces activation of NF- κ B, which requires the function of another CARD-containing protein, namely BCL10, and the adapter protein TRAF2.

He said there is a recent finding of novel CARMA Inhibitory Kinase (CIK) which inhibits the ability to induce NF- κ B but that the molecules have not tested for their function in human primary keratinocytes.

Because of this, the project team is attempting to understand the function of

CIK and its associated molecules by invitro and invivo models and further investigate the inhibitory activity exerted by CIK on CARMA2 in primary human keratinocytes expressing wild or psoriasis-associated mutant CARMA2 Gly117Ser and CARMA2 Glu138Ala. “In Qatar University we have already established the invitro model by using human keratinocytes. In addition both the Human HaCaT and HEK293 cell lines have also been established for transfection experiments and immunofluorescence analysis.

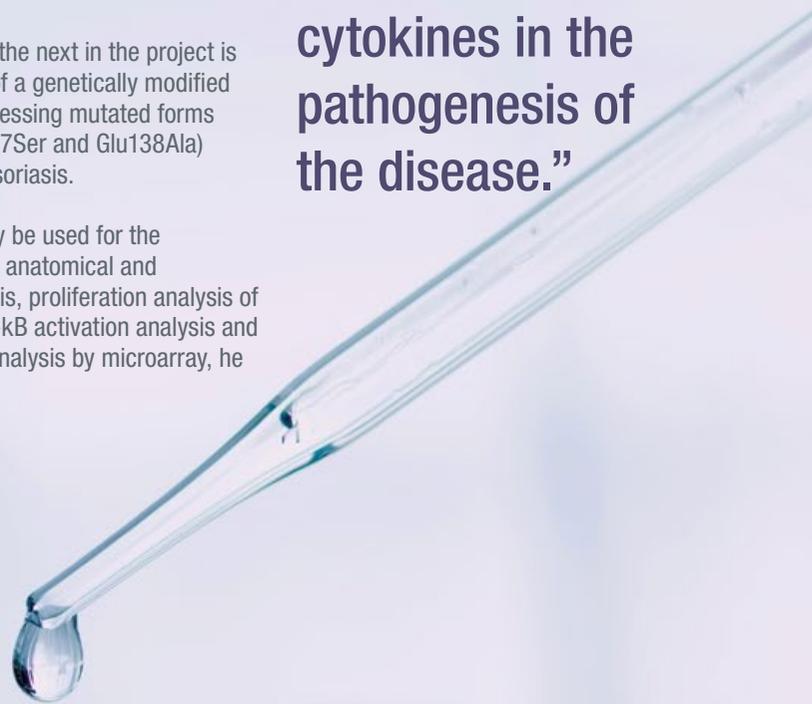
“Currently vectors expressing active or inactive forms of CIK and CARMA2sh and short interfering RNA that abolish the expression of CIK and CARMA2sh are being tested by transfecting keratinocytes and will be analyzed by Western blotting, Real Time PCR analysis and Immunofluorescence,” Dr. Muralitharan said.

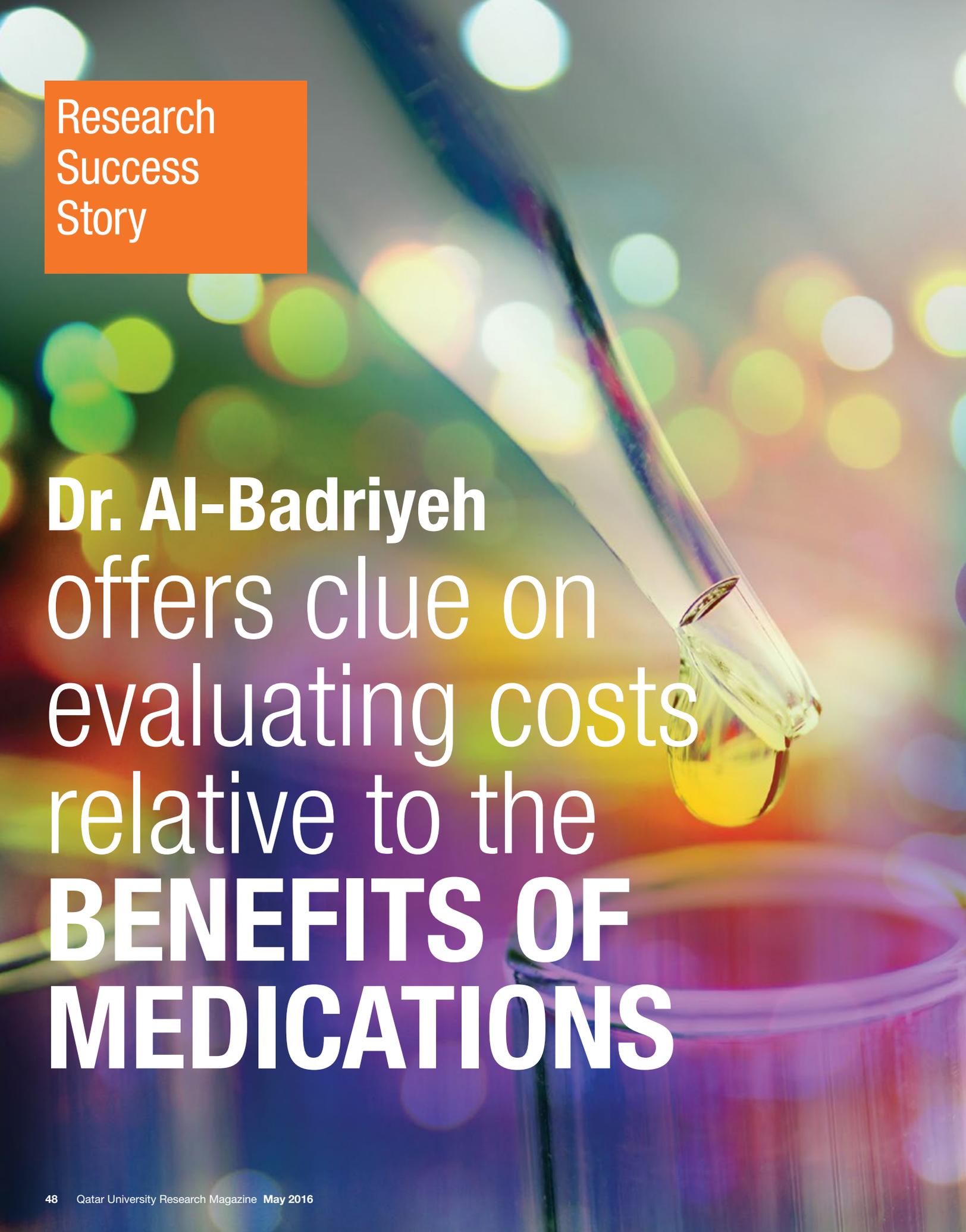
According to him, the next in the project is the development of a genetically modified murine strain expressing mutated forms of CARMA2 (Gly117Ser and Glu138Ala) associated with psoriasis.

