

Our Exclusive

QU sets up first zebrafish facility in Qatar



Dr. Gheyath Nasrallah leads the zebrafish facility team

Qatar University (QU) in collaboration with Qatar Cardiovascular Research Center (QCRC), led by heart surgeon Prof Magdi Ycoub, has set up the first zebrafish animal facility in Qatar. It is located in the QU Biomedical Research Center (BRC) headed by Dr. Asmaa Al-Thani, Head and Associate Professor of Virology, Health Sciences Department, College of Arts and Sciences.

The project is being supervised by Dr. Gheyath Nasrallah, an Assistant Professor in the Biomedical Science Program of the Department of Health Sciences, College of Arts and Sciences at Qatar University. Dr. Nasrallah obtained his PhD in Microbiology & Immunology from Dalhousie University Halifax, Canada. His PhD project elucidated the roles of the two bacterial genes, *htpB* and *potD*, in the pathogenesis of the fresh water pathogen *Legionella pneumophila*. He received his postdoctoral fellowship training in Dr. Jason Berman's zebrafish lab at the IWK Health Center, Canada. Dr. Nasrallah's postdoctoral work was part of a Genome Canada funded project that aimed to identify novel genes and therapeutic interventions for a number of orphan diseases using the zebrafish animal model. *Danio rerio*, better known as zebrafish, has been extensively used as a model system

for studying developmental processes. In the last 10 years, it has also emerged as an attractive and favorite tool for modeling many human diseases. It shares a large genetic resemblance to humans, and nearly 85% of human disease genes have functional homologs in zebrafish. According to Dr. Nasrallah, the biology of zebrafish has many advantages which make them a valuable tool for scientists. They are easy and inexpensive to grow and maintain in the lab environment, making it easy to raise thousands of fish at a reasonable price. Each fish can lay more than 200 transparent eggs per week which are fertilized and developed externally outside the fish body. The developmental process of the zebrafish is quick and most of the fish organs are formed in less than 24 hours post fertilization.

Dr. Nasrallah said the external fertilization provides simplicity in the observation and manipulation of genetic regulation and developmental processes that cannot be easily performed in mammals. In addition, the embryonic transparency provides a unique opportunity to easily observe genotype-phenotype functional relationships and evaluate cell-cell interactions in a whole animal multi-organ system environment. These advantages place the Zebrafish in an

excellent evolutionary position whereby both tissue-specific and whole organism non-cell autonomous interactions can be simply investigated. Collectively, he added, the numerous advantages of the zebrafish model demonstrate that it would be a valuable tool for understanding the pathogenesis of common and uncommon human disorders and eventually the discovery of new therapeutic agents for treatment of these disorders. Dr. Nasrallah said with cardiac diseases a high risk among the Qatari population, using the zebrafish model for cardiovascular research promises an understanding of the disease mechanisms in vivo and to reveal potential novel drug discovery.

"Zebrafish model has been proved to be an excellent model for studying human cardiovascular disease. The zebrafish research team will establish a zebrafish model of human cardiac hypertrophy and heart failure by genetic knockdown of *mybpc3*. We will characterize the phenotype and expression pattern of *mybpc3* gene in zebrafish. Once the mutant zebrafish is established, it will be used for revealing disease associated pathways and agents in targeting these correlated pathways as a potential therapeutics to improve the health and wellbeing of cardiac patients," he said.

In addition to the zebrafish facility, Dr. Nasrallah's lab also has an infectious diseases research section. Currently, Dr. Nasrallah and his team are investigating molecular and sero-epidemiology of blood-borne viruses among healthy blood donors in Qatar. "In this project, we utilize different detection methods including PCR, qRT-PCR, and ELISA for detection of these viruses. Further, we are also interested in phylogenetic analysis of the detected viruses in order to have a better understanding of the most predominant genotypes of the viruses in Qatar and in the Gulf region," he added. In Dr. Nasrallah's team are Lab Manager Ms. Enas S. Al-Absi, two research assistants Ms. Nadima Haj, and Mr. Tameem Hadwan; and two masters' students Ms. Maria Smatti and Ms. Salama Al-Taweel. The functional genomic zebrafish lab has two research associates, Ms. Sahar Daas and Dr. Eman Mohamed.

