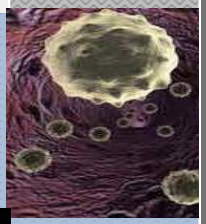

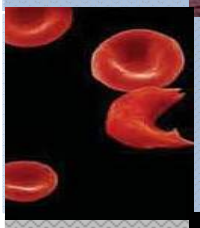

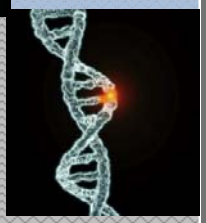

EMHGBN Newsletter

Vol. 1, Issue 10, July 30th, 2007

INSIDE THIS ISSUE:

Eastern Mediterranean Health Genomics and Biotechnology Network (EMHGBN) was created in 2004 with collaboration of representatives of selected centre of excellence in (health related) molecular biology, biotechnology & genomics in the Eastern Mediterranean region by recommendations and efforts of WHO/EMRO.

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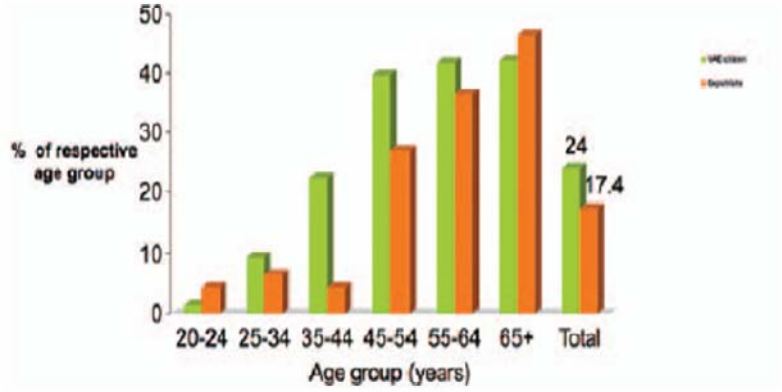
EPIDEMIC OF DIABETES WORLDWIDE

Undeniably, there is now an epidemic of diabetes mellitus worldwide. At least 50% of all people with diabetes are unaware of their condition, and in some countries, this may be as high as 80%. Diabetes is the fourth main cause of death in most developed countries, is the leading cause of blindness and visual impairment in developed countries, and is the most common cause of limb amputation which is not the result of an accident. The following map demonstrates the numbers of people aged between 20-79 with diabetes worldwide in 2003, split according to WHO regions North America, South and Central America, Europe, Africa, Eastern Mediterranean and Middle East, South-East Asia and Western Pacific. When you look at the prevalence in terms of percentage per country of adult population (aged 20-79), the countries with the highest prevalence in 2003 were the small Pacific island of Nauru (30.2%), the UAE (20.1%), Qatar (16%), Bahrain (14.9%) and Kuwait (12.8%) . If nothing is done to stem the epidemic in diabetes, the number is expected to exceed 333 million by the year 2025. By 2025, the number of people with diabetes is expected to: more than double in Africa, the Eastern Mediterranean & Middle East, and South-East Asia; rise by 20% in Europe; 50% in North America; 85% in South and Central America and 75% in the Western Pacific. For developing countries, there will be an expected increase of 170% of cases; for developed countries, there will be a projected rise of 42%.

Diabetes within the UAE, The problem of diabetes mellitus within the UAE is severe, given the phenomenal 20.1% prevalence in the country (24% national and 17.4% expatriate). The following chart displays the spread of diabetes within different age groups. [Ref: Dr Maha Taysir Barakat, Medical and Research Director, Imperial College London and Imperial College London Diabetes Centre,Abu Dhabi, Arab Health Magazine, Spring 2006]