This will eventually be used for the following analysis: anatomical and histological analysis, proliferation analysis of keratinocytes, NF- κ B activation analysis and gene expression analysis by microarray, he further said.

“

However, over the past decade, a great deal of evidence has established a role for the immune system and its interactive network of leukocytes and cytokines in the pathogenesis of the disease.”





Research
Success
Story

Dr. Al-Badriyeh
offers clue on
evaluating costs
relative to the
**BENEFITS OF
MEDICATIONS**



“

Every session of the course is mostly of real-life problems for the students to solve.”

Dr. Al-Badriyeh

Drugs are essential ingredients of healthcare and they come at a cost. How do we know if the money we spend on medication is worth the benefit we derive from it? This is the subject matter of pharmacoeconomics or health economics, the study of the economics of pharmaceuticals. Qatar University has the distinct record of being the only university in the country and of very few in the region to host the course. Dr. Daoud Al-Badriyeh, Assistant Professor of Pharmacoeconomics in the College of Pharmacy, is the anchor for the program. In this interview, he explains what the discipline is and talks about one of the research projects he has undertaken in conjunction with the Hamad Medical Corporation (HMC) to ensure that the best of the cost-benefit equilibrium is achieved in the course of dispensing medications.

Insight

Dr. Al-Badriyeh says pharmacoeconomics is not necessarily about reducing utilization costs. "In pharmacoeconomics we aim to know whether the money spent on a medication is worth the benefit received from the particular medication. Here, we do not evaluate medications based on clinical measures only, such as effectiveness and safety, which is what clinical researchers investigate, but it basically incorporates the economic consideration as well," he said. According to him, this is best judged when comparatively evaluated against the outcomes as generated by alternative medications.

"The special thing about pharmacoeconomics therefore, is that it is about considering the interaction between both effects and costs of comparative medications. The pharmacoeconomist is just like any other clinical researcher, but with the added ability of incorporating economic considerations in evaluations," he says. Pharmacoeconomics accordingly is comparative in nature. For example, assuming you have drug A and drug B and both are acting for the same indication against the same disease, with drug A being more effective and drug B less expensive. This is a common scenario that causes confusion in hospitals between decision makers. "Do we go with the more effective or the less expensive?" he asks. Pointing out that this is where pharmacoeconomics comes in, basically to answer such questions, Dr. Al-Badriyeh alludes that by doing pharmacoeconomics evaluations, it can be proved that the less expensive one achieved the minimum required effect for the particular patient in the particular setting. Then will the decision making be towards recommending drug B over A because it's more cost effective despite being less effective?

Dr. Al-Badriyeh said this would only be appropriate if the cheaper one achieved the required and expected effect. "You can have different drugs working on the same indication but they have different levels of effectiveness," he said. Because resources and budgets are limited, offering less expensive medication facilitates the treatment of more people.

Dr. Daoud Al-Badriyeh

Pharmacoeconomics, he says, makes sense when distributing resources in a way in order to be able to achieve the most successful outcomes with the least resources.

Projects

Dr. Al-Badriyeh's research projects do not focus on any particular drug or disease but his priority has always been to answer immediate important questions in relation to major problems that decision makers have in local settings or local hospitals. He is presently working on several projects. A major one is the Qatar National Research Fund (QNRF) National Priority Research Program project on revising the drug formulary in hospitals. A drug formulary in a hospital is a list of drugs from which a clinician is allowed to select drugs. The aim is to revise the list of major group of drugs, classes or families of drugs. He said decision makers in Hamad Medical Corporation (HMC) have the tendency to include most new drugs sponsored by drug companies into the hospital formulary, if these proved to be effective and safe. "Most people think this is a good thing because we have more drugs available. In reality, it is not. Because having different drugs acting in the same way against the same disease is not efficient. It is a waste of resources and importantly, it causes confusion among clinicians and decision makers in relation to which drug to use when all drugs really are the same with minimal differences," he posits. His collaborators, who are major decision makers in HMC are in full support of the project. Its results are already being published in international journals.

One of such medication groups, he says, is statins. Statins are a class of drugs prescribed to lower cholesterol levels in the blood. They have multiple indications as they help reduce the risk of heart attack, stroke, and even death in patients with heart diseases. As already discussed, the HMC formulary inclusion of statins is not very restricted, and is not structured or systematic. Ideally, as in advance overseas practices, formulary inclusion requires a transparent and structured method to comparatively evaluate the different statins entities, in relation to effect and cost. Such method is the typical decision analytic cost-effectiveness method, which is the most common tool used for formulary inclusion decisions in overseas practices.

According to Dr. Al-Badriyeh, while the method is conventional and effective in advanced international practices, this comes with inherited limitations by major disadvantages. Hence, his current project does not apply the typical tools used in advanced practices and countries to select from among statins, but it goes further to develop a comparative selection model that is novel and fixes the disadvantages that exist with the conventional method. “The developed model,” he says, “is based on a novel approach called the multi-criteria decision analysis (MCDA), which is of interest to researchers knowledgeable in the field.”

One disadvantage of the conventional cost-effectiveness evaluation method is that it compares differences in cost and effect between two alternatives for one indication of interest at a time. The novel in the current study however, is the fact that it compares alternatives based on multiple indications, which is especially important for the statins, as they are used in real practice for multiple indications in multiple settings. A second disadvantage of the conventional cost-effectiveness evaluation is that it does not consider all important criteria associated with an intervention. Trade-offs between the multiple decision criteria become required as different criteria will need to be measured by different evaluations, making generating a universal interpretation of these into a single conclusion extremely difficult. This is where the advantage of the MCDA arises. Dr. Al-Badriyeh said it enables incorporating several decision criteria, such as efficacy, safety, cost, social value and dosage form into a single value measure of the alternative, which also takes the importance of each criterion into consideration. Having all decision criteria measured in a single measure enables the decision making based on a simple single evaluation only.

An evidence-based, multi-indication, multi-criteria pharmacotherapeutic model was developed for the scoring of statins from the perspective of the main healthcare provider in Qatar. The literature and an expert panel informed the selection criteria of statins. The decision criteria were: clinical efficacy, best published evidence and experience, adverse effects, drug interaction, dosing time, and fixed dose combination availability. Relative importance

of selection criteria was based on the input of the relevant local clinician population. Statins were comparatively scored based on literature evidence, with those exceeding a defined scoring threshold being recommended for use. Measures of the statins multiple indications were related to effects on LDL cholesterol, HDL cholesterol, triglyceride, total cholesterol, and C-reactive protein. Out of five statins in HMC, atorvastatin, pravastatin, and rosuvastatin exceeded defined pharmacotherapeutic thresholds. Atorvastatin and pravastatin were recommended as first-line use and rosuvastatin as second line alternative. Most important, is that the objective of the novel model was achieved, whereby following the study recommendations is estimated to result in a reduction of the total annual statins expenditure at HMC from QAR 152,118,200 to QAR 125,367,620, which is 17.6% reduction. Adopting the study recommendation to only 70% extent resulted in an annual statins expenditure of QAR 129,654,180. This still translated to a considerable cost savings of 14.8%. (See figure). The work, he said, received excellent reviews when it was submitted for publication.