Our Exclusive

Housemaids, food handlers arrive with intestinal infections



Dr. Aarti Sharma

A study conducted by researchers in Qatar University in collaboration with Hamad Medical Corporation (HMC) has indicated that a significant number of workers coming to Qatar as housemaids or to serve in the food industry on arrival have some intestinal infections, a finding that is of great importance to public health in the country. The project was undertaken under the supervision of the principal investigator, Dr. Marawan Abu-Madi, Assistant Professor of Biomedical Sciences in the Department of Health Sciences of the College of Arts and Sciences, Qatar University.

Dr. Abu-Madi is a parasitologist. Members of the research team include Dr. Jerzy Behnke, collaborator from United Kingdom; Dr. Aarti Sharma, Miss Haneen Alberdaweel and Miss Roda Al-Jhrahim, research assistants at QU. According to Dr. Sharma, the lab investigation work focused on parasites and data analysis of patterns of infection among housemaids and food handlers arriving in Qatar from different regions of the world. Intestinal parasitic infections are among the major diseases of concern to public health throughout the world, according to a World Health Organization (WHO)

report. In recent decades the Arabian Gulf region has seen enormous growth mostly facilitated by oil and gas reserves and this growing economy has attracted many immigrants seeking work from less affluent states in Asia and Africa.

Qatar, in particular, has seen an enormous influx of immigrant workers for growing building and infrastructural projects, as well as for food industries and domestic purposes. Dr. Sharma said the ongoing study which started in 2005 and is approved by the Hamad Medical Corporation has led to some important conclusions. "The study was based on a survey of intestinal parasitic infections among immigrants in specific jobs (food handlers and housemaids) arriving in Qatar for the first time. Random samples were collected from healthy workers at the Medical Commission soon after arrival, during their participation in routine health examination prior to starting work," Dr. Sharma said. According to her, the workers were fully informed before being enrolled for the study while a record of their age, sex and nationality was kept. The samples were processed at the parasitology laboratory of the Hamad Medical Hospital. This

study was conducted among 1,737 housemaids and food handlers originally from Philippines, Indonesia, Indian sub-continent and Africa who were sampled over a two year period.

Although both males and females were enrolled for the study, the percentage of females was more compared to males. All the female subjects were between 15 and 25 years old while the males were between 20 and 50 years. "We studied a total of three nematode and four protozoa," Dr. Sharma said. 33.9 percent of the subjects were found to be positive for at least one of the species. The prevalence of the parasites was more among the females than males. Geographically, the prevalence was found to be more among Africans, followed by those from the Indian sub-continent with the individuals from Indonesia and Philippines being intermediate.

Commonest parasites like hookworm and *Ascaris lumbricoides* were found to be more prevalent among Philippine housemaids. All the parasite species that were quantified indicated that at least 30 percent of the subjects were infected. Despite the low prevalence, some individuals were found to be heavily infected with eggs or cyst which is also a threat to public health. "Our analysis has clearly shown that female subjects in particular are more infected with parasites on arrival in Qatar; therefore greater vigilance is required to identify such subjects before employing them as housemaids or as food handlers. One approach that has been shown to work effectively (other than personal hygiene) is to ensure treatment of potential immigrants in their country of origin, before departure and arrival at their destination and this could be implemented at the time migrant workers seek visas and work permits, whilst still abroad," Dr. Sharma further said. At the national level in Qatar, continued vigilance, long term monitoring of new arrivals, follow-up inspections, and frequent analysis of new data collected are highly desirable to safeguard public health in the years ahead, she added.

Our Partners

Leading heart surgeon **Prof. Sir Magdi Yacoub** talks to QU Research Magazine



This section will showcase 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.



Prof. Sir Magdi Yacoub

“For QU and QCRC, it is win-win, says Prof Magdi.”

Qatar University (QU) and Qatar Cardiovascular Research Center (QCRC) have a promising symbiotic relationship, says leading heart surgeon Prof. Sir Magdi Yacoub, Executive Director of QCRC. Both institutions have signed a Memorandum of Understanding (MoU) to advance research in cardiovascular health and improve heart health. The collaboration from all indications is yielding benefits as students from QU benefit from the mentorship of QCRC researchers. In this interview, Prof. Magdi speaks about the benefits of the collaboration between QU and QCRC and the efforts of bodies associated with him in improving global health.

Recently, Qatar University (QU) and Qatar Cardiovascular Research Center (QCRC) signed a Memorandum of Understanding (MoU) to foster research on cardiovascular health. How will this enhance student sponsorship and access to research facilities in both institutions?