Prevalence of Diabetes in the UAE according to age group, 2000



Genetic disorders in the Arab world

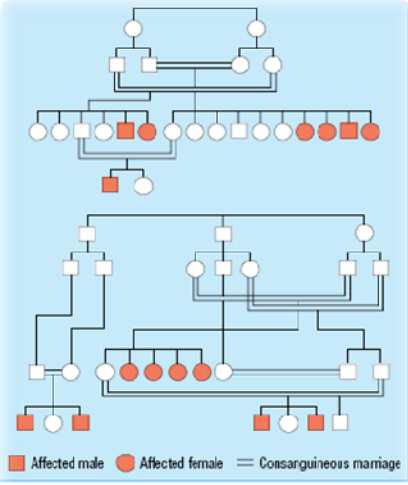


Fig 1 Two Arab pedigrees showing high level of consanguinity, large family size, and several affected children in different sibships

Available evidence suggests that congenital and genetic disorders are responsible for a major proportion of infant mortality, morbidity, and handicap in Arab countries. The population of the region is characterised by large family size, high maternal and paternal age, and a high level of inbreeding with consanguinity rates in the range of 25-60%.Certain disorders are common throughout the Arab world, including haemoglobinopathies, glucose-6-phosphate dehydrogenase deficiency, different congenital malformations caused by recessive genes, and several metabolic disorders. Other recessive disorders cluster in certain groups and subpopulations. Genetic services vary in extent and coverage in different Arab countries, but mostly they remain patchy, selective, and inadequate. We present the magnitude of the problem and the currently available genetic services in Arab countries, together with recommendations for developing strategies for prevention. In view of the good coverage of primary healthcare systems in most Arab countries, community genetic services that include screening programmes could be strengthened by the efficient training of primary healthcare personnel.

The population in Arab countries is characterized by large family size, high maternal and paternal age, and a high level of inbreeding

Premarital carrier screening

A screening programme for genetic carriers is a systematic attempt to identify and counsel as many people at genetic risk in a population as possible, whether or not they have a family history of a genetic disorder. Several countries in the Arab region have introduced premarital screening for haemoglobinopathies. In Saudi Arabia, a Royal decree was passed in 2003 for a mandatory premarital screening test followed by non-directive genetic counseling for haemoglobinopathies; the decision to marry is then left to the couple. Prenatal diagnosis and termination of pregnancy are not offered to carrier couples, even though a 1990 ruling (Fatwa) allows termination of pregnancy in the first 120 days after conception if the fetus is shown beyond doubt to be affected with a severe malformation that is not amenable to treatment. Similar programmes exist in other Arab countries such as Bahrain, the United Arab Emirates, Tunisia, and Jordan.

Family oriented approach to prevention

When a gene for a recessive disorder is present in a family, the diagnosis of the disease in a child serves as a marker of the extended family that is at increased genetic risk. In communities where a high level of consanguinity exists and large families are common, family oriented screening offers an alternative to population screening for identifying current and future couples at risk of producing affected children.

This approach is particularly suitable to populations with a high level of consanguinity and clustering of rare genetic diseases in certain tribes or families. It produces a high yield of information on carriers and couples at risk, family members understand the condition because they have had contact with an affected child, and usually one gene variant is present in a given family or tribe, simplifying and reducing the cost of DNA based diagnosis. This approach was tested in Pakistan in 15 large consanguineous families with thalassaemia and was found to be feasible. The programme was successful because carriers had the option of prenatal diagnosis and selective termination of pregnancy, which is legal in Pakistan. A similar approach was implemented in the Arab Negav Bedouin community, where the genetic data on carrier status for genetic disorders common in this community were incorporated into the decision making process of arranged marriages, giving carriers the option to choose a non-carrier partner. Clinical screening of newborn infants involves systematic examination with a checklist of all births, whether alive or stillbirths, by an experienced paediatrician to detect any abnormalities. The United Arab Emirates and Oman have established national or hospital based registries for congenital abnormalities. Some of these registries report to the International Clearing House for Birth Defects. In some industrialised countries, pregnant women have non-invasive screening for Down's syndrome and other congenital anomalies through the assessment of maternal serum markers and ultrasonography at around 11 weeks post-conception. This is followed by invasive prenatal diagnosis if the test is positive, giving the couple the option of selective termination of pregnancy of an affected fetus. As termination is not legal in many Arab countries, the value of introducing prenatal screening programmes is questionable. A better method of prevention would be the general availability of preconception information and family planning for older mothers, which would be expected to lead to a reduction of around 50% in the frequency of new cases of Down's syndrome.Pre-implantation genetic diagnosis is welcomed in Arab countries, as it does not involve the decision to terminate the pregnancy. A recent study from United Arab Emirates found that most people favour this mode of prevention.The procedure is, however, still in its early stages, with many limitations. Preimplantation genetic diagnosis involves assisted reproductive technology. It is a complex, time consuming, and expensive procedure that is available only at a small number of centres and for a limited number of genetic conditions. It is available in Saudi Arabia, where several single gene disorders can be diagnosed. The effect of genetic and congenital disorders in Arab countries is high. Genetic services are inadequate and do not cover all the population. Preventive strategies should be adopted at a national level, with development of regional and international collaboration and with technical support from WHO.