Comparison with other scholars/ researchers

The College of Pharmacy in Qatar University is the only one in the country and there are no other academic units where pharmacoeconomics research is of special interest in Qatar. Because of this, there is no other advanced research work in this field to compare with Dr. Al-Badriyeh's within Qatar.

But at the international level, regardless of which drug or disease he focuses on, his work has to be competitive in focus, methods and quality. “As you know, there can be many researchers working in the areas that I work on, trying to answer questions in relation to their own local settings. So my work has to always be (and it is always) of innovation, handling aspects of drugs and diseases that no one handled before; for the purpose of being locally relevant, able to publish in impact journals and also for personal development and career advancement,” he said.

Giving an example, he said that in relation to a project on the use of sedative medications in patients on mechanical ventilation in



My research focuses on the clinicoeconomics of medications and the revision of their use.”

the intensive care unit (ICU) of HMC, while there are similar projects abroad for the same purpose, his research team is working on an innovative economic comparative model that does not exist in literature. “In overseas ICU practices, information about economic efficiency of sedatives such as morphine and fentanyl is based on results of comparative studies in adults. There is no data available to guide the use of these in the neonate and infant population in the ICU, which is a particularly problematic population in the ICU of HMC, where recent practice changes have not been guided by local evidence. The comparative model that we are creating enables comparatively evaluating the sedatives based on the special management and consequences associated with neonates” he says. This is locally relevant to the HMC practice and fills an immediate knowledge gap in international literature.

Influence on teaching and student involvement in research

“Research significantly influences my teaching. Due to the practical nature of pharmacoeconomics, the teaching method that I use is the active student-centered method of teaching. Students learn pharmacoeconomics by doing research. The content in every session of the course is mostly of real-life problems for the students to solve. These are obtained from real-life research examples from literature,” Dr. Al-Badriyeh said. He adds that there are even whole sessions where students appraise and criticize full published research articles, identifying limitations and

making suggestions for improvement on the published methods. This is done at the undergraduate level, and even for a higher extent at the postgraduate level, where students are even asked to individually re-conduct methods and data analysis in published literature studies.

He said that in another complimentary course where students are exposed to pharmacoeconomics content, they are even asked to read much of research literature in relation to a topic of interest, so that they could produce “what we at the college call pharmacy review articles, which are mini reviews of published research that students write, to practice on critical thinking, academic writing as well as to identify limitations in literature and make suggestions for improvement.”

As the coordinator of the research-based courses in the pharmacy curriculum, he ensures that students are given opportunity to perform semester-long actual real research projects which include using real pharmacoeconomics methods to answer real practice questions, to produce data that are publishable and can guide decision making. “I cannot think of any other school of pharmacy in the region or internationally, where students are exposed to as much to pharmacoeconomics research as part of their learning of the topic. This is something that was even acknowledged by the external evaluators of the curriculum. All this is necessary if we are looking to maximize the understanding and retaining of information by students,” he said.

He is happy that undergraduate students participate regularly in research as part of Qatar University funded student projects and they produce results. This is in addition to his Undergraduate Research Experience Program (UREP) projects, funded by Qatar Foundation, where undergraduates conduct research. “In relation to postgraduates, I have been in Qatar University for five years, and unfortunately, for the first four years, we did not have a clinical pharmacy and practice postgraduate program in the college,” he says.

This made conducting research and writing of results very challenging, because of the time constrains occasioned by him being

a full faculty member. Dr. Al-Badriyeh said in the last year however, the College of Pharmacy has had the first year of an MSc degree in clinical pharmacy and practice research opening. “I immediately had students joining to do pharmacoeconomics research, and in this year, I have more students. They are already involved in most of the projects that I am handling. So I now have a research group that is expanding, in size and interests,” he said.

Involvement of patients in research

Dr. Al-Badriyeh’s research projects rely on patient data, he said. How patients are involved depends on the methods he uses in a particular research. Patient information according to him can be collected retrospectively from hospital medical records, hospital databases and registries, or can be from literature. These are the sources of patient information in most studies. In other projects he is involved in however, there are patients who are involved prospectively, where data, including blood samples, are collected in real time, while patients receive their therapies. The particular projects, he said, relate to evaluating therapy monitoring strategies and drug use in relation to antimicrobials of interest in HMC and major Australian hospitals.

In Qatar’s interest?

The Qatari interest is a priority to Dr. Al-Badriyeh as he focuses on filling knowledge gaps and answering immediate questions that practices in Qatar have. He is updated about the priority areas as identified in the Qatar National Health Strategy as well as by Qatar Foundation and Qatar University.

“My research has been focusing on clinicoeconomics of medications and the revision of their use, the better utilization of resources and identifying better models of spending, in relation to cancer, cardiovascular medications, newborns, infections, gastrointestinal medications, and I am about to get into the diabetes area as well. And all of these are priority areas and of interest to Qatar,” he said.

“All the capacity-building research is within Qatar, conducted by Qatari researchers, and

building the human capital in Qatar, which is an adoption from the National Health Strategy. No other academic or research unit in Qatar performs the research that we have,” he adds.

According to him, the College of Pharmacy and the expanding research culture in Qatar would benefit from the research projects through the scientific merits and the dissemination of results generated, regionally and internationally. “This is aligned with the mission of the College of Pharmacy in relation to becoming a leading pharmacy school, promoting research and becoming a resource for Qatar and beyond,” he enthused.

Evaluating the Qatari health care system and suggestions for improvement

Dr. Al-Badriyeh said apart from the lack of understanding and application of pharmacoeconomics in routine practices, there are two main challenges he could identify in relation to the health care system in Qatar.

“High prices are certainly a challenge and a burden on the government, which has been the case for many years now. Some years ago, Qatar tried to implement a free pricing system where prices are generally expected to go down due to competition among suppliers in the market. This however failed due to the small size of the market. New drug suppliers were not interested to operate and introduce medications in Qatar, due to the small benefit anticipated as compared to countries with larger utilization capacity,” he said.

