



News Feature

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Gulf states embrace stem cell technologies at home and abroad

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Seventy years ago, the desert sands of Arabia revealed vast oil reserves. That wealth is now being put to work to fund potential new sources of revenue

In the palaces of the oil-rich Gulf countries of the Middle East, discussion is turning to biotechnology. Rulers realize that their countries need economies that are not solely dependent on ultimately limited natural resources, and that realization seems to be encouraging the development of a stable science and technology infrastructure. King Abdullah of Saudi Arabia recently provided a multibillion-dollar endowment to support the establishment of the [King Abdullah University of Science and Technology](http://www.kaust.edu.sa/) (KAUST), while Sheikh Mohammed Bin Rashid, vice president of the United Arab Emirates, announced a [US\\$10 billion personal endowment](http://www.mbrfoundation.ae/) for the "development of a knowledge-based society in the region." The kings and emirs apparently believe that the biomedical industry holds some of the best potential for investment; biotech parks are cropping up in almost every country in the Gulf.



A researcher at FutureMed, a biotech company in Saudi Arabia that banks cord blood and mesenchymal stem cells. Image courtesy of FutureMed

Local applications

The race is on — and stem cell entrepreneurs do not plan on being left behind. Work on stem cells, including human embryonic stem cells, is permitted within Islamic sharia law, with certain restrictions ([Box 1 \(#a5\)](#)). The United States-based venture capital firm [Proteus Venture Partners](http://www.proteusvp.com/) is one of the first international investors to take an interest in stem cell research in the region. Proteus plans on raising \$250 million to invest in regenerative medicine around the world, and the Gulf is one of its primary targets.

"The capital to provide the funding, the intellectual capital in the universities and a market that has unmet needs should be enough to create the industry with enough people willing to work hard," says Gregory Bonfiglio, Proteus's managing partner.

That potential is driving Proteus to court several governments and private institutions in the Gulf to create a fund that will facilitate life-sciences technology transfer to the region from other parts of the world. "There is no question that the governments in the region are interested," says Bonfiglio.

And Gulf investors have reason to jump on board with Proteus. Bonfiglio likes to point to the venture capital fund [Anthem Venture Partners](http://www.anthemvp.com/), which he set up in 2000, whose investors are largely from the Gulf. He believes that this fund, worth \$100 million, which invests in information technology and biotechnology, will probably

take its place in the top 5% of the funds that were created that year.

Proteus already has a contract in place with, among others, Saudi Arabia's [FutureMed](http://www.futuremed.com.sa/) (<http://www.futuremed.com.sa/>), one of the Arab world's first facilities for processing umbilical cord blood. FutureMed recently expanded its operations to include banking of mesenchymal stem cells. Fayad Dandashi, founder and chief executive officer of FutureMed, explains that Gulf countries have particularly high rates of diabetes, cardiac diseases, hepatitis and blood diseases such as sickle-cell anaemia and thalassaemia, and so these countries could be a particularly rich market for stem cell-based therapies. "These diseases are all possibly cured by regenerative medicine therapies," he says.

FutureMed is one of the few private companies in the region that is funding stem cell research in local universities. Dandashi sees his company as helping to promote stem cell research and build biotechnology in Saudi Arabia. FutureMed is partially funding research on cord blood stem cells, mesenchymal stem cells and undifferentiated stem cells at KAUST's faculty of medicine in Jeddah, Saudi Arabia, says Bassim Albeirouti, assistant professor of medicine, haematology and stem cell transplantation

In addition to doing basic research, KAUST plans to establish both a stem cell research unit and a stem cell therapy unit, says Albeirouti, who believes that establishing national stem cell research centres in the kingdom is necessary because of the different rates and types of disease in the region. "It's important to treat our population on the basis of local research," he says. "What is best for the West and East might not be good for our population."

Some Saudi researchers believe so strongly in local stem cell research that — in the absence of university funding — they are funding research out of their own pockets. Hassan Abduljabbar, professor and consultant at King Abdul Aziz University Hospital, and his team are doing just that. They are currently working on two self-financed stem cell research projects. One involves expanding the numbers of stored stem cells. The average volume of 25 millilitres of stored stem cells from cord blood is only enough to treat a 20–30-kilogram child, says Abduljabbar. By expanding these stem cells five to tenfold, an adult could be treated by that same amount of blood, he says. The second of their projects concerns differentiating stem cells into various cell and tissue types.

The link between Saudi universities and the private sector is reinforced by several science chairs at KAUST and at King Saud University in Riyadh, Saudi Arabia, that are funded by the private sector. This includes a chair for stem cells, says Albeirouti.

Chaker Adra, director of the Stem Cell Therapy Program (SCTP) at King Faisal Specialist Hospital and Research Center in Riyadh, bubbles with enthusiasm for the kingdom's support for stem cell research. "The Saudis say we want to produce new knowledge, not simply buy knowledge," says Adra, who is of Lebanese origin.

The SCTP is considered by many researchers in the kingdom to be one of the region's strongest programmes. In the year since its launch, the programme has filed two patent applications, published five papers and established collaborative projects with researchers at both Harvard Medical School in the United States and Karolinska University Hospital in Sweden.