What we have seen from the beginning is that the two institutions are complementary because there are a lot of human resources in the form of students who are very bright and prepared to learn and research. They have facilities as well to be fully engaged. In QCRC, there are state-of-the-art equipment and people working on the latest topics in cardiovascular research, from heart muscle to stem cell to electrical activity in the heart and

irregular heartbeat, biomechanics, inherited heart diseases, genomics and molecular biology. All these are very advanced. We need good people, PhD students to learn the new methods and contribute to us because young students always have ideas. They learn and go back to Qatar University and apply what they learnt for the health of the country. It is a very symbiotic relationship. It is what I call win-win relationship.

The establishment of the Qatar University Biomedical Research Center is a milestone in the university's quest to achieve greater height in medical research. Is there a potential first project between the BRC and QCRC?

There is definitely. They are establishing a facility for bioscience. By that I mean animal models. We have only zebra fish at QCRC because of space and now we are housing it with Qatar University Biomedical Research Center. They will have transgenics, a lot of models where they have animals which express abnormal human genes. We have technology to make use of that because we come from translational research, from humans to stem cells, carrying the disease as a human model and then create the animal models, whether mouse or zebra fish. You will be surprised at the amount of knowledge which can be gained from that because once we know the mutation we put it in.



We publish a very high quality journal which tackles the latest global cardiology science and practice. It is an open access journal published by Qatar Foundation.”

At one time all the world thought that the human genome would conquer everything. But it was only the beginning. As you discover the abnormal gene you would want to know what it actually does.

What is the mechanism of the mutation? Alright you know the gene but how it acts and how you counteract the effect of the mutation in the body is much more important. For that you need molecular biology like we have and also animal models.

You see what happens with the zebra fish or mouse and you give the specific treatment to correct the genetic mutation at molecular level, what we call genetic engineering. We can then inject it back into the animal and cure the diseases. Some of the very serious diseases can be cured in the future because of that kind of thing.

The other important thing is the Biobank which is attached to Qatar University. We have been discussing to know the extent and type of diseases in the normal population of Qatar and compare that to what we see the people come to the clinic with.

We must have control to see what is in the genes of the ones who come to us as compared to the ones who do not come. And for the ones that do not come what are the differences which can pre-dispose them to disease so that we can help treat these conditions early if they have them.

The Biobank to us is a very good plus which will add to what we are already doing in the lab and hospital with Hamad Medical Corporation and Sidra Medical and Research Center. This large collaboration between all the research bodies, including obviously our keenness to work with Qatar University is contributing greatly to our output.

We have excellent three PhD students who work with us. We have taken some of them to Imperial College in London and Oxford University. We have some of them working with us in the lab. They are of excellent quality. Indeed we are very happy with this.

If you have all the latest equipment in the world and you do not have bright students, teachers cannot just sit there and teach nobody. The supervisors of the PhD students

are not just supervising what they do but are advancing them to become top scientists in the future.

How many researchers can we expect from QCRC to be engaged in activities in QU?

That is an evolving number. I think there are already seven or eight but that probably will increase to three times as time goes by because you have to pick very bright students and find something they are interested in. So, gradually the number is increasing. It's very hard for me to say how many but it could double or triple in the next couple of years.

Were there previous efforts at collaboration between QU and QCRC?

Yes, indeed. We have appointed some people working in genetics from Qatar University but also the two very big projects which I have mentioned – the zebra fish and animal models – and now the evolving one of the biobank which Qatar University is playing a big role with Dr. Asmaa Al-Thani.

We are collaborating in what else we do following the human genome or Genome Qatar. We concentrate on many aspects of cardiovascular health. That again is a win-win situation.

How will the partnership contribute to the realization of the objectives of Qatar National Vision 2030?

By doing translational research and joining forces between studying physiology, studying incidents of diseases and severity in the community and finding the mechanisms, we are contributing to the realization of the objectives of Qatar national Vision 2030. That is why we want to do to improve cardiovascular health among the Qatari population.

What can you say about the graduates of Qatar University who are working in Qatar Cardiovascular Research Center?

They are young but very, very bright and hardworking. I am very optimistic of what they are going to do in the future because the quality is very high. So also is the interest. The last time I was at Qatar University I asked

for more although there are limitations on the number of positions we have. Obviously, we love the collaboration.

Why was the QCRC established? What aims is it supposed to achieve?