The other challenge according to him is that the traditional model of health care in Qatar is hospital focused even though primary care constitutes a major component of health care in the country being more weighted towards an acute, curative, hospital-based approach. “The existing primary care system does not play a sufficiently strong role in preventing, monitoring and treating diseases. This is not efficient in the utilization of resources, not efficient in the flow and process of patient handling, associated with extra spending, and leads to over populated hospitals,” he said.



جامعة قطر
QATAR UNIVERSITY



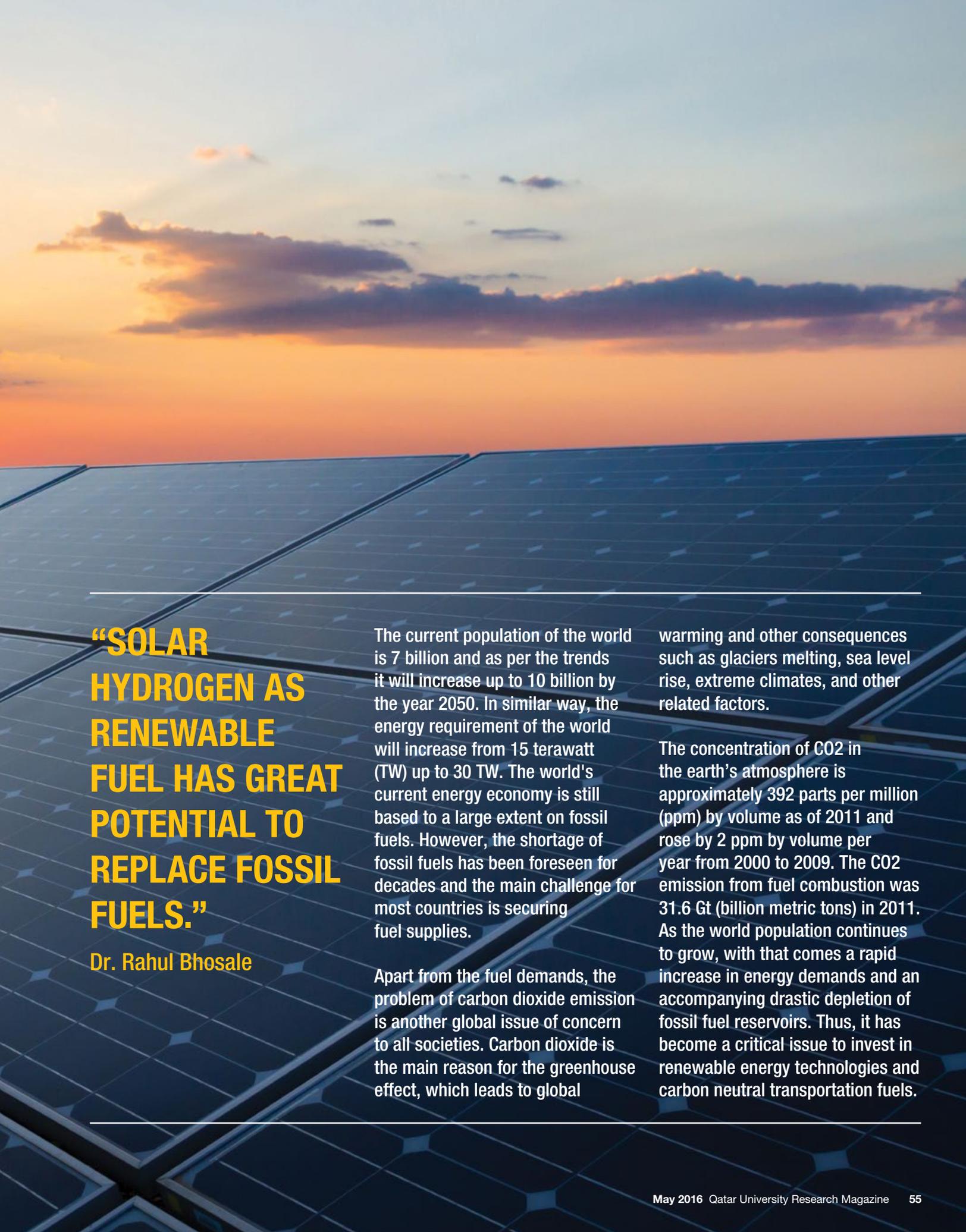
Extracting nanocellulose from palm trees at Qatar University

A promising research project by researchers from Qatar University Center for Advanced Materials (QU-CAM) will serve to extract nanocellulose from palm waste with the aim to overcome negative environmental consequences of its disposal and promote sustainability. This is in line with QU's commitment to tackling local challenges and seeking research solutions for real-world problems.



Research in
Energy

QU PIONEERS RESEARCH ON SOLAR FUEL PRODUCTION



“SOLAR HYDROGEN AS RENEWABLE FUEL HAS GREAT POTENTIAL TO REPLACE FOSSIL FUELS.”

Dr. Rahul Bhosale

The current population of the world is 7 billion and as per the trends it will increase up to 10 billion by the year 2050. In similar way, the energy requirement of the world will increase from 15 terawatt (TW) up to 30 TW. The world's current energy economy is still based to a large extent on fossil fuels. However, the shortage of fossil fuels has been foreseen for decades and the main challenge for most countries is securing fuel supplies.

Apart from the fuel demands, the problem of carbon dioxide emission is another global issue of concern to all societies. Carbon dioxide is the main reason for the greenhouse effect, which leads to global

warming and other consequences such as glaciers melting, sea level rise, extreme climates, and other related factors.

The concentration of CO₂ in the earth's atmosphere is approximately 392 parts per million (ppm) by volume as of 2011 and rose by 2 ppm by volume per year from 2000 to 2009. The CO₂ emission from fuel combustion was 31.6 Gt (billion metric tons) in 2011. As the world population continues to grow, with that comes a rapid increase in energy demands and an accompanying drastic depletion of fossil fuel reservoirs. Thus, it has become a critical issue to invest in renewable energy technologies and carbon neutral transportation fuels.



In Qatar University, a team of researchers led by Dr. Rahul Bhosale, Assistant Professor in the Department of Chemical Engineering, is spearheading research in the field of solar energy and solar fuels. So far, Dr. Bhosale and his team have published 24 technical research papers and have had their research work presented through 38 oral and poster presentations in several national and international conferences such as:

- 2014 Materials Research Society Spring Meeting and Exhibit (San Francisco, USA)

- 23rd International Symposium on Chemical Reaction Engineering (Bangkok, Thailand)
- 2014 AIChE Annual Meeting (Atlanta, USA)
- 2015 AIChE Spring Meeting (Austin, Texas, USA)
- 4th International Gas Processing Symposium (Doha, Qatar) | International Symposium on Chemical Engineering & Sciences (Doha, Qatar)

- My Gateway to Research, Qatar University (Doha, Qatar)

Students and researchers mentored by Dr. Rahul Bhosale have also been garnering awards. Undergraduate research assistant, Dareen Dardor in 2014 received the Best Oral Presentation Award for “A novel two-step Iron oxide – Iron sulfate water splitting cycle for thermochemical storage of concentrated solar energy” at the 4th International Gas Processing Symposium in Doha, Qatar. Graduate research assistant Eng. Mehak Jilani, also in 2014, received the Best E-Poster Award for “Solar thermochemical conversion of CO₂ into synthetic fuels via two-step ceria based redox cycle” at the 4th International Gas Processing Symposium, Doha, Qatar.