[Ref: Lihadh Al-Gazali, Hanan Hamamy and Shaikha Al-Arrayad, *BMJ*, 2006;p 333;831-834]

Some countries have started cost effective prevention programme for certain common genetic disorders, such as premarital carrier screening for haemoglobinopathies

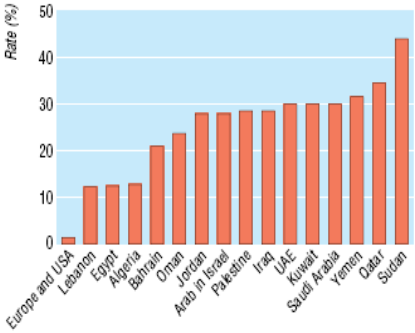


Fig 2 Average rates of marriages between first cousins among Arabs. UAE=United Arab Emirates

Top companies on corporate biographies

Egyptian International Pharmaceutical Industries Company (EIPICO)

Formed in 1980, EIPICO accounts for 20% of Egypt 's drug exports and has an 8% share of the domestic market. It produces over 200 products, 65 of which are under license from other companies. EIPICO's future plans include expansion into the production of interferon treatments for use in treating nervous system disorders and immune system stimulants for use in chemotherapy. Analysts generally agree EIPICO is the best-managed and top-performing state-owned drug company. With the largest sterile areas in the Middle East and North Africa , it has also invested in a biotechnology center that is now making a small (0.25% of sales) but growing contribution to EIPICO's bottom line. Also noteworthy, EIPICO has established, implemented and maintained integrated management systems for a quality environment satisfying the requirements of both ISO 9001 and ISO 14001. In 2005, EIPICO won a landmark patent-infringement suit brought against it by Pfizer (over Ator, which Pfizer claimed was identical to its Lipitor; Ator accounts for 1.5% of EIPICO's sales), although it lost a case brought against it by the Income Tax Authority and had to pay LE 3 million in taxes on free promotional samples it has distributed over a 10-year period. In 2006 EIPICO announced the establishment of a new company with Saudi partners. EIPICO owns a 30% share of the SAR60 million venture, which should start production in the second half of 2007. Exports account for 15% of EIPICO's sales of nearly 250 products, including 61 made under license from international copyright holders and 186 generics. In 2006, EIPICO purchased a plot of land adjacent to its Tenth of Ramadan factory on which it plans to add new production lines for veterinary products and cosmetics. EIPICO's 1Q07 financials showed continued double digit growth in net profits, which hit LE 56.5 million for the quarter. [Ref: phar.ca, 2007]

EIPICO, Egypt

Bioethics Activities in India

The Indian Council of Medical Research formulates, coordinates and promotes biomedical research in India. In 1980, they formulated the first national ethical guidelines. They offer a number of different training programmes, from 1 day to 6 months. The council is developing a core curriculum for teaching bioethics, which would be applied uniformly in medical schools throughout the country. Drug development and ethics is also important in India, particularly now that the local pharmaceutical industry is expanding and so many drugs trials are outsourced to the country. The council is also very active in encouraging the development of ethics review committees. [Ref: La Revue de Santé de la Méditerranée orientale, Vol. 12 (Supplément No 1), 2006]