The QCRC was established to improve Qatari cardiovascular health, including the expatriates and the world at large because we want research, especially translational research from this region to have a major impact on world health. You cannot do all the translational research in Western Europe, UK and Australia. You need data from this region. As a result, everybody benefits. They benefit as much as we benefit.

We want to make Qatar a hub for science. Already we are collaborating with people in the Gulf area in doing genetic research and recruiting patients. We are already going to Kuwait; we will go to Oman and Abu Dhabi. Making Qatar a hub for science is a priority.

We also have an interest in neglected diseases. I mean conditions like rheumatic heart disease which is not very high here but in Yemen. Egypt also is following it. It affects the joints and the heart. We are researching into that. We want to stop all these diseases. This is what we call global health. We want to attack the diseases.

For example, we have a charity called Chain of Hope which operates with QCRC and Qatar Foundation to bring in children from war-torn countries from Palestine, Iraq and Africa with advanced heart diseases and give them a chance. With that also we spread knowledge, another very important objective of the QCRC.

We publish a very high quality journal which tackles the latest global cardiology science and practice. It is an open access journal published by Qatar Foundation.

It helps to improve the health of poor people and we go on missions to train people in Mozambique and Kenya. In the past we went to Nigeria, Burundi and Ethiopia. We also have presence in Central America like Jamaica.

We want to improve health and give everybody a chance through teaching. That is the education side of QCRC. We have a big grant from Qatar Foundation to produce that journal

at the highest level and put it on the internet for free, as a hub of knowledge. We also run seminars and conferences and make the outcomes available on the QCRC website so that people can have access to them.

What do you think is the future of the human heart? How promising do you think is research in this field?

To reproduce the functions of the human heart is very complex. We have in QCRC, tissue engineering because we know that biology is supreme; life, a living heart.

We do reproduce many functions of the heart by mechanical things but it is not as perfect as the biology of the heart. So we try tissue engineering; grow matrices and cells and through chemistry as well put we call decorate the scaffold, the thing which we insert like a valve or a piece of muscle which starts functioning like a biological valve, a living valve or heart muscle.

The dream of creating a whole heart by tissue engineering is difficult. Now what we rely on is what we call a hybrid heart, using both mechanical and biology which interact with each other.

We lead in that to put artificial heart to rest the heart, to interact with it molecularly and mechanically to allow it to recover. Sometimes we leave the hybrid for years. Sometimes we induce recovery and take the device out. So this mixture of mechanical, biological and tissue engineering is very exciting.

It might be in the next 20 to 30 years that we will be able to produce a complete lung or heart.

Please tell us about the Magdi Yacoub Heart Foundation and the impact it has been able to make in the lives of people, especially in Egypt?

There are different foundations carrying my name. The one in London is called Magdi Yacoub Research Network (MYRN). The Magdi Research Heart Foundation is established independently but also with the help of the Chain of Hope charity which is in London. They raise money from abroad. Qatar has helped in that. A lot of money also comes from the poor people who give small amounts.

The important thing of the Foundation is four-fold. It treats children and young adults with severe heart conditions; giving them the very latest for free. It performs 800 to 1,000 open heart surgeries of very complex conditions a year; about 2,000 procedures to prevent heart attacks, and close the effects of congenital heart diseases. We give priority to the poor people because they cannot go anywhere else. We pay particular attention to people in the south of Egypt because they have been neglected for long.

The second objective is to develop infrastructure which consists first and foremost of human resources. So the center is dedicated to training young doctors, nurses and technicians at the highest level.

They are now performing everything mostly by themselves without international experts, making it a center of excellence like you have nowhere in the world in a neglected area.

We are also putting up physical facilities by building the latest type of structure as clean and advanced as can be with a research institute attached to it. So you need the physical infrastructure with equipment and all that, diagnostics like MRI and CT that work round the clock to serve the patients in the region and also to do research.

The foundation as well aims to create local expertise to carry on in the future; and enhance knowledge dissemination. All the advanced countries know that they cannot do everything alone. So in science and medicine, the buzz word is collaboration.

We work together because we cannot do everything alone. We want collaboration with big minds, getting together young people. Working with different institutions is much better than the sum of the component parts. That is the concept of the MYRN.

We have five or six top universities we collaborate with. They include Imperial College, Oxford University, Cambridge University, Harvard University and University of Florence, Italy. With Imperial College we have access to Singapore where they are doing a lot of genetic studies on Chinese Singaporeans. We are also going to Africa in Ethiopia to do research on different diseases. This is extremely exciting.