Relevance of solar energy

Dr. Bhosale says solar radiation is an essentially inexhaustible energy source that delivers about 100,000 terawatt (TW) to the earth which power exceeds the world’s present rate of energy consumption by about a factor of 10,000. According to him, nowadays solar energy is widely utilized to supply hot water for domestic use. Especially in Europe, distributed photovoltaic (PV) installations have become common for the energy production. The use of concentrated solar energy for energy production on an industrial scale has been mostly restricted to PV, or in the form of high temperature heat harvested in trough systems (one-axis concentrator) or in heliostat fields (two-axis concentrator) to supply the process heat for steam turbines.

These power stations produce electricity that cannot be easily stored. Recently, the use of molten salt storage has been implemented in several plants. This allows shifting electricity production towards the early evening hours and allows a better match of demand and supply. However, the use of solar energy is inherently coupled to the diurnal cycle, to the seasonal variations of the radiation budget, and to the local weather. It thus inherently faces the problem that supply cannot easily be matched to the demand. If an energy-rich chemical (solar fuel) can be produced in an endergonic reaction where the process heat is supplied by concentrated solar radiation, production of the fuel and its use is decoupled. Thus, the problems

related to energy storage, a possible mismatch of demand and supply, as well as transportation of the energy to the consumer, will be solved in an elegant way. To harvest solar radiation and to convert it effectively into renewable fuels such as hydrogen and syngas directly from water and captured carbon dioxide provides a promising path for a future sustainable energy economy. With this scenario, Dr. Bhosale believes that Qatar with its very high solar irradiation of about 2000 kWh/m²/year would be a highly suitable candidate for a future solar fuel producer.

Based on this, he and his research group are focusing their work mainly on the production of solar fuels such as solar hydrogen or solar syngas via thermochemical splitting of water (H₂O) and carbon dioxide (CO₂). Solar hydrogen (H₂), as a renewable fuel, he notes, has a great potential to replace fossil fuels and to contribute to clean energy by reducing the carbon foot-print. The energy density of H₂ (143 MJ/kg) is relatively higher than that of the fossil fuels such as oil (46.4 MJ/kg), gas (53.6 MJ/kg) and coal (32.5 MJ/kg), which makes it attractive as potential energy carrier.

Dr. Bhosale deduces that by using fuel cell technologies H₂ can be converted directly into electricity or added to natural gas fuelled combustion. As combustion of H₂ leads to water, partial replacement of fossil fuels by H₂ will help reducing the carbon foot-print. The production of CO and H₂ constitutes synthesis gas (syngas), the precursor to liquid hydrocarbon fuels via Fischer-Tropsch or other catalytic processes. He says that syngas produced with concentrated solar energy from H₂O and CO₂, the latter eventually captured from air, signifies a promising path toward sustainable energy utilization. Moreover, due to the challenges of demands on alternative fuels and CO₂ emission, the conversion of CO₂ has become a hot spot.

Solar fuel projects

Dr. Bhosale and his research group are currently undertaking three projects towards the production of solar fuels:

Project 1: Solar fuel production via thermochemical H₂O and CO₂ splitting cycle

H₂ and CO produced by the direct solar thermolysis of H₂O and CO₂ are examples of

solar fuels. The direct thermolysis requires ultra-high temperatures (>2500 K), at which gaseous products must be separated to avoid recombination upon cooling and to prevent the handling of explosive mixtures of H₂ and O₂. The process temperatures can be reduced and the separation problem bypassed by using solar thermochemical cycles (STCs) typically based on metal oxides (MOs) as working medium.

In the first step of these cycles, a MO is thermally reduced by concentrated solar radiation resulting in a lower valence oxide or the metal itself. In this strongly endothermic step O₂ is released to the atmosphere.

In the second step, the reduced MO is reoxidized by H₂O, CO₂ or by a mixture of the two producing H₂, CO or syngas. Thus, the MO is not consumed but is cycled between a high valent and a low valent state. Formally, the net reaction of the cycle consists of the splitting of H₂O into H₂ and O₂, the splitting of CO₂ into CO and O₂, or the formation of syngas from the two reactants.

Project 2: Solar Thermochemical Reforming of Qatari Natural Gas

Qatar is one of the top ranked countries in the world today in terms of per capita CO₂ emissions to the atmosphere mostly due to combustion of fossil fuels. The country is working to lower these emissions. It will not be possible to abruptly stop using fossil fuels and switch to cleaner technologies such as renewable energy sources, Dr. Bhosale says. According to him, "One way to decrease the CO₂ output is to adopt a reasonable approach of using an energy mix of fossil fuels with significant portion of carbon free energy derived from renewable resources. Natural gas can be converted into value added renewable products such as syngas (a mixture of H₂ and CO) and H₂."

The Rahul Bhosale research group focused towards metal oxide (MO) based two-step solar thermochemical CH₄ reforming process. Instead of using a traditional catalyst, the steam (or dry) reforming is executed in two different steps: (1) the strongly endothermic solar methanothermal reduction of a MO and (2) its slightly exothermal non-solar re-oxidation by either steam or CO₂, the latter resulting in dry reforming of methane. Thus, the metal oxide is cycled between a

high valent and a low valent state and is not consumed during the cycle.

The methanothermal reduction of CH₄ produces syngas with a H₂/CO ratio equal to 2.0, which is highly suitable for the production of synthetic liquid fuels via Fischer-Tropsch process. Side reactions such as the water-gas shift reaction is avoided as CH₄ and H₂O vapor, as reactive gases, are used in two different reactions. The reduced MO or metals can be either used to produce pure H₂ (re-oxidized by H₂O) or CO (re-oxidized by CO₂). Additional syngas is obtained if the re-oxidation is performed with a mixture of H₂O and CO₂.

Project 3: Solar H₂ Production via Metal Oxide – Metal Sulfate Water Splitting Cycle

In addition to the metal oxide based solar thermochemical water and CO₂ splitting cycle, Dr. Bhosale and his research team are also dealing with the Solar H₂ Production via Metal Oxide – Metal Sulfate Water Splitting Cycle. Utilization of metal oxides as the catalytic materials (instead of noble metal catalysts) and converting the sulfur iodine and hybrid sulfur cycle into a 'metal oxide – metal sulfate' cycle operated using concentrated solar energy is one of the alternative to achieve H₂ production at moderate temperatures.