Qatar Science Revolution

Qatar Science & Technology Park

Qatar is experiencing a near revolution in science aimed at catapulting the oil-wealthy emirate into the 21st century. Last November 2.8 per cent of Qatar's gross domestic product (GDP) allocated to science research. The education city project, Qatar Science and Technology Park (QSTP), Qatar National Research Fund (QNRF), Inviting top universities to set up branches and presence of top western universities are symbols of progress in Qatar. QSTP was established specifically to nurture Qatar's knowledge economy by juggling two tasks. One is to bring in multinational corporations with know-how in sectors such as information technology, hydrocarbon and the environment. The other is to encourage local research activities and entrepreneurship. Besides facilitating collaboration between industry and academia, QSTP will also offer incubation services to business start-ups, along with business entrepreneurship and mentoring programs. QF's other project is the QNRF, which aims to offer the means and incentives for researchers - from Qatar and abroad- to carry out research in the country. [Ref: SciDev.Net, 14 March 2007 http://www.scidev.net/Features/index.cfm?fuseaction=readFeatures&itemid=588&language=1]

Hikma set to rise on back of boom

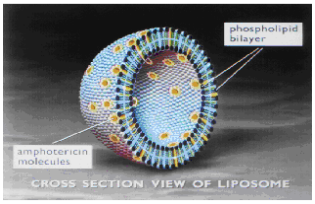
Hikma Pharmaceuticals, the London-listed Jordanian company, said it expected to report a 40 per cent rise in first-half revenues on the back of growth in its branded and injectables business. Hikma manufactures branded and non-branded generic drugs across 34 countries and its key markets are Algeria, Jordan, Saudi Arabia and the US, where it generates more than 50 per cent of sales. Hikma expects its branded business to increase by 60 per cent in the first half and its injectables division by more than 20 per cent. [Ref: FT.com, June 28 2007, By Salamander Davoudi]

Tissue culture in banana plants getting popular

Tissue-Cultured Banana Plants

Tissue-culturing of banana plants, a biotechnology initiative to increase the yield by five times of traditional farming, is becoming popular among farmers in Oman, Middle East, Pakistan, Sri Lanka and Africa. Recently, agro-technology major Jain Irrigation Systems exported the first consignment of its Grand-Nain variety of tissue-cultured banana plants to Oman. It plans to further export around 66,000 plants by the end of this year. Sources said farmers in the Middle East and other countries cultivate the traditional variety of banana which gives very low yield all over central Asia. Since the market potential for bananas is very high in the Middle East countries, the demand is met through exports from the Philippines, India and South American countries. The annual yield for traditional banana farming using drip irrigation technology was 65 tonne per hectare. The use of tissue culture technology, however, has further enhanced this yield to 95-100 tonne per hectare. Moreover, the traditional banana plants bloom in 16-18 months while the tissue-cultured plants bloom in only 11 months. [Ref: TIMES NEWS NETWORK, Saturday, June 16, 2007]

Recent Advances in Drug Delivery Systems



Drug encapsulation in liposomes

The method by which a drug is delivered can have a significant effect on its efficacy. Some drugs have an optimum concentration range within which maximum benefit is derived, and concentrations above or below this range can be toxic or produce no therapeutic benefit at all. On the other hand, the very slow progress in the efficacy of the treatment of severe diseases, has suggested a growing need for a multidisciplinary approach to the delivery of therapeutics to targets in tissues. From this, new ideas on controlling the pharmacokinetics, pharmacodynamics, non-specific toxicity, immunogenicity, biorecognition, and efficacy of drugs were generated. These new strategies, often called drug delivery systems (DDS), are based on interdisciplinary approaches that combine polymer science, pharmaceutics, bioconjugate chemistry, and molecular biology.