International outlook

But in addition to their local efforts, the Gulf countries are showing an interest in supporting international stem cell research. Sheikh Hamdan bin Rashid Al Maktoum, the United Arab Emirates's minister of finance and industry, has set up an institution in his name that, among other things, has an international award in the medical sciences. The [Sheikh Hamdan bin Rashid](#)



Fayad Dandashi, founder and chief executive officer of FutureMed, believes the Gulf countries could be a particularly rich market for stem cell therapies. Image courtesy of FutureMed.

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Al Maktoum Award for Medical Sciences (<http://www.hmaward.org.ae/site/award-intl-1.php>) focuses on international stem cell research. The winner will receive \$68,000, and the award is to be presented at a conference in December 2008 that will bring together the most distinguished stem cell researchers in the world.

In November 2006, the government of Qatar — through the **Qatar Foundation** (<http://www.qf.edu.qa/output/Page1.asp>) — donated \$2.5 million to Rice University's James A. Baker III Institute for Public Policy for the study of stem cell research and international policy on stem cells. Kirstin Matthews, the programme's manager, says the motivation was to expand the biomedical research programmes within Qatar: "By collaborating to learn more about stem cell research and policy, they will gain access to top researchers and will be able to determine the best, most thoughtful way of approaching this new and promising area of research."

Taking possession of the technology

But does all this promise a strong biotech industry for the Gulf region? Opinions vary. Adnan Badran, former prime minister of Jordan, is unimpressed with the biotech cities now being built in the Gulf. "They are importing the human resources, the patents and even the trademarks from abroad," says Badran. "They are only providing a physical set-up. So it's not really an indigenous science park," he says.

Abdalla Alnajjar, president of the **Arab Science and Technology Foundation** (<http://www.astf.net/>), sees things differently. "The region is full of universities and research centres that are well equipped," he says. "The problem is not equipment or scientists. The problem is creating technology output."

Alnajjar believes that the current culture in the Arab world is for researchers to publish papers for academic promotion. What is needed, he says, is to encourage researchers to write patents. Alnajjar believes that Arab researchers need to go beyond knowledge transfer, from their universities to international journals, to technology transfer, from their universities to surrounding industries and other countries. "Technology transfer does not exist in our countries. It's understood to be the other way around: from other countries to ours," he explains.

Alnajjar believes that venture capital investments for the Gulf region's biotech industry could build the culture he wants, but venture capital needs to adapt to the Gulf. He thinks that Arab academics will be particularly unwilling to licence technology to a separate company and let others develop the technologies they invent. "In our region, once the scientist reaches the stage of innovation he deals with it as his baby," Alnajjar says. "In the venture capital approach, the technology is dealt with as an orphan. So our scientists cannot cope with the venture capital culture of the West. This means we need a new approach for venture capital that suits the mentality in the region," he says.

Alnajjar proposes a venture capital approach that involves adopting the scientist, rather than the technology. Investors will reap more opportunities for revenue as individual scientists develop new technologies around initial products, he says.

Imad Ghandour, head of strategy and research at **Gulf Capital** (<http://www.gulfcapital.com/default/>), an alternative investment company in the United Arab Emirates, is sceptical. "The Gulf region is not of interest to venture capital investors," he says. "Venture capital goes in and eventually sells," he says, but the exit strategy for Arab start-ups would be complicated. Larger, established companies that might purchase a start-up are far away and so are the stock markets that investors like companies to be listed on. Ghandour believes that big Gulf investors will look to opportunities outside the region, whereas the smaller, local investors do not understand what it takes to make a biotech company work and lack the patience to wait out biotech's long development cycles. In any case, he says, venture capitalists don't have much to choose from; he believes the technology base is weak in most Gulf countries, and particularly so for biotech.

Moncef Jendoubi, a Tunisian venture capitalist based in California's Silicon Valley, disagrees. Jendoubi has created the Renaissance Venture Fund, for which he plans to raise millions of dollars to invest in biotech initiatives all over the Arab world.

"There are certainly many opportunities in the biotech industry in the Gulf region," he says, "but not necessarily in stem cells." He thinks options in food safety, infectious diseases and vaccines are much more promising. "I think it is very premature for venture capital investments in stem cells, particularly since the technologies are still evolving, even in the United States, Europe and Asia."

Nevertheless, Abduljabbar is optimistic that he won't have to fund his research from his own pocket much longer. "This is what we usually do," he says. "We start, and then propose, then, Allah willing, we have funds next year from our university or from the King Abdullah City for Science and Technology." And perhaps, eventually, funds will flow from venture capital as well.

Box 1. The 2003 fatwa (edict) issued in Saudi Arabia by the Fiqh (Islamic Jurisprudence) Council of the Muslim World League. This fatwa provides the religious framework for stem cell research in the Kingdom of Saudi Arabia.

"It is permissible to obtain, grow and use stem cells for therapeutic or permissible scientific research purposes if obtained from a permissible source, including:

- Adults, provided they give permission to do so and if no harm comes to them as a result
- Children, if their parents give permission to do so for a permissible reason and if no harm comes to them as a result
- The placenta or umbilical cord with the permission of the parents
- Embryos or fetuses that have been miscarried of their own accord or aborted for therapeutic reasons allowed by the sharia and with the permission of the parents
- Leftover fertilized embryos from in vitro fertilization that are donated by the parents. It must be remembered that these cannot be used for impermissible pregnancies

It is impermissible to obtain and use stem cells if taken from impermissible sources, which include:

- Fetuses that are aborted willfully and without a medical reason permitted by sharia
- Willful fertilization of a donated ovum and sperm
- Therapeutic cloning"

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