Solar 'metal oxide – metal sulfate' thermochemical cycle utilizes solar energy, metal oxide (MO), SO₂ and H₂O for the production of H₂ and O₂. It is a two-step process in which the first non-solar step belongs to the exothermic oxidation of MO by SO₂ and H₂O producing metal sulfate (MSO₄) and H₂. The endothermic step two corresponds to the solar thermal reduction of MSO₄ into MO, SO, and O₂. The MO and SO₂ produced in step 2 are recycled back to step 1 and hence can be used in multiple cycles.

The following different aspects of the above mentioned three solar fuel production processes are being dealt with and analyzed:

- Synthesis of different metal oxide materials with different crystal structures such as spinels, wustites, perovskites, mixed oxides.
- Exploring various synthesis approaches such as sol-gel, co-precipitation, solid



Team members in the lab

state, combustion synthesis, SHS, aerosol, sol-gel auto combustion towards metal oxide synthesis

- Improving the redox reactivity and thermal stability of the metal oxides derived
- Physico-chemical characterization of synthesized materials by using different analytical methods such as: Powder X-ray Diffraction (PXRD), scanning and transmission electron microscopy (SEM & TEM), High Temperature XRD (HT-XRD), BET Surface Area Analyzer (BET), X-ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-ray Spectroscopy (EDS), Inductively Coupled Plasma (ICP) elemental analysis.
- Testing the redox reactivity and thermal stability of the derived metal oxides towards solar fuel production by using thermogravimetric analyzer, high temperature packed bed reactor set-up, and solar reactor.
- Computational thermodynamic modeling of the solar fuel production processes.

Project 4: Solar Powered Water Pump and Process for Reverse Osmosis Desalination

Freshwater scarcity, demographic changes, and industrialization are driving an urgent need to increase global, sustainable supply of freshwater resources, Dr. Bhosale says, and

water production will contribute significantly to increased energy use. Current desalination techniques are typically very energy intensive: energy consumption can account for up to 70% of the desalination costs. Reverse osmosis (RO) is one of the most widely employed technologies for water desalination.

A drawback of this technology, according to him, is high consumption of electricity by electric motors used for high-pressure water pumping. High capital costs due to expensive high-pressure water pumps and concentrate water energy recovery systems such as pressure exchanges and Pelton turbines is another drawback. This project deals with the development of innovative energy efficient, inexpensive, robust water pump powered by solar energy and new RO desalination process. The major objective is to lower significantly the desalination costs.

Team members

In these projects, Dr. Bhosale is enjoying the collaboration of and support from Dr. Anand Kumar, Assistant Professor in the Department of Chemical Engineering at Qatar University; and Dr. Fares AIMomani, Associate Professor in the Department of Chemical Engineering at Qatar University.

Complementing the team are three graduate research assistants - Ahmed AlNouss, Mehak Jilani and Shahd Gharbia. There are also eight undergraduate research assistants - Dareen Dardor, Shiva Yousefi, Moustafa Hussein,

Manar Ali, Zineb Bouabidi, Mohammad Saad Anis, Mohammad Hamza Usmani, and Deema Alhams. It is expected that two postdoctoral fellows will join the research group in the near future.

Funded Projects

The team has benefitted from four funded research projects. One has ended while three are ongoing. The Qatar University funded project on “Solar Thermochemical CO₂ Reforming of Natural Gas: Thermodynamic Analysis” successfully ended in March 2014. The other QU funded project on “Post Combustion CO₂ Capture Using Amine Based Reactive Solvents” which started in April 2015 will end in March 2016.

There are two National Priority Research Program (NPRP) projects being funded by the Qatar National Research Fund (QNRF) of Qatar Foundation. There are on “H₂ and Syngas Production from Two-Step Solar Thermochemical Catalytic CO₂ Reforming of Qatari Natural Gas” and “Solar Powered Water Pump for Reverse Osmosis Desalination” respectively. Both of them would run from January 2015 to December 2018.

International collaboration

Contributing efforts, knowledge and expertise, to the quest for solar fuels coming from the labs of Qatar University, are experts from institutions in various countries.

They include Dr. Ivo Alxneit, Senior Scientist at the Solar Technology Laboratory of Paul Scherrer Institute, Switzerland; Prof. Jonathan Scheffe, Associate Professor of Chemical engineering in the Department of Mechanical & Aerospace Engineering, University of Florida, USA; Dr. Alexander Kronberg of Ecnotech B. V. of The Netherlands; and Dr. Sukanta K. Dash, Assistant Professor of Chemical Engineering in the Department of Chemical Engineering, School of Technology, Pandit Deendayal Petroleum University, Knowledge Corridor, Raisan, Gandhinagar, Gujarat, India.

Qatar National Vision 2030

Dr. Rahul Bhosale says the projects would have positive impact the Human Development, Economic Development and Environmental

Development pillars of the Qatar National Vision 2030. He said since the country's hydrocarbon resource will eventually run out it is highly important to work on new energy sources for the future of Qatar. In this regard, education and research towards energy sources will cover the Human Development pillar as Qatari students would be trained and educated to achieve international level cutting edge research.

It is important for Qatar, he says, to work on optimum utilization of nonrenewable hydrocarbon resources to ensure continuous economic development in the future.

"Our aim is to replace/reduce fossil fuel utilization towards production of transportation fuels such as gasoline, diesel and jet fuel with renewably prepared solar fuels such as solar H₂ (which can be used as a fuel directly) or solar syngas (which can be utilized for the production of liquid transportation fuels via Fischer Tropsch Process)." With this, the depleting reserves of fossil fuel will be saved and utilized for other developments.

Professors speak

"This is the only research in the entire Gulf region that is working towards the production of solar fuels by thermochemical splitting of water and CO₂ using metal oxide based redox reactions", Dr Bhosale said, noting that Qatar has one of the highest solar irradiation rates in the world and that the research would serve to generate a potential option for the replacement of fossil fuels by solar fuels in the transportation sector.

Dr. Anand Kumar said: "Solar energy harvesting and its direct utilization to drive chemical changes could play a significant role in the energy sector in future."

Students comment

In Dr. Bhosale's team is made up of a group of enthusiastic and motivated students who cherish every moment they spend working on the projects. "This is actually my first time working as a research assistant. It has so far been a wonderful experience which has helped me enhance my research skills in a field that I find to be very interesting. In fact, from my point of view solar fuels are the future," said Daren Dardor. For Jamila

Folady, "Being part of such an important research project boosted my interest in research as a future career in which I can continue to work on issues that will have positive impact on the community".

Eng. Ahmed AlNouss: "Science and innovative research (in the field of solar fuel production) supports the chemical science community to help create a sustainable energy future and change global power options."