Controlled drug release and subsequent biodegradation are important for developing successful formulations. Potential release mechanisms involve: (i) desorption of surface-bound /adsorbed drugs; (ii) diffusion through the carrier matrix; (iii) diffusion (in the case of nanocapsules) through the carrier wall; (iv) carrier matrix erosion; and (v) a combined erosion /diffusion process. The mode of delivery can be the difference between a drug's success and failure, as the choice of a drug is often influenced by the way the medicine is administered. Sustained (or continuous) release of a drug involves polymers that release the drug at a controlled rate due to diffusion out of the polymer or by degradation of the polymer over time. Pulsatile release is often the preferred method of drug delivery, as it closely mimics the way by which the body naturally produces hormones such as insulin. It is achieved by using drug-carrying polymers that respond to specific stimuli (e.g., exposure to light, changes in pH or temperature).

Drug Delivery Carriers

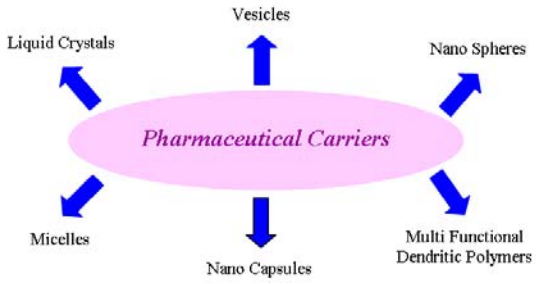
Colloidal drug carrier systems such as micellar solutions, vesicle and liquid crystal dispersions, as well as nanoparticle dispersions consisting of small particles of 10–400 nm diameter show great promise as drug delivery systems.

MICELLES formed by self-assembly of amphiphilic block copolymers (5-50 nm) in aqueous solutions are of great interest for drug delivery applications. Functionalization of block copolymers with crosslinkable groups can increase the stability of the corresponding micelles and improve their temporal control.

LIPOSOMES are a form of vesicles that consist either of many, few or just one phospholipid bilayers. Channel proteins can be incorporated without loss of their activity within the hydrophobic domain of vesicle membranes, acting as a size-selective filter, only allowing passive diffusion of small solutes such as ions, nutrients and antibiotics.

DENDRIMERS are nanometer-sized, highly branched and monodisperse macromolecules with symmetrical architecture. They consist of a central core, branching units and terminal functional groups. The core together with the internal units, determine the environment of the nanocavities and consequently their solubilizing properties, whereas the external groups the solubility and chemical behaviour of these polymers.

Right: Pharmaceutical carriers



NANOPARTICLES are in the solid state and are either amorphous or crystalline. Nanoparticles as drug carriers can be formed from both biodegradable polymers and non-biodegradable polymers.

HYDROGELS are three-dimensional, hydrophilic, polymeric networks capable of imbibing large amounts of water or biological fluids. Hydrogels exhibit a thermodynamic compatibility with water, which allows them to swell in aqueous media. They are used to regulate drug release in reservoir-based, controlled release systems or as carriers in swellable and swelling-controlled release devices.

MIP-based(molecular imprinting technology) drug delivery systems involve: (i) rate-programmed drug delivery, where drug diffusion from the system has to follow a specific rate profile, (ii) activation-modulated drug delivery, where the release is activated by some physical, chemical or biochemical processes and (iii) feedback-regulated drug delivery, where the rate of drug release is regulated by the concentration of a triggering agent, such as a biochemical substance, the concentration of which is dependent on the drug concentration in the body.

CONJUGATION of suitable biocompatible polymers to bioactive peptides or proteins can reduce toxicity, prevent immunogenic or antigenic side reactions, enhance blood circulation times and improve solubility.

The field of in-situ forming IMPLANTS has grown exponentially in recent years. Liquid formulations generating a (semi-)solid depot after subcutaneous injection, also designated as implants, is an attractive delivery system for parenteral application because; they are less invasive and painful compared to implants. Injectable in-situ forming implants are classified into four categories, according to their mechanism of depot formation: (i) thermoplastic pastes, (ii) *in-situ* cross-linked polymer systems, (iii) *in-situ* polymer precipitation, and (iv) thermally induced gelling systems. [Ref: www.azonano.com/oars.asp, 2006]

Interview

Please introduce yourself briefly and explain your scientific role?

I'm Dr. F. Mahboudi, Director of Medical Biotechnology Network. I've received my PhD. In Molecular Immunology.

What are your fields of activity?