Moustafa Hussein: "Having the opportunity as an undergraduate to conduct research has highlighted QU's commitment to empowering students early in their academic experience to be curious, innovative, and develop strong observation and critical thinking skills that add value to their academic and personal development".

Shahd Gharbia: "Working as a research assistant for this project was a great chance which enhanced my academic research skills as well as my job prospects. I was able to participate in international conferences and publish papers in international journals".

Mohammad Saad Anis: "The research topics are very innovative and interesting. The experience has been great, enjoyable and appealing. We were selected on the basis of our potential not on how famous or how many contacts we have. Our hard work paid

off here. It's a gateway to build our future."

Manar Ali: "The belief that research is the gateway for new inventions and discoveries motivated me to join the Rahul Bhosale Research Group.

Working as a research assistant has affected my skills and knowledge positively. Additionally, gaining new experiences by dealing with different programs is one of the benefits that I have gained by working on the solar fuel production research."

Zineb Bouabidi: "Being a part of the research group has enhanced my knowledge about this interesting field. I would like to point out that more actions need to be taken to enhance the field of solar fuel production."



Qatar with very high solar irradiation is suitable as a solar fuel producer."



Researchers considering issues

Our Exclusive

QU-BRC seminar raises awareness about zika virus disease



Dr. Mohammed Al-Hajri

Qatar University Biomedical Research Center (QU-BRC) held a seminar on 'Zika Virus and Public Health Response in Qatar'. It was organized in collaboration with the Ministry of Public Health.

Moderated by Dr. Hadi Yassine, Assistant Professor of Infectious Diseases at QU-BRC, the seminar was an opportunity to raise awareness about the Zika virus phenomenon and its implication on global health, while focusing on Qatar's response strategies regarding the health issue.

It featured presentations by Dr. Mohammed Al-Hajri, Director of Emergency Preparedness and Response Department, Supreme Council of Health (SCH); Dr. Shazia Nadim, Acting Head of Surveillance and Outbreak, Public Health Department, SCH; Dr. Elmoubasher Farag, Acting Head of Communicable Diseases Control Programs,

Public Health Department, Ministry of Public Health; Dr. Hassan Altigani, Test Confirm Specialist, Ministry of Municipalities and Environment; and Dr. Mohamed Nour, Public Health Specialist, Communicable Disease Control Department, SCH.

While presenting on 'The current situation of zika virus and the national response framework', Dr. Al-Hajri said that the World Health Organization (WHO) has declared a Public Health Emergency of International Concern (PHEIC) over the mosquito-borne zika virus disease which could be transmitted during pregnancy to unborn babies.

According to him, since there is no specific vaccine or treatment yet for the disease, the best form of prevention is protection against mosquitoes especially through the use of insect repellants. Speaking on 'Human

Surveillance for Zika Infections', Dr. Nadim, alerted that about one out of five people develop symptoms associated with the zika virus disease, emphasizing as well that since there is yet no vaccine to prevent it, people in endemic areas also need to wear long sleeve shirts and long pants.

She said that although the disease has not yet been reported in Qatar, a surveillance case alert has been developed and distributed to all hospitals and health facilities in the country. In addition, all Qatar Airways flights from affected countries are disinfected while screening of blood donors for recent travel history to affected countries has been instituted, Dr. Nadim added.

While advising people to also make use of the zika mobile apps developed by WHO to update their knowledge about the disease and access available information, she said

that Qatar has set up two 24/7 hotlines for people to reach the relevant agencies anytime. The numbers are 66740948 and 66740951. The issue of 'Vector Surveillance and Control' was treated by Dr. Farag and Dr. Altigani. Dr. Farag said the aedes mosquito, which causes the zika virus disease is adaptable to human habitation and that the eggs can remain dry for up to 400 days.

He said that steps were being taken to develop a National Strategy for Surveillance Control of Disease Vectors of Public Health Concern in Qatar. Dr. Altigani outlined preventive and control measures against mosquitoes in Qatar and urged people to use mosquito nets, tightly knit mesh and insect repellants as well.

Dr. Nour on his part spoke on "health education and risk communication". The seminar attracted participants from the Ministry of Public Health, Hamad Medical Corporation, Sidra Medical and Research Center and Qatar University colleges and research centers.

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Since there is no specific vaccine or treatment yet for the disease, the best form of prevention is protection against mosquitoes especially through the use of insect repellants.”

- Dr. Mohammed Al-Hajri



Dr. Elmoubasher Farag



Expanding literacy programs crucial for **national vision**

“ The need for scientific research has become a priority as the world is in an excited race to achieve the greatest possible accurate knowledge.”

Following his recent success at the Abdul Hameed Shoman Award for Arab Researchers, Qatar University Research Magazine caught up with Dr. Fathi Ihmeideh to find out more about his winning, gain insight into what influenced him to go into his research area and know what advice he has for those considering careers in early childhood education. An associate professor of Early Childhood Education at the Department of

Psychological Sciences in the College of Education at Qatar University, Dr. Ihmeideh has extensive experience in teaching, training, leading research projects, developing kindergarten curriculum, parenting programs, preparing and evaluating kindergarten teacher education programs, assessing educational awards and consulting.





Dr. Fathi Ihmeideh

He has contributed to over 40 peer-reviewed publications in the areas of emergent literacy, parental involvement, and early childhood teacher education; most of which were published in reputable journals with impact factors.

He is also an active reviewer in several international journals. Besides, Dr. Ihmeideh has numerous research papers published in conference proceedings and two books, one of which he translated from English into Arabic. Consequently, he won the Abdul Hameed Shoman Award for Arab Researchers in 2014 in recognition of his outstanding achievements. The award was in the Art and Human, Social and Administrative Sciences category of Child Education Sciences.

It was essential to know how Dr Ihmeideh felt on winning the award and why he decided to participate. He admitted being pleased at the recognition which underlines the level of research being conducted in the field of early childhood education. Hence, this serves to contribute to the

dialogue on child development among educators, researchers, teachers and parents.

Dr Ihmeideh reflected that his attraction was to get his research read and spread. "For me personally, it is to increase the citations of my research and H-index simultaneously," he said. He believes that he has made significant contribution in the field of early childhood education and his research deserves recognition.

Race for knowledge

He continues: "The need for scientific research has become a priority as the world is in an excited race to achieve the greatest possible accurate knowledge to ensure the comfort and well-being of the human society. I believe that research can solve many problems, whether they are economic, health, political or education.

It can be said today that scientific research has become one of the essential areas that contribute to the growth of countries." It is

noteworthy to mention that Dr Ihmeideh's major field of Early Childhood Education is research based.

The focus of his PhD was on the area of early literacy development. Later, he developed several areas of research related to early literacy development and began investigating these areas.

It was interesting to get a glimpse into his research interest, and he was ready with explanations. "My research interest includes emergent literacy, developmentally appropriate practice, and parental involvement in children education, early childhood teacher education, and play in the early years," he said. In the last three years, he has focused on another important area of research which is early childhood technology.

"I started studying how children acquire technology skills, and the impact of ICT (Information and Communication Technology) in their development and learning, Dr Ihmeideh says. "We live in



Almost every aspect of people's lives is affected by technology these days."

research grant under the Undergraduate Research Experience Program (UREP). The students will be mentored in all stages of the research," he added.

He explained further that this will enable the undergraduate researchers to attain research experience early and become successful researchers in the future.

The students play an active role in all phases of the research process as they are going to: examine the literature review, participate in developing the research instruments, pilot the research process, learn how to evaluate children's websites based on the developmental perspective and participate in evaluating children's websites which are used in Qatari schools separately.

He also said that their aim is to know to what extent specific websites are developmentally appropriate for children's age, individuals and culture. "We are going to interview children and listen to their voices. We have already created a scale based on extensive review to evaluate these educational websites that our children use," he added.

He continues: The second grant is an NPRP (National Priority Research Program) project. It will aim to develop children's literacy skills through establishing family literacy in Qatari kindergartens. Dr. Fathi is currently working on different research projects.

"One of them is based on an internal grant which I and my colleague Dr. Fatima Al-Maadadi received recently from the Office of Academic Research (OAR) at Qatar

University. This project aims at improving early childhood teachers' skills in using ICT effectively in their teaching practices. We interview teachers and attend classroom observations in teachers' daily routine.

After that, we are going to train teachers on how to use ICT in a developmentally appropriate manner," he said.

When asked what effects his researches have had on the way children are managed, Dr Fathi believed that he has achieved some of his aims, through increasing awareness among educators on the importance of the first five years in developing children's literacy skills. "I share the findings of my research with early childhood researchers, colleagues and students to provide the best learning possible for our new generation.

Based on Google Scholar records as well as other research websites like research gates and SCOUPS, I have noticed that the citation of my research is increasing from day to day and that means my research is viewed and read by many researchers worldwide and they can make use of it to develop the quality of education for young children," he said. "I hope to have obvious positive impact in the new future," he added.

QU Making Impact

Dr Fathi, who joined Qatar University in 2012, is positive that the institution is making impact globally with its recent ranking among the world's top 500 universities. "Qatar University has achieved a great achievement for being ranked as one of the world's top 500 universities. This is impacted by professors and researchers at the university who publish in leading international journals and who have been awarded research grants or even recognized outside.

I hope this award plus our future publications will add to Qatar University's achievement and take it higher in the ranking." "My award is one of the most significant in the region," says Dr Fathi. "It will give me the boost to work collaboratively with other early childhood researchers from different institutions in the world and facilitate the achievement of the objectives QU's 5 year research roadmap. The area of my research is also aligned with Qatar's National Priorities Research Program.

I should also say that this achievement is a reflection of Qatar University's commitment to fostering a research environment and encouraging researchers to do their utmost in their areas of specialization."

With reference to the Qatari National Vision 2030, Dr Fathi said, "With so much passion, I hope that my previous, current and coming projects have tackled or will focus on three major areas (i.e. literacy development, parental involvement in early years, and early childhood technology) which are really related to both the National Vision and the National Development Strategy for 2011–2016."

He stated that since the Qatar national Vision 2030 emphasizes the importance of ICT in enhancing and supporting education in all educational stages, fostering students' language and literacy skills and expanding literacy programs at all K-12 levels are important goals.

He said that the objectives of his research projects align with the aims of the Qatar National Vision 2030 which charges parents and teachers with the responsibility for the achievement of success at all levels of the education system. This means that the importance of improving parental and community participation is an important goal in addressing quality education in Qatar, he said.

My department at the College of Education at Qatar University is known to have three major areas of research: educational psychology and mental health; special education and early childhood education. These areas are open to any researcher who can make significant and relevant contributions and add to the existing theories and practices in their fields.

"My humble advice", Dr Fathi says in respect of psychological science researchers, "is that they should tackle new contemporary trends, start from what other researchers end with by keeping in touch with latest research papers, focusing on experimental studies plus letting the voice of participants be heard instead of just writing on behalf of their perspectives, beliefs, and views."

Our Exclusive

QU-BRC seminar x-rays basics of stem cells and regenerative medicine

Within the framework of activities of the Biomedical Research Center at Qatar University (QU-BRC), a seminar that tackled the possible use of Neural Stem Cells (NSC) for treatment of central nervous system diseases (brain and spinal cord) was held.

The seminar highlighted the role of stem cells as important tool for regenerative medicine, a relatively new branch of medicine that deals with the possible use of stem cells for renewal and regeneration of body tissues and organs.

The seminar was presented by Dr. Hany El-Sayed Marei, professor and project manager at QU-BRC, who clarified that there are two types of stem cells in the human body: the embryonic stem cells, and adult stem cells.

The embryonic stem cells, he explained, are derived from the inner cell mass of 5-6 day-old human embryo whose cells are very active and have the ability to renew themselves, and produce the different types of cells (more than 200 types) that form the human body.

The presentation offered a summary of latest researches relevant to the therapeutic potential of OBNSC-based therapies for Alzheimer's disease (AD), Parkinson's disease (PD) and spinal cord injury (SCI), discussing the major impediments against their successful translation into clinical.

According to Dr. Marei, the adult stem cells are located in different organs of the human body, and are responsible for the renewal of damaged cells/tissue at the time of need.

Dr. Marei said that the research team which he leads at BRC had succeeded to isolate the neural stem cells (NSC) from the olfactory bulb of human during brain surgery; grow NSC in lab by culturing them in specific



Dr. Hany El-Sayed Marei

media; genetically engineer the NSC to secrete nerve growth factor (which helps in renewal of nervous and brain tissue); and develop animal (rat) model for Alzheimer's disease (AD), Parkinson's disease (PD), and spinal cord injury (SCI).

He said following transplantation of NSC into the brain of the animal models, the NSC had succeeded to survive, proliferate, and specialize to renew different cell types forming the brain.

He informed the participants that the outcome of stem cells research at QUBRC has provided strong evidence at the pre-clinical level (in animal model) for the

possible use of NSC for cell-based therapy for AD, PD, and SCI. It should also be noted that the stem cells research Dr. Marei conducted in collaboration with QUBRC was selected for Honorable Mention in the 2015 World Stem Cell Summit from among more than 300 accepted posters.

Dr. Marei said that a critical issue is technological advancement that has permitted remarkable increase in both human life expectancy and the percentage of the adult population surviving into old age.



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انضم إلينا اليوم!