I'm currently running a research on heterologous gene expression for Biopharmaceutical and vaccine purposes.

Why did you choose such fields?

Biotechnology especially in the area of biopharmaceutics, is a fast growing area of science. In addition the needs of developing countries are to have access to this technology to promote the health condition of the society.

Do you use any biotechnology or genomics tools in your research?

Yes, techniques like Microarray, Real Time PCR, gene expression and protein purification.

Which aspects of world health would be affected by biotechnology and genomics?

Health in general and treatment specifically have been promoted very much. More than 110 new medicines with biotech techniques have been launched so far, that have changed the medical world.

What are your suggestions to improve regional collaboration?

Biotech needs worldwide collaboration, also regional collaboration makes our network more capable to compete with the rest of the world.

How do you see EMHGBN and its future?

EMHGBN is one of the requirements for our countries to work together and create a network for science and technology. This network has to know related sciences in the region and create a scientific collaboration. It also, should be one of the centres that biotech scientists can come together for research and technology collaboration.

What is your opinion about industrial biotechnology in EMRO countries?

This is a fact that our region is very poor in terms of technology development in the area of biotechnology.

How do you see biotech industry in Iran?

Japan, South Korea, China, India and Iran are the countries that showed a progress in this area.

However, Iran is still behind, in compare to others, but with more than 500 papers in the international journals and more than 7 recombinant proteins in the market is a pioneer in the region. Iran also has paid attention to developing recombinant DNA technology that helps the community's health.

Which problems we are facing in industrial biotechnology?

We need more research budget, more collaboration, regional and network collaborations.

What should be done to overcome these problems?

Joint investment in technology and production creates the regional market.

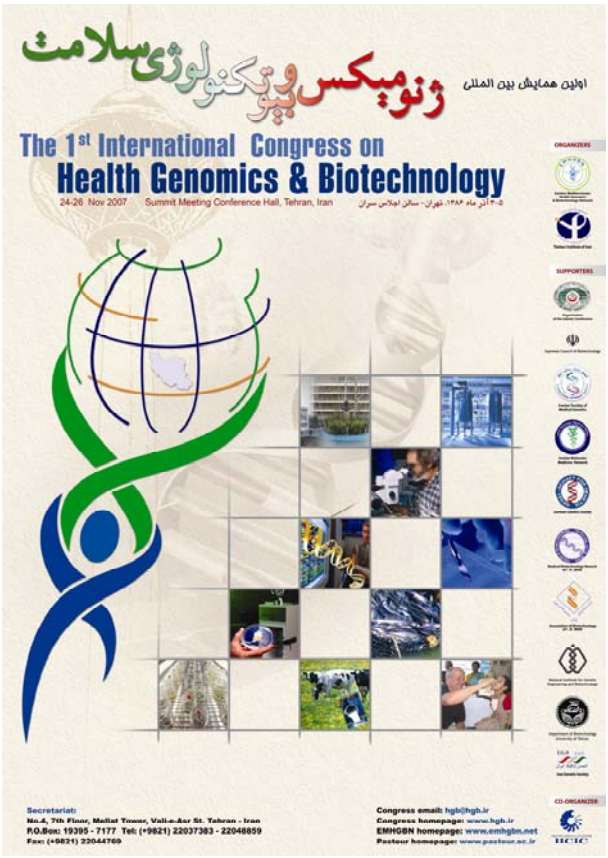
What is your idea about linkage improvement between research and industry?

Joint research grants.

How do you see collaboration of EMRO countries, and what should be done to improve it?

Joint training programmes for short and long term. Joint investment in industrial production, joint research projects and finally joint market.

Anouncements



The First International Congress on Health Genomics and Biotechnology will take place On 24-26 Nov. 2007 in Tehran, Islamic Republic of Iran

The congress will cover more than 40 different topics including:

- **Genomics and Biotechnology in non communicable diseases**
- **Genetics of Human Pathogens**
- **Biopharmaceutics and Genetic Technology**
- **Bioethics, Biosafety in Genomics and Biotechnology Research, Application, Policy, Regulation, Networking and Management**

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